KINGDOM OF CAMBODIA
NATION RELIGION KING



SIXTH NATIONAL REPORT

To The Convention on Biological Diversity

June 2019

THE ROYAL GOVERNMENT OF CAMBODIA

THE SIXTH NATIONAL REPORT TO THE CONVENTION ON BIOLOGICAL DIVERSITY

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FOREWORD

The Kingdom of Cambodia is recognized as one of the richest biodiversity hotspots within Southeast Asia. Biodiversity and ecosystems whose natural processes are deeply inter-connected provide many services, resources and functions important for the livelihoods and human well-beings of the people of Cambodia, wildlife, Cambodia's economy, and mitigating climate hazards. While biodiversity provides fundamental goods and services upon which all life depends, it is particularly important to the most vulnerable groups of our society. Numerous Cambodian people, especially indigenous groups and remote communities depend intensely upon biodiversity for their basic necessities such as food, water, shelter, medicine and their livelihoods. With such importance, the Kingdom of Cambodia has developed a series of policies, strategies and action plans, aiming to conserve and sustain such biological resources. To reflect what we have been doing and as part of regional and global endeavors, the Kingdom of Cambodia has committed to, among others, developing 5 periodic national reports on biological diversity.

Now, in my capacity as Minister for Environment and Chair of National Council for Sustainable Development, I am pleased to adopt the Cambodia's Sixth National Report to the UN Convention on Biological Diversity, covering the period between 2014 and 2018. I am not only proud but also encouraged that significant progress has been made by the country towards the targets identified in the National Biodiversity Strategy and Action Plan (NBSAP), the roadmap adopted in 2016 by the Royal Government of Cambodia to ensure that Cambodia's natural capital is "valued, conserved, restored where necessary, wisely used and managed so as to ensure equitable economic prosperity and improved quality of life for all in the country." It is worth recalling that our national biodiversity targets were adopted in line with the Rectangular Strategy, the National Environment Strategy and Action Plan 2016 -2023 and the National Protected Area Strategic Management Plan 2017-2031. They are also in phase with our national action plans for the Sustainable Development Goals and the commitments we made under the UN Framework Convention on Climate Change as well as the UN Convention to Combat Desertification.

The encouraging outcomes have been realized in only two years after the adoption of the updated NBSAP and 2 years before the deadline for the national and global biodiversity targets in 2020. Among the most significant achievements, the Kingdom of Cambodia managed to expand its protected area (PA) system to make sure that our rich and unique ecosystems are used sustainably and conserved effectively for the present and future generations, not only for urban populations but also for rural communities and ethnic minorities. The PA system of the Kingdom of Cambodia, with its extended network of biodiversity conservation corridors, has now reached 41% of its territory, which is far above the 17% of the global biodiversity target.

The Sixth National Report also confirms that the Kingdom of Cambodia is on track to achieving many other targets, including, for instance, having in place the necessary legislations, policies and guidelines for the conservation of specific ecosystems like coral reefs or forests; for the sustainable production and consumption, which is key for sustainable development in such sectors as agriculture, energy, textile or waste treatment. We commend on the progress made in promoting different schemes of Payment for Ecosystem Service (PES) as incentives for the conservation and sustainable use of biodiversity, while particularly contributing to the livelihoods of rural communities.

In developing the Sixth National Report, we also identified areas requiring additional efforts and commitments. Although some work is under way, restoration of degraded land as well as expansion of both *ex-situ* and *in-situ* conservation of genetic resources, in particular in face of climate change, need additional investment to meet our targets.

Under the wise leadership of **Samdech Akka Moha Sena Padei Techo HUN SEN**, Prime Minister of the Kingdom of Cambodia, the country will continue mobilizing the needed resources to achieve its targets, some of which will be redefined in line with specific and measurable targets adopted in the framework of other development strategies and the action plans for realization of the sustainable development goals. As a matter of strategy, the Kingdom of Cambodia will promote synergies in the implementation of its plans, projects and programmes of relevance to biodiversity to optimize resource use and mobilize engagement of the private sector in a coherent manner.

I commend all the people who contributed to the achievement of the targets we adopted in the 2016 National Biodiversity Strategy and Action Plan and in preparation and drafting of this report. Special appreciation is due to GEF through UNDP for its financial and technical support.

Phnom Penh, June 12, 2019

Say Samal

Minister of Environment,
Chair of National Council for Sustainable Development

ACKNOWLEDGMENTS

This Sixth National Report to the Convention on Biological Diversity is the results of collective contributions from line ministries and agencies, both national and international non-governmental organizations, academic and research institutions, local communities and civil society organizations.

I would like to acknowledge them all here with appreciation on behalf of the General Secretariat of the National Council for Sustainable Development (GSSD). In addition, the valuable inputs from the followings are particularly recognized: members of Biodiversity Technical Working Group (BTWG), Ministry of Environment, Ministry of Agriculture, Forestry and Fisheries, Ministry of Health, Royal University of Phnom Penh, Royal University of Agriculture, Prek Leap National College of Agriculture, Cambodian Agricultural Research and Development Institute (CARDI), development partners, as well as the national and international consultants for their commitments to the whole process of developing the national report.

Department of Biodiversity and GSSD would like to express particular thanks to **H.E. Say Samal**, Minister of Environment and Chair of the National Council for Sustainable Development (NCSD) for his leadership and ongoing nationwide initiatives on the conservation and sustainable use of natural resources, especially biological diversity for the well-being of all in the Kingdom of Cambodia. His Excellency Minister has always been with us to encourage and support the implementation of biodiversity-related projects and development of this report.

Our appreciation is given to the members of NCSD for their support, advice and supervision to ensure the quality of the Sixth National Report of the Kingdom of Cambodia in responding to the Royal Government's obligations to implement the Convention on Biological Diversity.

Our deep thanks are conveyed to **H.E. Tin Ponlok**, Secretary General of GSSD and chair of BTWG for his tireless support, encouragement and guidance. Our gratitude is expressed for the members of BTWG for their cooperation and inputs in ensuring the highest quality of the report. Special thanks are due to all colleagues from Department of Biodiversity and experts for their valuable time and efforts in providing significant ideas and feedback during the preparation and development process of the Sixth National Report to the Convention on Biological Diversity.

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Phnom Penh, ..June.07,2019....



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List of Abbreviations

ABS	Access and Benefit Sharing
ABT	Aichi Biodiversity Targets
AFD	Agence Française de Développment
APBRN	Asia-Pacific Biosphere Reserves Networks
APCEIU	Asia-Pacific Centre of Education for International Understanding
ASEAN	Association of Southeast Asian Nations
CARDI	Cambodian Agricultural Research and Development Institute
CBC	Centre for Biodiversity Conservation
CBD	Convention on Biological Diversity
CCB-CCA	Community Capacity Building for Climate Change Adaptation
CDM	Clean Development Mechanism
CEPA	Communication, Education and Public Awareness
CF	Community Forestry
CFi	Community Fisheries
CHM	Clearing-House Mechanism
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CJNH	Cambodian Journal of Natural History
CPA	Community Protected Areas
ECOLAND	Ecosystem Services and Land Use Research Centre
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organization
FCPF	Forest Carbon Partnership Facility
FLRM	Forest and Landscape Restoration Mechanism
FREL	Forest Reference Emission Level
GCED	Global Citizenship Education
GDANCP	General Directorate of Administration for Nature Conservation and Protection
GEF	Global Environment Facility
GHG	Greenhouse gas
IAS	Invasive Alien Species
IBA	Important Bird Areas
IBE	International Bureau of Education
ILK	Indigenous and Local Knowledge
InVEST	Integrated Valuation of Ecosystem Services and Trade-offs
IPBES	Inter-governmental Science-Policy Platform on Biodiversity and Ecosystem Services
IRRI	International Rice Research Institute
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
KBA	Key Biodiversity Areas
KE	Kouprey Express
KNFC	Keidanren Nature Conservation Fund
LDN	Land Degradation Neutrality

LMB	Lower Mekong Basin
LMO	Living Modified Organisms (resulting from modern biotechnology)
MAFF	Ministry of Agriculture Forestry and Fisheries
MARPOL	Convention on the Prevention of Marine Pollution from Ships
MCFA	Ministry of Culture and Fine Arts
MEF	Ministry of Economy and Finance
MEYS / MOEYS	Ministry of Education, Youth and Sports
MIH	Ministry of Industry and Handicraft
MIME	Ministry of Industry, Mining and Energy, *which is now MME*
MLMUPC	Ministry of Land Management urban Plan and Construction
MME	Ministry of Mine and Energy
MOC	Ministry of Commerce
MOE	Ministry of Environment
MOH	Ministry of Health
MOI	Ministry of Interior
MOINF	Ministry of Information
MOP	Ministry of Planning
MOT	Ministry of Tourism
MOWRAM	Ministry of Water Resource and Metrology
MPA	Marine Protected Area
MPWT	Ministry of Public Works and Transport
MRCS	Mekong River Commission Secretariat
MRD	Ministry of Rural Development
MWAV	Ministry of Women Affairs and Veteran
NAP	National Action Program to Combat Land Degradation
NBSAP	National Biodiversity Strategy and Action Plan
NCSD	General Secretariat of National Council for Sustainable Development
NFMS	National Forest Monitoring System
NFP	National Forest Programme
NIE	National Institute of Education
NPASMP	National Protected Area Strategic Management Plan
NRM	Natural Resource Management
PEER	Partnerships for Enhanced Engagement in Research
PES	Payment for Ecosystem Services
PoEYS	Provincial Office of Education, Youth and Sport
RAPPAM	Rapid Assessment and Priorization of Protected Areas Management
REDD	Reducing Emissions from Deforestation and Forest Degradation
RGC	Royal Government of Cambodia
RUA	Royal University of Agriculture
RUPP	Royal University of Phnom Penh
SCCF	Special Climate Change Fund
SEA	Strategic Environmental Assessment
SEPLS	Socio-ecological Production Landscapes and Seascapes
SFB	Supporting Forests and Biodiversity

SMART	Spatial Monitoring and Reporting Tool
SPS	Sanitary and Phytosanitary
SYUMI	Satoyama UMI
TRP	Tumring REDD+ Project
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WA	Wildlife Alliance
WCS	Wildlife Conservation Society
WDPA	World Database on Protected Areas
WWF	World Wildlife Fund

EXECUTIVE SUMMARY

Cambodia has prepared this 6th National Report in compliance with Article 26 of the Convention on Biological Diversity (CBD). This 6th national report covers the period from 2014 to 2018 in line with the national reporting guidelines adopted by the Conference of the Parties to the Convention in Decision XIII/27. It presents an assessment of progress toward Cambodia's national biodiversity targets adopted as part of the revised National Biodiversity Strategy and Action Plan (NBSAP) (approved in February 2016) and the Aichi Biodiversity Targets. The report includes also an assessment of the effectiveness of measures taken on the implementation of the revised NBSAP. It consists of 5 sections. The optional sections proposed in the guidelines (i.e. "Description of the national contribution to the achievement of the targets of the Global Strategy for Plant Conservation" and "Additional information on the contribution of indigenous peoples and local communities to the achievement of the ABT") were not considered because matters relating to plant conservation and to the contribution of indigenous peoples and local communities were captured in the relevant sections of the report.

Section I presents information on biodiversity targets being pursued in Cambodia. Under the coordination of the General Directorate of Administration for Nature Conservation and Protection (GDANCP), the General Secretariat of National Council for Sustainable Development (NCSD) and the Ministry of Environment (MOE), the process used for the development and adoption of the national biodiversity targets was truly participatory to ensure wide ownership among the Ministries and all the stakeholders, as well as harmony, coherence, complementarity and synergy between the updated NBSAP, including the national biodiversity targets, and all the strategies and plans adopted by the Government in the framework of national development goals. Cambodia adopted 20 national biodiversity targets that are in line with the country's priorities and generally reflect the 20 Aichi Biodiversity Targets. For each national target, we provide some background and an indicative list of the implementing Ministries or their Departments.

Section II outlines the measures taken to reach each of the national targets. These measures were identified in the National Biodiversity Strategy and Action Plan and are cross-referenced when they are applicable to more than one target. They are also put in their specific contexts in light of the thematic biodiversity priorities of Cambodia. In this framework, they include measures taken in other sectors and under other relevant strategic and action plans such as the National Action Plan to Combat Land Degradation (NAP) 2018-2026 , the Intended Nationally Determined Contribution to the United Nations Framework Convention on Climate Change (UNFCCC), the Second National Communication to UNFCCC or the National Strategic Development Plan.

Section III on assessment of progress towards each national target is the core of this report. For each target, we note the level of progress and provide explanations with concrete examples and data. References for the data used are provided as footnotes. Overall, Cambodia made significant progress on all the targets and exceeded expectations in establishing new protected areas, terrestrial as well as marine, and corridors to ensure that the protected area system is well connected. Although progress is evident, Cambodia is trying to define more measurable targets in line with the themes described in the NBSAP. Some of the current targets overlap and there may be a need to take that into consideration while refining the targets into more measurable terms. More details are given below (see Box below).

Section IV: Description of the national contribution to the achievement of each global Aichi Biodiversity Targets. Most of Cambodia's national targets are related to the Aichi Biodiversity Targets without being

exactly the same. In terms of the national contribution to the achievement of the global targets, since 2010, Cambodia has added about 15% of its territory to the world protected areas, corresponding to 2.7 Mha, including 52,448 ha of marine protected area. In addition, Cambodia has been successful with its payment for ecosystem services; particularly, the nest protection programme and the community-based agri-environmental ecotourism payment programme has allowed the protection of wildlife that is endemic to Cambodia and of global importance. Cambodia is still experiencing a lot of loss of forest ecosystems, but the rate of loss has declined comparatively to previous years.

Section V: Updated biodiversity country profiles. The country profile has been updated to take into consideration the actual socioeconomic development, the latest conservation achievements, and the discovery of new species in the country.

Box: Progress towards national target

Raising consciousness about biodiversity values and their integration in national development planning and strategies so as to influence behavioral transformation towards better management of natural resources (Targets 1 and 3)

Cambodia is on track to reach the targets

During this reporting period (2014 -2018), the Government (essentially MoE, MAFF and MOEYS) with many partners (UN organizations, bilateral cooperation agencies, intergovernmental organizations, national and international non-governmental organizations and the media) organized many events to inform and raise awareness about environmental, economic, health, social and cultural values of biodiversity. The training workshops or just awareness raising initiatives were organized for all groups in the society, with particular focus on rural communities who depend more directly on nature for their livelihoods and who are the primary custodians of biodiversity. These awareness-raising and capacity-building sessions occurred as part of the programmes on protected area management; on rescue, recovery and protection of threatened wildlife; on sustainable use of natural resources in aquatic or terrestrial ecosystems; or in agricultural system including animal production.

Cambodia has participated in a number of initiatives as one of the pilot countries. One such initiative is the UNESCO 'Learning about Biodiversity: Multiple-perspective Approaches'. Integration of biodiversity values in schools and higher institutions is particularly critical for the future of conservation and management of natural resources. Cambodia introduced the Eco-School Programme following ASEAN guidelines. In order to make sure that biodiversity, among other things, is well integrated in school curriculums, the Government increased substantially MOEYS budget in the past years.

Research on valuation of ecosystem and their services is gaining momentum in Cambodia; the results are needed for policy and decision-making in many areas.

Strategies and action plans adopted after 2014 contain more and more references to the value of biodiversity and importance to manage this natural asset sustainably. Cambodia Climate Change Strategic Plan 2014-2023, the Second National Communication to UNFCCC, the National Action Program to Combat Land Degradation 2018-2027, the voluntary targets for Land Degradation Neutrality, the National Environment Strategy and Action Plan 2016-2023, and the Environment and Natural Resources Code of Cambodia are some examples of that integration.

The few assessments that have been conducted e.g., to understand the impact of the nest protection programme or the Ibis Rice programme indicate some behavioral changes towards a better management of the environment and biodiversity. More systematic assessments need to be carried out at wider scale.

Increasing by 20% the budget allocated to biodiversity conservation and sustainable use, including NBSAP implementation (Target 2)

Cambodia reached the target but needs to re-adjust it taking into account additional work between now and 2020

The public financial management has continued to improve in Cambodia. Between 2013 and 2018, state's current revenue increased more than twofold, from USD 2,264 million to USD 4,560 million, which has allowed the total expenditure to be increased nearly twofold. It is not possible to assess exactly how much of the national budget was allocated to biodiversity. Increases in the budgets of ministries dealing with biodiversity can be used as indicators of possible budget allocations to biodiversity plans and programmes.

The Ministry of Environment (MOE) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) are the main government ministries dealing with the management of biodiversity. In recent years, the Ministry of Education, Youth and Sport has also stepped up its activities to integrate biodiversity in school curriculums, in line with the Royal Government's strategic goal to develop a "quality, equitable and inclusive education system."

Among the main achievements from the implementation of the "Rectangular Strategy-Phase 3", budgets of Ministry of Education, Youth and Sport (MOEYS) and the Ministry of Health have been increased significantly. In 2019 MOE, MAFF and MOEYS budgets have almost tripled with increases of 3.3, 2.9 and 2.7 times the respective 2014 budgets. This is a clear suggestion that Cambodia has already exceeded its 2020 target of increasing by 20 % its national budget allocation for biodiversity conservation and sustainable use. However, because more financial resources are needed for the conservation and sustainable use programmes described in the strategic documents, this target will be adjusted for the period to 2020.

Sustainable management of freshwater fisheries and aquaculture (Target 4)

Cambodia is on track to reach the target

The future of the fisheries sector in Cambodia is set in the context of growing demand due to population growth and economic development with increased size of fish export. The sector must rise to the challenge of meeting demand while making sure that this supply continues to be available for future generations. Among the relevant strategic documents, the Strategic Planning Framework for Fisheries: 2015-2024 and Cambodia's National Biodiversity Strategy and Action Plan (2016) contain detailed actions and guidance for a sustainable future of the fisheries sector in Cambodia, in line with the country's Rectangular Strategy and the global Sustainable Development Goals.

We reviewed the inland capture fisheries and aquaculture with some reference to marine capture fisheries and marine aquaculture in Cambodia. Generally, the amount of fish produced has been increasing with time while the diversity of fish has been declining due to fishing practices, some of which are not sustainable. We thus identified factors along the fish value chain that can make fisheries unsustainable and reported on actions that Cambodia has been taking to manage fisheries in a sustainable manner. Some of the points highlighted in the report are:

(a) Many valuation studies are being carried out to understand factors that need to be controlled for the economic sustainability of the value chain, which is currently threatened e.g., by the low profits at farm-level, competition from neighbouring countries that sell cheaper fish of low quality and high costs of inputs (such as feed that need to be imported);

(b) Laws and regulations are available, but enforcement can be limited due to insufficient financial and human resources;

(c) The Ministry of Agriculture, Forest and Fisheries promoted the establishment of Community fisheries (CFi) to improve management and use the fishery resources in a sustainable manner. 516 CFi have been created with total members of 332,168 persons (35% of women) from 475 households. Some of these CFi have been demarcated with conservation zones;

(d) In 2016/2017, 644 fishery conservation areas including the community fisheries were created;

(e) Guidelines for post-harvest handling to reduce losses were disseminated during awareness-raising and capacity-building workshop

(f) In accordance with the Strategic Planning Framework for Fisheries 2010-2019 and the provisions in the Environment and Natural Resources Code of Cambodia, environmental impact assessments and

restoration measures have been taken when developing new infrastructure (industry, mining, land-use change etc.) that can affect the aquatic environment.

When the Ministry of Agriculture, Forestry and Fisheries carried out a mid-term assessment of progress toward the implementation of actions identified in the Strategic Planning Framework for Fisheries 2010 – 2019, the identified constraints to sustainable freshwater fisheries and aquaculture included for example the use of illegal fishing gear; the adverse effects from hydro-dam construction in Mekong and its tributaries; community fishery groups not having all the needed capacities, including financial resources and management plans; imports of inputs for aquaculture poorly regulated and expensive; sanitary and phytosanitary (SPS) measures not well integrated in production chains; limited equipment and funds for research.

Sustainable management of areas under forestry, agriculture and animal production (Target 5)

Cambodia has reached or is on track to reach some elements of the targets (e.g., required legislation, strategies and policies are in place, Cambodia's protected area system covers many forests). However, more effort is required to halt the decline in forest cover, restore lost and degraded forests, enforce Protected Area Law more efficiently and improve forest management.

In 2014, the country's forest cover was equivalent to 48.49% of the country's total area. Forest cover declined to 48.14% of the country's land area in 2016 i.e. 8.742.401 ha (including rubber plantation, palm oil plantation and other perennial crops). Forests ecosystems are under a lot of pressures essentially from clearance for agriculture, settlement expansion, infrastructure development, illegal logging, and unsustainable harvesting of wood fuel. The rate of decline slowed down between 2014 and 2016 (decline of 0.67% annually) as compared to the rate between 2010 and 2014 (decline of 1.90/year), which was attributed to the reforms by the government in forest management as well as the effective participation of local communities, armed forces and authorities at all levels that prevented some deforestation.

Measures taken during the reporting period to promote sustainable management of forests include:

(a) With regard to legislation, strategies and policies: The 2016 jurisdictional reform of the Ministry of Environment (MoE) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) strengthened sustainable natural resource management, and effectiveness and efficiency in managing forest resources. The reform included the transfer of all protected forests and fisheries to MoE for their integration in the country's protected area system. Protected areas are governed by the Protected Area Law and have recently benefitted from guidance on ways to enhance sustainable management from the 2017 National Protected Area Strategic Management Plan. The Production Forest Strategic Plan 2018-2032 is also guiding the future development and sustainable management of production forests for their contribution to poverty alleviation, livelihoods and economic growth. Cambodia's Land Degradation Neutrality plans under the United Nations Convention to Combat Desertification[1] and Nationally Determined Contributions to Climate Change provide additional guidance on sustainable forest management. There are still challenges that must be resolved. One of the principal concerns is the continuing decline in the country's forest cover, which resulted essentially from recent increases in agricultural land to respond to increasing demand domestically and internationally.

(b) Cambodia believes that a better knowledge of the multiple values of its forests, including mangrove forests, will enable decision-makers and all the stakeholders to manage forests in a more sustainable manner. In 2014, a study was undertaken to assess existing information on valuation of multiple benefits provided by standing forests in Cambodia.

(c) In addition to the protected forests that were transferred to MoE from MAFF, Cambodia designated a large number of new protected areas and conservation areas including community-based forests, representing more than 4.2 million ha. In 2017, Cambodia counted 610 community forests (CF), of which 464 were registered and 153 community protected areas over 24,410 ha. Community forests give an opportunity to local communities to take care of forests, on which their livelihoods depend. However, studies indicate that more actions are needed to curb illegal selective logging of valuable timber trees. FA/MAFF reported to have completed in 2016 the permanent forest demarcation with concrete poles in Kampong Thom, Pursat, MundulKiri and Prey Veng. This work needs to be continued including zoning within protected areas;

[1] https://knowledge.unccd.int/sites/default/files/ldn_targets/Cambodia.pdf

(d) Sustainable forest management (SFM), REDD+ and biomass energy: A lot of experience and lessons were gained through the UNDP/GEF funded project carried out from 2011 to 2015 across Kampong Speu, Kampong Chhnang, Pursat and Battambang on "Strengthening SFM and bioenergy markets to promote environmental sustainability and to reduce greenhouse gas emissions in Cambodia." The project strengthened community-based SFM among Community Forests (CFs) and Community Protected Areas (CPAs) and increased the production and marketing of improved wood stoves for reduced fuelwood use and reduced greenhouse gas emissions. In 2017, UNDP funded research work to identify the best conditions for the promotion of sustainable fuelwood and charcoal production and consumption in Cambodia;

(e) Some forest restoration projects took place between 2014 and 2018. The total areas covered by these projects is below the 10% targeted in Cambodian National Target 6. A field-testing of methodologies to empower community organizations to implement participatory landscape planning and enhance resilience at the community level is still ongoing as part of COMDEKS[2] programme under the International Partnership for the Satoyama Initiative;

(f) Awareness-raising initiatives with several partners.

Restoration of 10 % of pressured protected areas, conservation areas, agro-ecosystems and forest ecosystems including mangroves (Target 6)

Cambodia is on track but at an insufficient rate

In 2011, it was estimated that approximately 2,600,000 hectares of forest land required restoration. In 2010, up to 55% of the total rural population inhabit degraded agricultural land.

Several restoration projects were under way or initiated between 2014 and 2018 covering protected areas and other conservation areas, forest ecosystems including mangroves, and agricultural lands. Many of these projects were conducted to provide basic information on ways and means to carry out restoration projects. They are of small size (below 100 ha) and will have to be upscaled to cover significant portions of the degraded ecosystems and reach the 10% target. For example, FA developed with FAO the Forest and Landscape Restoration Mechanism (FLRM) Work Plan for Cambodia 2016–2018. Through this project, Cambodia identified pilot sites for restoration; tested techniques and methods; started building the needed capacity, essentially by empowering local communities; and identified possible sources of funding. Pilot projects revealed that long-term success of landscape restoration projects required some level of land security.

The GEF-funded project "Collaborative Management for Watershed and Ecosystem Service Protection and Rehabilitation in the Cardamom Mountains, Upper Prek Thnot River Basin" is an example of relatively large-scale restoration project. The project was started in 2017 to restore and maintain forest cover and watershed stability functions while providing for sustainable livelihoods and ecosystem services in the Upper Prek Thnot Watershed. The project outputs include 1,000 ha of forestland under assisted natural regeneration.

Reduction of negative impact of unsustainable production and consumption (Target 7)

Cambodia is on track to achieve this target

Cambodia has in place the necessary legislation, policies and guidelines for sustainable production and consumption. Many ongoing initiatives have already integrated the provisions from the guidelines and legislation compiled and harmonized in the Environment and Natural Resources Code of Cambodia. Sustainable consumption and production are key to the country's sustainable development and poverty alleviation. The report contains some activities started between 2014 and 2018. They are selected examples of many ongoing initiatives in the field of energy for industries, recycling, waste treatment, crop improvement and efficient technologies, and capacity-building.

Protected areas: expansion, valuation, enhanced management effectiveness and improved connectivity (Target 8)

[2] The 'Community Development and Knowledge Management for the Satoyama Initiative' is a UNDP-led programme.

This target has four sub-targets: coverage expansion (by doubling marine and coastal as well as freshwater protected areas (PAs); classifying as protected areas additional important biodiversity areas that are under a lot of pressure; expanding protected forest areas); development of management plans and improvement of management effectiveness; valuation of contributions of protected areas to people, enhancing connectivity and mainstreaming protected areas.

1. **Protected areas coverage:**
Cambodia has already exceeded the terrestrial coverage part of Aichi Biodiversity Target 11 (17%).

As of December 2018, Cambodia's protected area system counts 56 PAs covering 7,412,392.67 ha i.e. 40.9% of the territory in the following categories: National Parks (12), Wildlife Sanctuaries (20[3]), Protected Landscapes (10), Multiple Use Areas (8), Ramsar Site (1[4]), Natural Heritage Sites (2), and Marine National Park (1), Genetic Conservation Area (1) and Biodiversity Corridors (counted as 1, but also considered as three sets as North-East Corridor, North-West Corridor and Cardamom Corridor)

2. **Development of management plans and improvement of management effectiveness:**
Cambodia is on track to achieve the adjusted target of developing management plans for 25 PAs by 2021.

The importance of management plans is well understood and experience in developing them has been gained. Only two of the 56 protected areas have active management plans. Four other protected areas (2 of which are Ramsar sites) have management plans that are obsolete. Some management plans (including for some Community Protected Areas and Community Forests) have already been developed but need approval.

With the adoption of the National Protected Area Strategic Management Plan (MPASMP) in 2017, Cambodia took the necessary measures to have management plans for at least 25 protected areas by 2021. This is the adjusted target adopted in the MPASMP.

In addition, a review of management plans of community protected areas is also planned. Demarcation and zoning, already started in a few protected areas, are priority tasks in the implementation of management plans.

3. **At least doubling of marine and coastal as well as freshwater protected area coverage:**
Cambodia is on track to exceed the target limited to marine area.

The establishment of the Marine National Park (1.08% of the EEZ) is more than the double of the 0.2 % marine protected area before 2016. It can also be noted that new protected areas were established in the coastal zone (the Veounsai-Siem pang National Park and Ang Trapeng Thmor Protected Landscape) many others protect the aquatic system (e.g., a large portion of the Mekong River Basin is included in the newly established corridors)

4. Designation of important biodiversity areas under pressure:
On track to achieve the target

Many Key Biodiversity Areas (KBA) have now been included in the PA system (including the corridors). However, a few KBAs need some or additional protection. Cambodia is very conscious that designation alone is not sufficient but there is a need to continue strengthening law enforcement and apply adequate management. Cambodian rangers use effective tools in their patrolling of PAs, such as Spatial Monitoring & Reporting Tool (SMART), with encouraging successes.

5. Valuation, connectivity and mainstreaming of protected areas:
Cambodia is on track to exceed the target

An increasing amount of work carried out by the Ministry of Environment (MoE) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) involves some kind of valuation of the contributions of biodiversity, in particular within protected areas and other conservation areas, in an effort to show the relevance of the work to the well-being of the Cambodians and the country's economic development, and to catalyse the participation of all in the conservation and sustainable use and management of Cambodia's

[3] This number takes into account that Snoul Wildlife Sanctuary and Roniem Daun Sam Wildlife Sanctuary were both declassified in February 2018

[4] This site is Stung Treng. There are 4 other Ramsar Sites that are part of Tonle Sap Multiple Use Area (Boeng Chhmar Core Area, Prek Toal Core Area and Stung Sen Core Area) and part of Peam Krasaop Wildlife Sanctuary (Koh Kapik).

natural assets. Non-governmental organizations support the Government in many ways, including by organizing awareness raising meetings and promoting work on ecosystem mapping and zoning using some of the latest methodologies. Universities and other higher education institutions publish more and more data on ecosystem valuation in response to the needs of policy and decision-makers. An indicative list of some of the published articles is provided. Benefitting from the experience of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), Cambodia is considering ways and means to launch a national biodiversity valuation initiative.

In terms of connectivity, the establishment of biodiversity conservation corridors in 2017 is outstanding. The 1427939.76 ha designated as biodiversity corridors represent 7.9 % of the total national land: "Target exceeded." Biodiversity corridors are considered prominently in 'The Environment and Natural Resources Code of Cambodia[5]'

Integration of PAs in national development goals and strategies is evident in the Rectangular Strategy Phase IV, which defines the framework for all strategies, plans and programmes that Cambodia is taking. PAs are also well integrated into strategies and action plans for climate change and land degradation. The jurisdictional reform of the natural resource management (NRM) sector, undertaken by the Government in 2016, reflects the Government's commitment to ensure the best management and conservation of the country's natural resources. The place given to PAs in the Environment and Natural Resources Code of Cambodia is also a clear indication that everyone and all the sectors are required to contribute to the success of the PA system in Cambodia for the benefit of all. "Target exceeded".

6. Expansion of protected forests:
Cambodia is on track to exceed the target

From 2016, Cambodia designated 34 new protected areas, including the Koh Rong Marine National Park and declassified two protected areas. As compared to the situation before 2016, Cambodia added 23.3 % of its territory to the country's protected area system. Most of the new PAs contain a lot of forested areas. Together with the protected forests transferred to the Ministry of Environment (MoE) in 2016, the area of forests under protection has exceeded the 3 million ha targeted for 2029.

Promoting payment for ecosystem services (PES) schemes as incentives for the conservation and sustainable use of biodiversity (Target 9)

Cambodia is on track to achieve this target

Cambodia's experience with payment for ecosystem services (PES) is that this innovative financing tool can be an effective incentive for the protection/conservation and sustainable use/management of biodiversity and related ecosystem services. PES was referred to in new strategic and policy documents. For example, PES is featured in the National Action Program to Combat Land Degradation (NAP) 2018 – 2027, Cambodia climate change strategic plan (2014-2023), and the National Strategic Development Plan 2014 -2018. The Environment and Natural Resources Code of Cambodia (under review before finalization) devotes a lot of articles to PES schemes. However, there is not yet a specific law or regulatory framework on PES. The issue of land property right is of particular concern among local communities and indigenous peoples. Discussions are under way to agree on modalities and possible contents of a regulatory mechanism for PES.

In this report, we considered (i) direct payments for biodiversity conservation of threatened species of fauna and flora, particularly the Nest Protection Programme; (ii) community conservation agreements particularly in the context of watersheds and ecotourism; (iii) the Ibis Rice Programme or agri-environmental payment; and (iv) the REDD^{+} projects and programmes in which the environmental service is carbon sequestration and the aim is to secure buyers from the voluntary carbon market. The direct payments for the conservation of threatened species of fauna and flora, particularly the Nest Protection Programme, and the Ibis Rice Programme are functioning well. Examples of successful protection of nests and wildlife are reported. A key success factor is that these schemes are small in scale and have a relatively simple payment system without cumbersome transaction costs.

[5] Under review before finalization

Regarding the REDD+ programme, Cambodia was able to sell some carbon but the carbon market is still rather weak. During the reporting period, Cambodia started two new REDD+ projects: (i) the Southern Cardamom REDD+ project (Forestry Administration, Wildlife Alliance (WA) and other partners) and (ii) Tumring REDD+ Project (TRP) (Forestry Administration, Korea Forest Service, Agence Française de Développement (AFD)). In 2016, the Walt Disney Company bought 360,000 carbon credits from Keo Seima Wildlife Sanctuary REDD project for US$2.6 million. In early 2018, following a report by forestry NGO Fern, Virgin Atlantic Airways announced the removal of the Oddar Meanchey REDD+ project from its carbon offset portfolio.

However, in the past 4 years, Cambodia's progress on REDD+ readiness activities and on activities supported by the Forest Carbon Partnership Facility (FCPF) was on track. The National REDD+ Strategy (NRS) 2017-2026 was endorsed by the government in December 2017 as well as the National Protected Area Strategic Management Plan (NPASMP) 2017-2031. The National Forest Monitoring System (NFMS) as well as the forest reference emission level (FREL) were reviewed in 2018. Some challenges being addressed included: (i) the lack of a system for data collection on safeguards and data sharing; (ii) the need to address the drivers of forest loss/degradation from outside the forest, bearing in mind that so far REDD+ in Cambodia focused only on interventions in the forest sector; (iii) needs of adequate financial and human resources for the effective law enforcement, and (iv) incentivization of local and indigenous ethnic minorities.

Identification of all species of fauna and flora threatened at the national level and improvement of their status (Target 10)
Cambodia is on track to achieve this target

The Royal Government of Cambodia adopted the Rectangular Strategy and many other strategies, decrees and action plans that have been serving as roadmaps towards the conservation, sustainable use and restoration of the country's natural assets. Despite these safeguards and roadmaps, trend in the number and status of threatened species is still downward. Being a sanctuary to about 1.6% of all globally threatened species on the IUCN Red List including 2.5% of globally threatened mammals, 2% of globally threatened birds, 5% of globally threatened reptiles, 1.6% of globally threatened fish and a bit less than 1% of globally threatened amphibians, Cambodia is conscious about the importance of its work on threatened and has mobilized a lot of resources accordingly.

List of threatened species exists and are regularly updated. During the reporting period, development of lists and description of threatened species took place within MoE (e.g., the 2016 Biodiversity Status Report and 2016 NBSAP), MAFF (e.g. through CITES and annual reports), in universities and other research institutions and by partner national and international organisations. The CJNH is a flagship publication that gather scientific data on latest discoveries and observations for Cambodia. The Red List and other databases like FishBase are the international references that capture observations we make at the local, national and regional levels.

In order to improve the status of threatened species, Cambodia continued to work with many non-governmental organisations. Measures taken are successful. We report on many success stories regarding rescues, care and breeding at some centers (e.g., the Phnom Tamao Wildlife Rescue Center where thousands of rescued animals found sanctuary between 2014 and 2018 and some animals were born or hatched); release in nature, essentially within protected areas; and recovery away from the release sites. The bird and turtle nest protection programmes are producing positive results as well as other programmes linked to ecotourism such as the IBIS Rice. We report on the measures taken to successfully improve the status of many threatened birds, reptiles, mammals, fishes and few invertebrates. Also, Cambodia and collaborating partners developed "endangered species action plans" and improved in-country capacity to monitor and trace the released animals.

Not all the threatened species receive the same conservation attention. Ecosystem/habitat protection and restoration are enabling all the threatened species to recover as their habitats is restored and protected. The recent expansion of the PA system (from 2016 to 2018), including the establishment of new wildlife sanctuaries and refuge ponds for fishes (see section on protected areas – National Target 8), work on defining and demarcating conservation zones within protected areas, and the improved patrolling with the

support of tools like the 'Spatial Monitoring and Reporting Tool' (SMART) have been key factors in enabling Cambodia make positive progress toward the achievement of target 10.

In its combat against illegal wildlife trade, Cambodia pays more and more attention to the entire illegal wildlife trade chain. Attention is paid not only to what is happening locally but also in the region and at the global level, from poachers to buyers of illegally acquired wildlife or their parts. Cambodia is also actively involved in CITES. In addition, Cambodia carried out a lot of awareness-raising initiatives and research generating information needed by policy and decision-makers (e.g., characterization of species at the genetic level to facilitate tracing; valuation of threatened species and cost of losing them). Assessments indicate that the training programmes and workshops/conferences carried out during the reporting period influenced people's behaviour positively toward more conservation of the natural assets.

All these measures are yielding a lot of positive results visible at the site level. However, when considered as a whole, the trend in the recovery of threatened species is still downward, which calls for more actions and involvement.

Enhancing forest ecosystems and protected areas resilience and their contribution to carbon stocks through conservation and restoration (Target 11)

Regarding Cambodia's protected area system, its expansion by more than 23% of the territory between 2016 and 2018 as well as the ongoing efforts to ensure that the country's protected area system guarantee the resilience of the ecosystems and landscapes it covers and represents, - in other words, the resilience of the ecosystems / ecoregions found in the country as well as the resilience of human communities and biodiversity, - reflect the Government will to set solid foundations for the country's socioeconomic development as described in the Rectangular Strategy (Phase IV) and translated in the National Development Strategic Plan 2019-2023. More than 40% of the country is now classified as protected areas in different categories with zones ranging from strict conservation areas to multiple use areas and corridors for connectivity. Measures to ensure effective management such as development and implementation of management plans or more effective patrolling using tools like SMART are being used in some protected areas and being extended to other protected areas.

In addition, protected areas cover a large portion of forests and thus areas containing large amounts of aboveground biomass carbon as well as belowground carbon. Protected areas contribute to storing carbon and reducing deforestation, forest degradation and, as a result, greenhouse gas emission from biomass (climate change mitigation) while conserving biodiversity (a requirement for adaptation).

The rate of forest cover loss is decreasing, and some forest ecosystem restoration projects are under way. Application of sustainable forest management is expanding, particularly with the increase in the number of community forests and community protected areas supported by the Government and a number of non-governmental organizations.

Halving the loss of coral reefs (Target 12)
Cambodia is on track to achieve this target

In close collaboration with national universities and national and international non-governmental organizations, Cambodia gathered a lot of information and data on the country's reef ecosystems, on their status, past trends and some projections in the future. The information allowed decision-makers to design the Koh Rong Marine National Park using spatial conservation prioritization, and the "ridge-to-reef" approach involving stakeholders from many sectors and the different layers of the society.

Establishment of the Marine National Park with the different zones provided for in the Protected Area Law, the various educational awareness-raising seminars, workshops and capacity-building sessions for local communities, students, tourists and workers, implementation of the Strategic Planning Framework for Fisheries 2010 – 2019 (having among its objectives that 840 ha of coral reef should be under an appropriate form of sustainable management), and effective application of the Environment and Natural Resources Code of Cambodia are the key strategic measures that are allowing to stop coral reefs decline and promote their recovery.

There is a need to further strengthen national research capacities; identify sources of funding and mobilize financial resources; acquire the techniques and technologies in particular for monitoring the status and trends of coral reefs and the related pressures, including by disseminating tools like Spatial Monitoring and Reporting Tools (SMART); and build capacities to enforce legislation and policies

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization: ratification and implementation (Target 13)
On track to achieve target

Cambodia ratified the Protocol in 2015. Since then, the country made significant progress on the strategic objectives identified in the 2016 National Strategy and Action Plan.

Cambodia was one of the 65 Parties eligible to funds for the project "Support to Preparation of the Interim National Report on the Implementation of the Nagoya Protocol" for 2017 - 2018. The objective of the project was to assist GEF-Eligible Parties to the Nagoya Protocol on Access and Benefit Sharing to prepare and make timely submission of their Interim National Reports on measures that each party has taken to implement the Protocol in line with Article 29 of the Protocol.

Many training workshops were organized to empower indigenous ethnic minorities and local communities. As result, they participated effectively in many processes for the conservation and sustainable management of biodiversity and associated ecosystem services, particularly in the framework of the REDD+ programme. Conscious about the unique value of Cambodia's natural assets, in particular the many endemic species and the new species that are regularly identified, scientists have increased their work on valuation of Cambodia's biodiversity, partnering with other scientists in the subregion and the Asia Pacific region.

Cambodia is now developing a Comprehensive Framework for Practical Implementation of the Nagoya Protocol with GEF-6 funds. Analysis of existing relevant legislation and policies as well as discussions for the development of a new comprehensive legislation on access and benefit sharing are under way. The Ministry of Environment is in the process of finalizing the Environment and Natural Resources Code that will include provisions related to ABS while the Code contains already many provisions on benefit sharing that could be applicable to ABS. In the meantime, Cambodia is considering the possibility of adopting a temporary procedure for granting permission for accessing genetic materials and sharing benefits from their utilization, in the spirit of the Nagoya Protocol, while waiting for the finalisation of the national ABS legislation.

Enabling initiatives include the establishment of the Technical Working Group on ABS, and participation in the project titled 'Promoting biodiversity-based products to improve livelihoods and protect biodiversity, 2015-2019', supported by GIZ and the intergovernmental ASEAN Centre for Biodiversity, through which Cambodia is gaining relevant experiences and strengthening its capacities to promote biodiversity-based value chains.

The updating and implementation of the National Biodiversity Strategy and Action Plan (Target 14)
On track to achieve target

Cambodia's National Biodiversity Strategy and Action Plan (NBSAP) was updated in 2014 and 2015, under the overall coordination of the General Directorate of Administration for Nature Conservation and Protection of the Ministry of Environment, and the General Secretariat of the National Council for Sustainable Development, with financial and technical support from UNDP/GEF and HARVEST/USAID. The Strategy was approved and launched by the Prime Minister on 5 February 2016 as a reflection of the political will and firm commitment of the Government to safeguard biodiversity for the benefit of the people of Cambodia and the world.

The updated NBSAP consists of 498 key actions identified to achieve 78 strategic objectives under 24 themes. The Strategy includes also 20 national targets.

Since its approval, the strategy has been central to the implementation of measures taken in the country to effectively conserve and use biodiversity and its components sustainably and ensure the best contribution to the country's socioeconomic development. This 6th National Report presents some highlights of the achievements with the overall conclusion that Cambodia is on track to achieve most of the targets with an outstanding achievement in the establishment of well-connected protected areas (40.9 % of the territory).

Reduction of pressure on corals and other ecosystems impacted by climate change (Target 15)
On track to achieve the target with regards to coral reefs

Cambodia is very vulnerable to climate change. All its ecosystems are impacted by climate change in ways requiring attention. Measures taken to adapt to climate change or mitigate its impacts in agroecosystems, forests and mangroves, and freshwaters/wetlands are described under relevant targets. Only coral reefs are considered here.

The establishment in 2016 of the Multiple Use Marine Protected Area, also known locally as Marine Fisheries Management Area, around the Koh Rong Archipelago and its expansion and designation as Koh Rong Marine National Park constitute important steps in the protection of coral reefs along the country's coastline from anthropogenic pressures (unsustainable fishing practices and overfishing, illegal collection of corals for sale, siltation/sedimentation from development projects, water pollution particularly from solid wastes, and global warming/climate change). The processes leading to the designation of the Marine National Park were an opportunity to gather a lot of baseline information on the taxonomy, ecology and value of coral reefs, and to confirm the importance of consulting and engaging local communities and other stakeholders.

The legal framework has been reaffirmed with the development of the Environment and Natural Resources Code of Cambodia (draft under review for finalization). The Code issues a reminder about the need for a strategic environmental assessment, environmental impact assessment, and polluter-pays principle. In addition, Cambodia Climate Change Strategy and related national communication and Nationally Determined Contribution to UNFCCC contain objectives and guidance on best ways to address the identified threats to coral reefs in Cambodia. There is, however, a need to ensure continuous enforcement of policies and legislation, and to carry out further research to better understand the threats and effectiveness of measures taken.

In any case, the measures currently taken are bearing fruits:

(a) Using SMART, patrolling in the MPA has become very efficient and reports indicate a decline in incidences of direct human threats to biodiversity and its contribution to the well-being of Cambodians and the country's economy;
(b) Waste treatment is high on the land planning agendas of the islands within the MPA while, with assistance from many non-governmental organizations, islands inhabitants and visitors are being informed on best ways and means to manage all types of wastes;
(c) Occurrence of sedimentation as a threat needs to be assessed quantitatively in order to design informed measures to address the threat. Qualitative information has been and continues to be gathered by scientists;
(d) Measures taken to reduce pollution are considered in the next sub-section of this report;

There is a need to continue documenting the ecological and socioeconomic impact of the establishment of the Marine National Park and related activities. Finalization and implementation of the Park management plan will further contribute to the strengthening of the protection of coral reefs.

Reduction of pollution pressure on terrestrial and aquatic ecosystems (Target 16)
On track to achieve the target

Cambodia compiled all the relevant regulations and sub-decrees relating to biodiversity in the Environment and Natural Resources Code of Cambodia. Altogether, the relevant articles in the Code constitute a detailed guideline on how to address different types of pollutants that can impact biodiversity and its services.

Many actions have been carried out in various parts of the country and for different types of pollutants. They provide a rich set of experiences, some of which have been organized as guidelines and in the form of materials for awareness-raising activities and capacity building, already in use in the country and elsewhere. Success stories (e.g., the use of biodigesters) have been replicated within provinces and in other provinces.

Research institutions are also participating in addressing gaps in knowledge and providing insights on the way pollutants are produced and how they can be avoided or controlled.

While significant efforts are devoted to the reduction of pollutant pressures, Cambodia initiated a programme on the 3R (Reduce, Re-use, Recycle), particularly in the context of the Industrial Development Policy and in line with some of the country's key strategies and plans (e.g. the Green Growth Roadmap and the National Environment Strategy and Action Plan, 2016–2023).

Respect and integration of indigenous and local knowledge (Target 17)
Progress but at an insufficient rate

Local communities and indigenous ethnic minorities have been involved and continue to be involved in several consultations for payment for ecosystem services including REDD[6]+ projects, the zoning of protected areas, mapping and valuing ecosystem services. Their perceptions on some of the measures taken to protect biodiversity and ecosystem services are being studied by many university researchers to inform policy and decision-makers.

However, there is still a need to document and learn more about indigenous and local knowledge, practices and innovations, and to find ways to integrate them into the strategies, plans, and programmes for natural resources management. Being a member of the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES), Cambodia gained experience in the best ways for integrating indigenous and local knowledge (ILK) into policy- and decision-making.

Control of invasive alien species (Target 18)
On track to achieve the target

Between 2014 and 2018, existing databases of invasive alien species (IAS) in Cambodia were updated. *Mimosa pigra* continued to be a threat but other plants such as *Eichornia crassipes* (water hyacinth) and *Imperata cylindrica* or *Brontispa longissimi,* the coconut beetle, continued spreading. Training workshops were organized with training materials specifically developed for Cambodia. The main ways through which IAS enter and are spread within Cambodia (trade, transport and travel) as well as the main factors catalyzing their spread and establishment are known. Measures to control and eradicate IAS as well as restore ecosystems are being implemented, in addition to the enforcement of the laws and guidelines provided in the Environment and Natural Resources Code of Cambodia. Chances of success are high now that the challenge is still manageable.

Enhanced effectiveness of the clearing house mechanism (Target 19)
On track to achieve the target

Taking advantage of progress made and experience gained in developing a web portal that is common to the Rio conventions, with support from UNDP and GEF, Cambodia will transfer the know-how to the national clearing house mechanism. The web portal is designed to be user-friendly and useful to those who are interested in each of the Rio conventions.

Data gathered through the web portal as well as messages and data/information from this 6th National Report will be used to populate the national clearing house. By hosting the common web portal, the CHM will be exchanging and gathering information from the 3 Rio conventions as a starting point toward interoperability.

***In-situ* and *ex-situ* conservation of plant and animal genetic diversity (Target 20)**
Progress but at an insufficient rate

The extensive protected area system that characterizes Cambodia is the best guarantee that plant and animal genetic diversity is well conserved in situ. The designation of Cardamom Genetic Conservation Area is in itself extraordinary. In addition, the "*ex-situ*" collections of crops and their wild relatives at certain research institutions (e.g., crop germplasm at the Cambodian Agricultural Research and Development Institute (CARDI), or the herbarium and butterfly collection at the Royal University of Phnom Penh) provide an opportunity for various ecological and genetic analysis and breeding work. Equivalent institutions for animal resources are needed. Through partnership, Cambodia acquired the necessary expertise (e.g., some scientists obtained academic degrees at partner universities in Japan or through partner-organized specific training e.g. on *in-vitro* culture) and technology (e.g., acquisition of equipment for DNA analysis). The work needs to be upscaled to better cover the wide range of diversity found in the country (beyond rice, banana, elephants and crocodiles)

[6] Reduced Emission from Deforestation and Forest Degradation

Cambodia is particularly satisfied with the progress achieved just 2 years after the adoption of the National Biodiversity Strategy and Action Plan and 2 years before 2020, the end time of the Aichi Biodiversity Targets. Cambodia identified areas requiring additional efforts and has adopted more specific targets under some themes of the NBSAP, including in the framework of the United Nations Convention to Combat Desertification (e.g. the voluntary targets for the Land Degradation Neutrality) and the Nationally Determined Contributions as well as the second national communication to the United Nations Framework Convention on Climate Change, with deadlines beyond 2020. These targets have been adopted in line with the Rectangular Strategy Phase IV, the National Environment Strategy and Action Plan 2016 -2023 and the Green Growth Roadmap. They are also in phase with our national action plans for the Sustainable Development Goals.

INTRODUCTION

The Royal Government of Cambodia acceded to the Convention on Biological Diversity on 9 February 1995 and became a Contracting Party three months later. According to Article 26 of the Convention, Cambodia has submitted national reports, three of which have been posted on the country's clearing house mechanism[7]:

(a) The third national report submitted in 2006 followed a pattern similar to that of the second national report: questions and answers on the progress made in the implementation of the decisions of the Conference of the Parties relating to the articles of the Convention and the implementation of the programmes of work. It should be noted that (i) Cambodia adopted its National Biodiversity Strategy and Action Plan in 2002; (ii) the Conference of the Parties had endorsed the 2010 target at its 6th meeting in 2002. The objective of the 2010 target was to significantly reduce the loss of biodiversity globally, regionally and nationally by the end of 2010, in order to contribute on the one hand to the fight against poverty, and on the other hand to benefit all the forms of life on the planet; (iii) in 2005 the report of the Millennium Ecosystem Assessment was published; and (iv) in the same year, following a request of the Conference of the Parties, Cambodia submitted its interim National Report on the Implementation of the Cartagena Protocol on Biosafety to which it became a Party on 16 December 2003. The following year, in 2006, the Convention Secretariat published the second edition of the Global Biodiversity Outlook, which contained not only the state and trend of global biodiversity, but also the main drivers of the loss of biodiversity. Both the Millennium Ecosystem Assessment and the Global Biodiversity Outlook emphasized the importance of taking into account the underlying causes of biodiversity loss.

(b) Cambodia submitted its fourth national report on the implementation of the Convention on Biological Diversity in 2010. The report described the progress made in the implementation of the National Biodiversity Strategy and Action Plan, and in the pursuit of the 2010 biodiversity target at the national level. The report included an overview of the status of the Country's biodiversity, a description of areas where national implementation had been most effective (e.g., community forestry, community fisheries, and ecotourism in national parks) or slow (due to limited human and financial resources and weak institutions). In 2010, the Conference of the Parties concluded, on the basis of the fourth national reports and the third edition of the Global Biodiversity Outlook, that progress towards the 2010 target was insufficient. The Conference of the Parties had thus adopted a new Biodiversity Strategic Plan 2011-2020 with its 20 so-called Aichi Biodiversity Targets to be achieved by 2020 at global level. The Conference of the Parties invited governments to update their respective biodiversity strategies and action plans in line with the Convention's Strategic Plan for Biodiversity 2010-2020 and the Aichi Biodiversity Targets.

(c) In accordance with the guidelines of the Conference of the Parties, Cambodia's fifth national report that was submitted in June 2014 was organized around three major themes: (i) a reminder about Cambodia's exceptional biodiversity and its dynamics; (ii) the implementation of the National Biodiversity Strategy and Action Plan and (iii) progress towards achieving the Aichi Biodiversity Targets. Cambodia adopted a first version of its National Biodiversity Targets in 2014 and finished updating its national strategy and national targets in early 2016.

The technical guidelines for the Sixth National Report had been adopted by the Conference of the Parties at its thirteenth meeting in 2016. They required the Parties to assess progress towards the achievement of their respective national targets and the Aichi targets, and to assess the effectiveness of measures taken to implement their national strategies and action plans. The Parties were thus to provide updated information since the submission of the last national report, including information on new or recently

[7] http://www.chm.gdancp-moe.org/10-chm/4-welcome-to-cambodia-clearing-house-mechanism.html

undertaken initiatives, as well as updates on ongoing initiatives. The report had also to include recent changes in the status and dynamic of biodiversity and related threats.

The process for the development of this national report is described in the Appendix, at the end of document.

In accordance with the guidelines of the Conference of the Parties, Cambodia's sixth national report comprises the following five sections: (i) information on the targets being pursued at the national level; (ii) implementation measures taken, assessment of their effectiveness, associated obstacles and scientific and technical needs to achieve national targets; (iii) assessment of progress towards each national target; (iv) description of the national contribution to the achievement of each global Aichi Biodiversity Target; and (v) updated national biodiversity profile. The optional sections ((i) description of the national contribution to the achievement of the targets of the Global Strategy for Plant Conservation, and (ii) additional information on the contribution of indigenous peoples and local communities to the achievement of the global Aichi Biodiversity Target) are not included.

The release of this sixth report is timely since it takes place just two years before 2020, the end year for the current set of biodiversity targets. The findings will provide the best ideas on ways and means to enhance implementation for outstanding achievements in 2020 and the way forward.

SECTION I

INFORMATION ON TARGETS BEING PURSUED AT THE NATIONAL LEVEL

1. The process of developing and adopting the national target, the stakeholders involved

In decision X/2 (para (c)) adopted at its 10th meeting in 2010, the CBD Conference of the Parties urged Parties to review and, as appropriate, update and revise their NBSAPs in line with the Strategic Plan for Biodiversity 2011-2020 adopted at that meeting, and with the guidance outlined in its decision IX/8. The Aichi Biodiversity Target 17 reiterated this request in stating that "by 2015, each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan."

Cambodia initiated its review process in July 2012 and completed it in December 2015 under the coordination of the General Directorate of Administration for Nature Conservation and Protection (GDANCP), the General Secretariat of National Council for Sustainable Development (NCSD), and the Ministry of Environment (MOE). In order to ensure a truly participatory approach in the review process that would lead to the full ownership of the updated NBSAP and an effective engagement in the implementation of the NBSAP, an inter-ministerial technical working group was invited to participate actively in the consultations. This group consisted of representatives of 9 ministries and from other government entities, local communities and indigenous ethnic minorities, the civil society and nongovernmental organizations (NGOs) each having a role and responsibilities in environmental management in Cambodia.

An assessment of the implementation of the 2002 NBSAP and a Biodiversity Status Report were carried out to take stock of the achievements derived from the implementation of the NBSAP, and to identify obstacles, opportunities, as well as the country's weaknesses and strengths in the implementation of the NBSAP. These findings constitute important elements to be taken into consideration in updating the NBSAP. In addition, laws, strategies and plans relating to biodiversity and sustainable development adopted by Cambodia since 2002 were reviewed so as to ensure harmony, coherence, complementarity and synergy between the updated NBSAP and all these approaches, strategies and plans, and to align with the national development goals and priorities.

The Strategy was approved and launched by the Prime Minister on 5 February 2016 as a reflection of the political will and firm commitment of the Government to safeguard biodiversity for the benefit of the people of Cambodia and the world. In updating its NBSAP, Cambodia adopted 20 national targets based on/ in line with the Aichi Biodiversity Targets and the Strategic Plan for Biodiversity 2011-2020.

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2. Background information about each target

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
Target 1 (Aichi Target 1[8]): **By 2020, every Cambodian** **(i) is conscious about the environmental, economic, health, social and cultural value of the services derived from ecosystems**, in particular the value of protected area systems as well as the value of terrestrial and aquatic animal and plant resources including animal wildlife, livestock, agricultural, forest, freshwater and marine resources, and the biomass used for energy production, **and** **(ii) integrates this knowledge in the way they deal with these ecosystems and resources.**	Cambodia considers that biodiversity strategy and action plan can be implemented successfully only if people are aware and convinced about the value of biodiversity, about its importance not only for our economy and what is referred to as sustainable development but in our daily lives i.e. the importance of biodiversity for food, water, energy, health and livelihood security, taking into account our traditional knowledge. This target, which is in line with Theme 20 of the National Biodiversity Strategy and Action Plan (NBSAP) on Awareness, Education, Research Coordination and Development (see below Annex 1 to this section for the list of themes covered in the updated NBSAP), is considered as one of the highest priorities for, a prerequisite to, the implementation of the NBSAP. Activities considered under this target contribute to the achievement of most, if not all, of the other targets. In addition, many actions planned under the other strategic themes in the updated NBSAP will contribute to the implementation of this target in more specific sectors or situations. Cambodia considers that there is a critical need: to gather information and build our knowledge base on the value of biodiversity at all levels of biological organization i.e. at the genetic, species and ecosystem/landscape levels, and for plants, animals and microorganisms; to inform everyone at every level of the society, from local communities to policymakers through the media and the science-policy interface, by using appropriate and well targeted messages	The inter-ministerial technical working group (consisting of 9 ministries and other government entities, local communities and indigenous ethnic minorities, the civil society and nongovernmental organizations (NGOs), each having a role and responsibilities in environmental management in Cambodia) that was consulted during the updating of the NBSAP considered that the following were already or needed to be involved in the achievement of this target: MOE[9], MOEYS, MAFF, MIME, MLMUPC, MOH, MCR and MWAV,

[8] Aichi Target 1
By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.
[9] See list of abbreviations

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	for everyone to integrate this knowledge about biodiversity value in the way they deal with genetic resources, species and ecosystems/land- and sea-scapes while operating in various sectors (agriculture, mining, forestry, education etc.)	IMSCEE, RUPP, MI, MEYS. They were all involved in the consultation to asses achievement of the Target
Target 2 (Aichi Target 20[10]): **By 2020, at the latest, the national budget allocation for biodiversity conservation and sustainable use (including NBSAP implementation) has increased by 20 percent through the development and implementation of a resource mobilization strategy** based on identified needs and taking into account international and national guidance and policies	Cambodia decided to have this target on budget allocation to biodiversity upfront because financial resources are needed to be able to address each one of the targets. The 2015-2016 assessment of the implementation of the 2002 NBSAP indicated clearly that the major challenge encountered during the implementation of that NBSAP was the limited financial resources. The inter-ministerial technical working group consulted during the updating of the 2002 NBSAP considered that, in light of the identified needs, it was necessary to mobilize more resources from all possible sources i.e. from government, the private sector, nongovernmental organizations, the financial mechanism considering all the focal areas, as well as bilateral and other international sources. Although they recognized not knowing the exact national budget allocation to biodiversity, they felt that an increase of 20% in national allocation for biodiversity was realistic, considering the expected returns on investment. Cambodia has already gained good experience with GEF, international cooperation agencies and the Asian Development Bank. The country is exploring in particular the synergy among the three Rio conventions and is considering increasing the number of projects that would take advantage of all the GEF focal areas (in particular biodiversity, land degradation and climate change) and other funds linked to climate change.	MOE, MOEYS, MEF, MOP and MAFF

[10] **Aichi Target 20**: By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
Target 3 (Aichi Target 2[11]): **By 2020, at the latest, biodiversity values have been integrated into national and sub-national development and poverty reduction strategies and planning processes.**	As emphasized in the background information about Target 1, raising awareness about biodiversity and its multiple values is considered as one of the highest priorities for the implementation of the NBSAP. Target 1 challenges every Cambodian at the individual level, in ways we deal with biodiversity in our daily lives. Target 3 speaks mainly to policy and decision-makers in the government at the national, provincial and local levels. Cambodia has adopted and is implementing important strategies through which biodiversity values put forward in the NBSAP should be considered. These strategies include in particular the Rectangular Strategy, the National Poverty Reduction Strategy, the National Strategic Development Plan, the National Green Growth Roadmap 2013-2030, the National Adaptation Programme of Action to Climate Change, the National Action Program to Combat Land Degradation, the Agricultural Sector Strategic Development Plan, Climate Change Action Plan for Agriculture, Forestry and Fisheries Sector (2014-2018) and the REDD+ Strategy. It is also critical to mainstream biodiversity in planning processes e.g., by applying the voluntary guidelines on biodiversity-inclusive Environmental Impact Assessment (EIA) and strategic environmental assessment **(**SEA) adopted by the CBD COP in 2006 (decision VIII/28). Both COP 13 and 14 have biodiversity mainstreaming into various economic sectors as an important item for the consideration of the Parties. This target is in line with NBSAP Strategic Objective 1 under Theme 20 on Awareness, Education, Research Coordination and Development. Activities considered under this target will contribute to the achievement of most of the other targets. Valuation studies are just in an initial phase in Cambodia and the country will develop a coherent plan to undertake valuation studies at the national level taking into account recommendations and tools developed in the framework of the Intergovernmental Science-policy Platform on Biodiversity and Ecosystem Services (IPBES).	MOE, MOEYS, MAFF, MIME, MLMUPC, MOH, MCR & MWAV, IMSCEE and RUPP

[11] **Aichi Target 2:** By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
Target 4 (Aichi Target 6[12]): **By 2020, freshwater fisheries and aquaculture are managed sustainably by addressing their constraints, and by reducing and preventing their possible negative impact on fish stocks and on aquatic threatened species and vulnerable ecosystems [13].**	In Cambodia, fish is an important diet staple, accounting for 61**%** of households' animal protein intake and the second most consumed food after rice. Fishing and fisheries, both freshwater (mainly from Tonle Sap, Mekong and Bassac rivers) and marine, make up another cornerstone of Cambodia's rural economy. Freshwater fisheries in Cambodia are directly affected by seasonal patterns of floods and droughts, and thus are vulnerable to changing climate conditions. In addition, fisheries in the Mekong, Tonle Sap and Bassac rivers and their associated floodplains are under a significant amount of anthropogenic pressure, including for example water pollutions and the use of destructive fishing methods that eliminate non-target fish. These pressures are expected to lead to a decline in fish stocks and in the size of fish caught. Aquaculture contributed approximately one sixth to total fish production in 2014 with a value estimated at USD 240 million. In order to offset the projected decline, Cambodia is developing its aquaculture. Through the "Strategic Planning Framework for Fisheries: 2010-2019", is conscious that while production is being enhanced progressively, aquaculture should b kept efficient and sustainable by using "domesticated, selectively-bred, high-health fish reared on sustainable feeds, in gender-inclusive production systems that have low carbon and environmental footprints." Cambodia adopted this target in line with Aichi Biodiversity Target 6 and also taking into account the detailed guidance provided in the Strategic Planning Framework for Fisheries: 2010-2019 where the need for research to generate data on fish stocks and for fishing within safe ecological limits is emphasized. This target is directly in line with Theme 10 on Freshwater Fisheries and Aquaculture, Theme 2 on Threatened Species, Theme 7 on Water Resources, Theme 8 on Biodiversity and Climate Change, and Theme 16 on Customary use and Traditional Knowledge.	MAFF, MOE, MEYS, MOP, TSA, MOWRAM, MME, MRD, MWRM, MOEYS and TSA

[12] **Aichi Target 6**: By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

[13] For more detailed targets and indicators, see the Strategic Planning Framework for Fisheries: 2010-2019 Cambodia (*http://www.issuelab.org/resource/strategic_planning_framework_for_fisheries_2010_2019_cambodia*). Annex 1 contains concrete targets, milestones and indicators

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	Progress toward the achievement of this target will benefit from the implementation of a number of targets such as Targets 1, 2, 3, 6 to 10, 12, and 16 to 19	
Target 5 (Aichi Target 7[14]): **By 2020 the majority of areas under agriculture[15], animal production, aquaculture[16] and forestry[17] are managed sustainably,** ensuring conservation of biodiversity, sustainable development, poverty eradication and improved well-being.	In Cambodia, biodiversity is considered as a cross-cutting issue. Development of the NBSAP with the national biodiversity targets was "based on a broad and inclusive consultation process to ensure consensus, strategic cohesion and ownership of the Plan by relevant stakeholders." MOE worked very closely with MAFF. This target translates in a way the fact that work carried out under MAFF contributes to the conservation of biodiversity, while the mandates of both MOE and MAFF lead to sustainable development, poverty eradication and improved well-being. Also, at the time of the revision of the NBSAP and development of the national biodiversity targets, Cambodia was actively involved in the International Partnership for the Satoyama Initiative, which promotes collaboration in the conservation and restoration of socio-ecological production landscapes and seascapes: (SEPLS), natural environments where humans manage agriculture, animal production, forestry and settlements in a sustainable and traditional way. This target is in line with Themes 10 on aquaculture, 12 on forest resources, and 13 on agriculture and animal production. This target is linked to target 4 (regarding aquaculture), target 8 on protected areas and conservation areas, particularly protected forests, and a few other targets. Restoration of agro-ecosystems and forest ecosystems including mangroves that have been under a lot of pressures in recent years (target 6) can be an important step towards the sustainable management of these ecosystems. The	MAFF, MOE, MWRM, MRD, MOP, MOEYS, TSA, MEYS, MIH, MOC

[14] **Aichi Target 7**: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

[15] **Agriculture** is a broad term that encompasses the cultivation of animals, plants, fungi, and other life forms for the purposes of providing food, fibber, and other products used to sustain life. The variety and variability of animals, plants and microorganisms used in agriculture is an important aspect of biodiversity. However, some agricultural practices are also a major cause of biodiversity loss (*http://www.cbd.int/doc/strategic-plan/targets/T7-quick-guide-en.pdf*).

[16] **Aquaculture** refers to the cultivation of fish, crustaceans, mollusks and aquatic plants. It can occur in both inland water and marine environments. Aquaculture can be contrasted with commercial fishing which is the harvest of wild aquatic organisms (*http://www.cbd.int/doc/strategic-plan/targets/T7-quick-guide-en.pdf*).

[17] **Forestry** refers to the interdisciplinary process of establishing, managing, using, and conserving forests and their associated resources. As such, forestry encompasses not just trees, but the multitude of plants, animals and micro-organisms that inhabit forest areas and the ways in which they are used. Forestry can occur in all types of forests from plantations to primary forests.

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	sustainable management of ecosystems sought through this Target 5 will (i) maintain at an appropriate level or improve the status of threatened species of fauna and flora, and thus contribute to the achievement of Target 10, (ii) enhance the resilience of the ecosystems that are being managed sustainably, and may contribute to carbon stocks and thus to climate change mitigation and adaptation and to combating desertification (Target 11). The respect of traditional knowledge, innovations and practices (Target 18), resource mobilization (Target 2), reduction of pollutants (Target 16), control and eradication of invasive alien species (Target 18), database and information systems (Target 19), the protection of genetic diversity of cultivated plants and farmed and domesticated animals, as well as their in-situ and ex-situ conservation (Target 20) will all support the achievement of Target 5.	
Target 6 (Aichi Target 14[18]) **By 2020, 10 % of those protected areas, conservation areas, agro-ecosystems and forest ecosystems including mangroves that have been under a lot of pressures in recent years are in an advanced state of restoration and are providing enhanced services, particularly to local communities' and indigenous ethnic minorities' women, old persons and children..**	Cambodia recognizes that the ultimate objective of the NBSAP is to ensure that biodiversity provides goods and services to the populations, in particular the most vulnerable groups or the groups most in need. Most of these ecosystems have been overused, degraded or converted to other uses for short term gains. They need to be restored. While Aichi Biodiversity Target 14 refers to ecosystems (that provide essential services) in general, Cambodia decided to name such ecosystems: protected areas and other conservation areas, agro-ecosystems and forest ecosystems including mangroves. This target is relevant to the NBSAP themes on protected area system (theme 1), agriculture (theme 13) and forest resources (theme 12). Actions leading to it achievement should be in synergy or at least coordinated with the achievement of targets 1, 2, 3, 8, 11, 12, 15, 16 and 20. Finally, achievement of Targets 9, 17 and 19 will provide incentives, knowledge and data / information that can facilitate implementation of this Target 6. Restoration of forest ecosystems is being planned and undertaken having in mind the strategic indicators for NFP long-term monitoring, in particular that, by 2029, (i) forest	MOE, MAFF, TSA, CNMC, MRD, MLMUPC, MOI, MEYS, MIH, MOC

[18] **Aichi Target 14**: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	cover will have to be increased to 60% of the total land area; (ii) sustainable forest management with prescribed silviculture will have to be implemented on 2.4 million hectares of production forest; (iii) Protected Forest covers should reach 3 million hectares; 500,000 hectares of high value commercial plantation should be established and 10 million tree seedlings distributed per year; and (iv) 2 million ha of forest land should be set aside for Community Forestry (CF) groups (approximately 1,000 CF) fully recognized with CF agreements. It is also important to plan to restore degraded lands for allocation to agriculture and thus meet Cambodia's National Voluntary LDN Target of 5% agricultural growth per annum. Cambodia recognizes that for success, local communities and indigenous ethnic minorities, the private sector and other stakeholders should be involved as much as possible at every step; and that awareness should be raised among the populations at all levels of the society regarding the value of ecosystems and their services so that there is a transformational change in the way people consider biodiversity and ecosystem services as national capital/assets	
Target 7 (Aichi Target 4[19]) **By 2020, Government, private sector and other stakeholders have taken steps to reduce the**	Cambodia is enjoying rapid industrialization and economic growth. Although Cambodia has currently a relatively small ecological footprint[21] and a small biocapacity, which results in a deficit of about 0.1 global hectare per person[22], production and consumption activities coming with industrialization can have negative impact on the environment and human health. The country does not have specific laws for sustainable production and	MIH, MOE, MAFF, MOI, MOEYS, MOINF, MOP, MOC, MME, MOT,

[19] **Aichi Target 4**: By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

[21] The ecological footprint is a measure of the area needed to support a population's lifestyle. This includes the consumption of food, fuel, wood, and fibers. Pollution, such as carbon dioxide emissions, is also counted as part of the footprint. (*http://www.worldmapper.org/posters/worldmapper_map322_ver5.pdf*)

[22] Cambodia is among the countries with the smallest EF, ranked in 2002 197 /200 with a value of 0.55 Global hectares per capita against 10.6 for United Arab Emirates, ranked 1. Happy Planet Index calculated Cambodia Ecological Footprint at 1.2 (*http://www.happyplanetindex.org/countries/cambodia/*) in 2015? Or more recently. Cambodia has a ecological footprint of 1.0 (2010) and a biological capacity of 0.9 (2010). This means the country has a deficit of 0.1 (*http://11saekre.wordpress.com/2010/11/15/cambodia-ecological-footprint/*). Wikipedia: In 2010, with a population of 14.32 M, Cambodia ecological footprint was 1.03 global hectares per person and a biocapacity of 0.94, and thus a deficit of -0.09 (http://en.wikipedia.org/wiki/List_of_countries_by_ecological_footprint)

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
negative impacts on ecosystems and their services caused by unsustainable production and consumption[20] activities.	consumption. However, there exists a number of laws[23] and policies aimed at sustainable development and sound environmental management which are relevant and consistent with sustainable production and consumption requirements. Noteworthy is the fact that the Ministry of Environment (MoE) developed the Green Growth Roadmap that was approved by the Council of Ministers in 2013. The roadmap integrates ideas and projects on green growth into national strategic development. It thus creates the basis for environmentally sound economic development through, among other things, the promotion of sustainable consumption and production. While there are very limited references to biodiversity and impacts of consumption and production on ecosystems, this target draws the attention of governments, the private sector and everybody else to the need to control the production and consumption activities and reduce their impacts if they are unsustainable. This target is particularly relevant to Themes 17 on Industry and other themes where reference is made to production and consumption. Issues and opportunities regarding production and consumption of biological resources in Cambodia are described under the Theme 4 on mining. Achievement of Target 7 will be in synergy and coordination with the achievement of Target 5(sustainable management of agricultural, animal, aquaculture and forestry productions), Target 6 (regarding the provision of enhanced services (e.g. food, water, wood and non-timber forest products) from protected areas, conservation areas, agro-ecosystems and forest ecosystems that have been under a lot of pressures in recent years), Target 10 (on species of fauna and flora threatened by unsustainable production and consumption), Target 11 (in the sense that sustainable production and consumption e.g. through the promotion of low carbon technology will contribute to enhanced carbon stocks), Target 12 (reduction of habitat degradation, pollution and overharvesting from unsustainable production and consumption), Targets 15 and 16 (reduction of pollution and exploitation from anthropogenic pressures), Target	MCFA, MLMUPC and MRD

[20] From NSDS: Increasing consumption of natural resources and environmental pollution including water, soil and the atmosphere are causing high potential risks and hazards to the public health and the environment, and are jeopardizing the long-term economic development of the country.

[23] E.g., 1- Law on Environmental Protection and Natural Resource Management – 24 December 1996 2- The Land Law, August 2001 3- The Law on Fisheries 4- Forest Law, August 2002 5- Law on Mineral Exploitation and Mining Resources 2001 6- Law on Water Resource Management 7- Law on Biosafety 2008 8- Law on Protected Areas 2008

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	17 (on Traditional knowledge and customary use that can be used to ensure sustainable production and consumption), and Target 19 (on information system/clearing-house mechanism for cooperation and exchange of relevant information and technologies). The Protected area system (Target 8) and the protection of genetic diversity (Target 20) will contribute to sustainable production and consumption of biological resources. Target 9 on Payment for ecosystem services can serve as an incentive.	
Target 8 (Aichi Target 11[24]): **In 2020, at the latest, existing protected areas and conservation areas, including community-based natural resource management areas, have management plans and have started effective implementation.** **By 2020,** **(i) the coverage of marine and coastal protected areas and freshwater protected areas has at least doubled as compared to the 2010 levels;** **(ii) Currently unprotected areas of particular importance for biodiversity and ecosystem services that are under a lot of pressures from human**	Cambodia is proud to have been one of the few countries that had achieved the 17% target for terrestrial protected areas at the time of the adoption of the Strategic Plan for Biodiversity 2011-2020. In developing its national target on protected areas, Cambodia assessed what remained to be done to achieve Aichi Biodiversity Target 11 fully. The following were identified: (i) complete the development of management plans called for in the 2008 Protected Area Law for all protected areas, and start implementing the plans; (ii) develop new marine protected areas to match the Aichi Biodiversity Target; (iii) make sure that Cambodia protected area system represents all the ecoregions found in the country as well as areas that have biodiversity importance such as key biodiversity areas and important areas that are under a lot of pressure; (iv) ensure connectivity among protected areas to allow biodiversity, wildlife in particular, to move freely within their range; (v) integrate the protected areas into the wider landscapes and seascapes, and (vi) reduce human pressure on protected areas e.g., from logging, forest conversion, illegal wildlife trade and mining. This target was design as the roadmap toward the achievement of Aichi Biodiversity Target 11 in Cambodia. This target supports targets 10 and 11 because PAs are among measures that can be taken to (i) address factors affecting threatened fauna and flora species, and (ii) enhance ecosystem resilience and the contribution of biodiversity to carbon stock, and thus contribute to climate change mitigation and adaptation and to combating desertification, respectively.	MOE, MAFF, TSA, CNMC, MRD, MLMUPC, MOI

[24] Aichi Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
activities are identified and integrated in the protected area system; and **(iii) Protected areas and conservation areas have been valued, are part of a well-connected protected area system and have been integrated in national sustainable development goals and national green growth strategies, plans and programmes;** **By 2029, protected forest covers 3.0 million hectares, in line with the objectives of the National Forest Programme 2010-2029**	In addition, PAs are mechanisms that can be used to (i) reduce the rate of loss of natural forests, coral reefs and other natural habitats (Target 12), (ii) halve the anthropogenic pressures on coral reefs and vulnerable ecosystems impacted by climate change (Target 15), and (iii) protect wild relatives of genetic resources (target 20). Marine protected areas would specifically protect coral reefs (Targets 12 and 15) and be used as a tool for fisheries sustainable management (Target 4). Similarly, forest protected areas and conservation areas are tools for sustainable forest management (Target 5). This target 8 is complemented by target 6 (By 2020, 10 % of those protected areas […] that have been under a lot of pressures in recent years are in an advanced state of restoration and are providing enhanced services, particularly to local communities, women, old persons, children and indigenous peoples). Achievement of Target 9 on Payment for Ecosystem Services can serve as source of funding for activities under PAs and thus serve as an incentive.	
Target 9 (Aichi Target 3[25]): **By 2020, Payment for Ecosystem Services (PES) is used throughout the country as an incentive for the conservation and sustainable use of biodiversity.**	Indigenous ethnic minorities and local communities are the custodians of biodiversity. They have never been formally rewarded for this service. They have limited income sources and are often among the nation's poorest. Experiences in Latin America indicated that a payment for ecosystem service (PES) programme could serve as a continuous source of revenue and provide an alternative to unsustainable income sources (such as illegal logging or mining) for local communities and indigenous ethnic minorities.	MOE, MAFF, MOEYS, MOP and MEF

[25] **Aichi Target 3**: By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	The experiences with the PES programme in the country, although still limited, have proved successful even if all the prerequisites (e.g., a national policy on PES and a national PES scheme) have not yet been put in place. This target is relating to Theme 18 on Resource mobilization. Its implementation will benefit all the other targets dealing directly or indirectly with ecosystems and biological resources as an incentive for conservation and sustainable use	
Target 10 (Aichi Target 12[26]): **By 2020, all species of fauna and flora threatened at national level have been identified and their status has been improved significantly as a result of applying measures to address their respective threats.**	This target is the type of objectives usually put forward for the conservation of biodiversity. What is interesting here is the emphasis on addressing the threats as conservation measure. This target is relevant to Theme 2 on endangered species. Also, actions required to conserve threatened species of fauna and flora under this Target 10 will likely include designation and effective management of protected areas and conservation areas (Theme 1 and target 8). Ex-situ conservation (Theme 3) can complement these actions. Mining (Theme 4), unsustainable tourism (Theme 17), forest conversion to agricultural lands (Themes 12 and 13), pollution and wastes from manufacturing industries (Theme 17), unsustainable energy production (Theme 14) and climate change (Theme 8) can be cited among the direct threats posed to species of flora and fauna. In addition, actions necessary to meet this Target 10 will also deliver substantial contributions to other Cambodia Biodiversity Targets. For example, (i) an effectively managed protected area system will contribute to the reduction in the rate of loss of natural habitats (Target 8); (ii) aquaculture can relieve the stress of fishing on fish stocks and well managed fisheries, agriculture, animal production and forestry (Targets 4 and 5) will ensure that these sectors have no significant adverse impacts on threatened species. Similarly, actions taken to achieve other targets (e.g., Target 1 on raising awareness about the value of components of biodiversity, Targets 6 and 11 putting forward ecosystem restoration, Target 7 for the sustainable production and consumption of biological resources and ecosystem services, Target 15 to reduce anthropogenic	MOE, MAFF, TSA, CNMC, MRD, MLMUPC, MOI, MEYS, MOP, TSA, MME, MPWT, MOT, MOH, MWRM, MIH, MOC, MOEYS, MOINF and MCFA

[26] **Aichi Target 12**: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	pressures on biodiversity components impacted by climate change, Target 16 for the reduction of pollutant pressures on ecosystems, and Target 18 for controlling invasive alien species) will support actions towards the achievement of this Target 10.	
Target 11 (Aichi Target 15[27]): **By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks have been enhanced, through conservation and restoration of degraded ecosystems, focusing in particular on degraded forests, protected areas and conservation areas, thereby contributing to climate change mitigation and adaptation and to combating desertification.**	This target is key for the synergistic implementation of the Rio conventions. Cambodia is implementing a programme to ensure synergy among the three Rio convention to optimize the use of its human and financial capacities. Establishment of protected areas (>40% of the land as of November 2018), the REDD+ programme and sustainable land management in general are expected to maintain vegetation/tree and thus promote the sequestration of carbon in various ecosystems. About one third of Cambodia's terrestrial carbon stock (0.95 Gt) is found in protected areas and protected forests, 0.75 Gt in Forest Concessions and the remainder 1.27 Gt in other terrestrial systems[28]. The target considers conservation and restoration of degraded ecosystems, but it calls to focus in particular on "degraded forests, protected areas and conservation areas." The areas of focus could also include agro-ecosystems, because agriculture as well as agroforestry can release greenhouse gas, and serve as C sinks and cropping/farming systems can integrate ways to adapt to climate change (climate smart agriculture). This target is applicable to all degraded ecosystems, but it is particularly relevant to Theme 1 on protected area system, Theme 8 on biodiversity and climate change, Theme 9 on forests, Theme 13 on agricultural lands, and Theme 4 on mining. Actions envisaged under many other themes will support actions for this target; for example, under Theme 6 and Group 3 themes. As such, this target will reinforce progress toward the achievement of Target 5 (Sustainable management of forests and agricultural lands), Target 6 (for 10 % ecosystem restoration), Target 8 (on PA system), Target 15 (on controlling anthropogenic pressures)	MOE, MAFF, TSA, CNMC, MRD, MLMUPC, MOI, MME, MPWT, MOT, MOH, MPLUP, MOP, MOWRAM, MWRM, MEYS, MEF, MIH, MOC

[27] **Aichi Target 15**: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.
[28] From a 2010 UNEP World Conservation Monitoring Center (WCMC) study on REDD+.

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	and will benefit from actions undertaken for Targets 19 (on clearing –house mechanism), 17 (traditional knowledge). Implementation of action required to achieve this target are being considered with Land Neutrality and the Nationally Determined Contribution to UNFCCC in mind	
Target 12 (Aichi Target 5[29]): **By 2020, the rate of loss of natural forests[30], coral reefs and other natural habitats is at least halved; and habitat degradation and fragmentation, pollution, overharvesting, introduction of invasive alien species and their impacts are significantly reduced.**	By adopting this target, Cambodia wanted to send a strong message about the need to address all the direct human causes of biodiversity loss in the last habitats that are still natural. Cambodia is very conscious about the need to protect these last natural habitats with their fauna and flora, rich in endemism. In addition to the many protected areas established and being planned (particularly in marine areas), Cambodia calls for reducing and ultimately eliminating the human drivers of biodiversity loss in natural habitats. Although research on Cambodian coral reefs have just begun, it is a good strategy to take protective action as soon as possible. Regarding forests, Cambodia is implementing a powerful National Forest Programme 2010-2029 (NFP). The NFP contains strategic provisions for the conservation of wildlife and other biodiversity components in the forest. Regarding natural forests, the NFP calls for "prevention, mitigation and adaptation strategies […] needed to sustain ecologically sound natural forests that maintain their production potential and environmental services and mitigate effects to areas surrounding agriculture that are also areas of high human pressure." These natural forests are threatened by the "escalating demand for, and pressures on, land and natural resources from increasing population growth (approximately 1.53%), rapidly rising	MOE, MAFF and others

[29] **Aichi Target 5**: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

[30] Strategic indicators for National Forest Programme (NFP) long-term monitoring are as follows – as per 2029: (i) Current level of forest cover will be increased to 60% of the total land area; (ii) Sustainable forest management with prescribed silviculture implemented on 2.4 million hectares of production forest; (iii) On average, 20 registered and vibrant small- and medium scale direct and indirect forest-based enterprises or cooperatives operating in each forestry cantonment. minimum of 50% of processed wood for export will be certified; (iv) Annual net revenue from the forest sector of 125 million USD; (v) Annual average net income (excluding establishment and maintenance costs) from carbon sequestration of 25 million USD; […] (vi) Civil servants in the forest sector able to initiate and implement activities with partners external to the Forestry Administration as a natural part of their daily routines; (vii) Protected Forest covers 3.0 million hectares 500,000 hectares of high value commercial plantation established and 10 million tree seedlings distributed per year; (viii) Two million ha of forest land allocated for Community Forestry (approximately 1,000 CF) groups fully recognised with CF agreements; (ix) The forest sector will be fully self-financed; (x) Demarcation of a total 120,000 km of forest boarders (primarily completed during the last ten years).

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	unemployment, internal migration, and developments in infrastructure and other economic sectors, combined with legislation that is not fully formed and weakly enforced, exposes our forests to unsustainable exploitation and leads to conflicts over rights of access and use." Because this target addresses all direct causes of biodiversity loss (minus climate change), implementation of actions under all the other themes will support the achievement of this target. In addition, achieving this target has potential synergies and co-benefits associated with many other targets, especially Targets 5 (sustainable aquaculture to reduce the stress on fisheries, and sustainable forest management), 6 (ecosystem restoration), 7 (sustainable production and consumption), 8 (protected area system), 11 (ecosystem resilience), 15 (reducing anthropogenic pressures) and 18 (control of invasive alien species). Implementation of this target becomes an opportunity to promote synergistic implementation of the Rio conventions.	
Target 13 (Aichi Target 16[31]): **By 2015, Cambodia has designated a national focal point and one or more competent national authorities for the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS), and established a functional ABS Clearing-House as part of the clearing-house mechanism;**	This target was adopted in response to COP decision X/1 and as part of the obligations after ratifying the Protocol. In addition, conscious about the many plant and animal species that have been identified in the country and the new ones that are found frequently, many of which needing to be described (including their ecological role and possible benefits to humans), Cambodia like many other developing countries hopes that (i) the Protocol will increase opportunities to reward the country and more particularly indigenous ethnic minorities and local communities who are the custodians of our 'native' biodiversity; and (ii) when the native biodiversity is transformed using the knowledge, innovations and practices of indigenous ethnic minorities and local communities and commercialized, the country and more specifically indigenous ethnic minorities and local communities will share the benefits. In sharing its genetic resources, Cambodia hopes to gain access to and/or acquire new technologies and thus build research and innovation capacities for adding value to its genetic resources. It is also	MOE, MOEYS, MRD

[31] Aichi Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
By 2020, Cambodia has developed and is enforcing a legislation and national policies on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization.	hoped that all these benefits will create incentives to continue conserving and using biodiversity sustainably as well as the associated traditional knowledge. Efforts to achieve this target are linked to activities described in the NBSAP under themes 9 on Industry, Technology and Services, 15 on resource mobilization, 16 on community participation, 18 on Awareness, Education, Research Coordination and Development, and 22 on Technology and Information Sharing (CHM).	
Target 14 (Aichi Target 17[32]): **By 2015, the National Biodiversity Strategy and Action Plan (NBSAP) have been updated and adopted, and have commenced to be implemented effectively**.	Done. The Target was adopted in response to COP decisions IX/8 and X/2. The NBSAP was endorsed by the Royal Government of Cambodia in 2016 as a policy document that should guide all the Ministries.	MOE
Target 15 (Aichi Target 10[33]): **By 2020, anthropogenic pressures (pollution, exploitation, sedimentation…) on coral reefs and vulnerable ecosystems impacted by climate change have been significantly reduced.**	Cambodia is among the countries most vulnerable to climate change in Southeast Asia. Climate change is impacting many ecosystems in the country essentially through recurrent floods and droughts. Agricultural lands seem to be the most affected, with impact on local communities. Disturbances taking place in the ecosystems is expected to increase occurrences of diseases like Dengue fever and malaria. This target is about the impact of human activities on natural ecosystems that are vulnerable to climate change. It was adopted to echo Aichi Biodiversity Target 10. Its relevance in Cambodia is essentially to coral reefs, mangroves and the 322 000 ha of primary forests found in the country. Cambodia is enjoying rapid industrialization and economic growth. Forest clearing and expansion of agricultural lands, particularly along the Mekong River and its tributaries, has been necessary to increase agricultural production, agriculture being the dominant	MOWRAM, MOE, MAFF, MME, MRD, MWRM, MEYS, MOP, MRD, MEF, MLMUPC, MIH, MOC

[32] **Aichi Target 17**: By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

[33] **Aichi Target 10**: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	livelihood in Cambodia. Various land-based activities such as intensive logging and deforestation together with mining activities are affecting the quality of water streams by increasing the levels of pesticides and/or chemical wastes from rubber and palm oil industries, and from sediments washed loose from degraded and bare soils towards rivers or coastal areas downstream. All the above-mentioned human activities impact coral reefs and other natural ecosystems impacted by climate change. This target goes essentially with strategic objective 1 under Theme 11 on marine and coastal resources and actions under Themes 7 (Water resources), 8 (Biodiversity and climate change), 9 (Forest resources), 11 (Coastal and marine resources) and 13 (Agriculture and animal production). There are also a lot of co-benefits in achieving this target with other targets, in particular for the sustainable management of fisheries and aquaculture (Target 4), the sustainable management of areas under agriculture, aquaculture and forestry (Target 5), sustainable production and consumption (Target 7), an effectively managed protected area system (Target 8), the reduction of the loss of natural habitats (Target 12) and the reduction of pollutant pressures on ecosystems (Target 16).	
Target 16 (Aichi Target 8[34]): **By 2020, pollutant pressures on terrestrial and aquatic ecosystems are substantially reduced to levels that are not detrimental to ecosystem function and biodiversity.**	Cambodia is successfully undergoing rapid development and industrial growth. However, (i) its air quality is deteriorating from industrial and handicraft processes as well as fossil fuel combustion, (ii) its soils and waters are becoming more and more polluted by various types of wastes and by chemicals used in agriculture and mining activities, and (iii) its marine and coastal areas are being degraded from land-based activities as well as from ships. Cambodia adopted laws and sub-decrees calling for the prevention and control of pollutions and pollutants[35], and the National Strategic Plan on Green Growth 2013-2030 for a green economy through environmental sustainability. The laws and strategy are not	MME, MAFF, MOE, MOI, MME, MRD, MPWT, MOT, MOH, NCDM, MOWRAM, MLMUPC, MOSVY, MOP, MWRM, MEYS, MIH, MOI, MOEYS, MOINF, MOC, MCFA

[34] Aichi Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

[35] The 1996 Law on the Environmental Protection and Natural Resources Management created the basis of standard setting for air pollution. The management of pollution and waste is governed by the Sub-Decree on the Environmental Impacts Assessment (1999), Sub-Decree on Solid Waste Management (1999), Sub-Decree on the Control on Air and Noise Pollution (2000) and Sub-Decree on Water Pollution Control (1999).

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	explicit about impacts on biodiversity. In addition, Cambodia ratified treaties such as the International Convention for the Prevention of Pollution from Ships (MARPOL) or endorsed programmes like the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, which deal with different types of pollutions. Actions under NBSAP Themes 4 on mining, 5 on environmental security, 7 on water resources, 11 on marine and coastal resources, 17 on industry, and 8 on climate change will support the achievement of this target. There are potential synergies in implementing actions required by this Target and the activities planned under Targets 5 on sustainable management of areas under agriculture, forestry and aquaculture, 6 on sustainable fisheries and aquaculture, 9 (because payment for ecosystem services will discourage anthropogenic pressures on ecosystems), 15 on the reduction of anthropogenic pressures on vulnerable ecosystems impacted by climate change, and 18 on the control and eradication of invasive alien species. Actions identified for sustainable production and consumption under Target 7 are applicable for the achievement of this target. For example, industrial pollution can be controlled by using cleaner production. Organic agriculture can solve to some extent the question of excessive chemical input in modern agriculture. Recycling can reduce the amount of industrial or domestic wastes. Perverse subsidies leading to excess nutrient use in agricultural lands can be removed.	
Target 17 (Aichi Target 18[36]): **By 2020, the traditional knowledge, innovations and practices of indigenous ethnic minorities and local communities relevant for the conservation and**	Indigenous and local communities have been acknowledged as key partners in achieving the goals of the CBD and other biodiversity-related conventions. Their knowledge, innovations and practices are now considered essential for the sustainable management of biodiversity. In Cambodia, this was recognized e.g., with regard to the knowledge on medicinal plants. The Ministry of Health organizes workshop to inform different groups of people, in particular students, about the healing power of plants. The workshops intend to raise awareness and respect of traditional knowledge. Also, regarding the	MAFF, MRD, MOEYS, MRD, MOP, MLMUPC MWAV, MOP, MOT, MME

[36] Aichi Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
sustainable use of biodiversity, and their customary use of biological resources, are (i) **respected, subject to national legislation and relevant international obligations, and** (ii) **fully integrated and reflected in the implementation of the Convention and the NBSAP with the full and effective participation of these communities, at all relevant levels.**	nutritional value of many plants as well as the agricultural practices in home gardens, tradition is a treasure of knowledge. Encouraged and guided by decisions taken in United Nations forums, Cambodia is developing ways and means to gather traditional knowledge on many aspects, integrate it in management practices of natural resources and, in light with the Nagoya Protocol, share the benefits from the utilization of the traditional knowledge with the holders of the knowledge. This target is linked to NBSAP Theme 16 on Customary use and Traditional knowledge, Theme 19 on Community Participation and other related themes such as Theme 20 on awareness raising. This Target is relevant to the overall Strategic Objective A and Target 1 of Cambodia NBSAP because assessment of the status and trends of biodiversity and its value usually includes assessment of the associated traditional knowledge. This Target is also cross-cutting under a number of other themes[37] and as an essential element of the "enabling" cluster, required for the achievement of other Cambodia Biodiversity Targets. Given the broad nature of this target, progress towards its fulfillment will contribute to several other targets, in particular targets 4, 5, 6, 8, 13 and 15.	MOEYS, MIME, MLMUPC, MOH, MCR, RUPP, IMSCEE
Target 18 (Aichi Target 9[38]): **By 2020, major invasive alien species (IAS) and their pathways have been identified and prioritized, and prioritized IAS and pathways are controlled.**	Little has been reported about invasive alien species in Cambodia. Two invasive alien species have been reported in the Lower Mekong Basin: (i) the Giant Mimosa (*Mimosa pigra)* from the Amazon, and (ii) the Golden Apple Snail (*Pomacea canaliculata*) from South America. There are some mentions of the water hyacinth. Studies are yet to be carried out to assess the extent of their spread and impact in Cambodia. However, according to IUCN[39], many IAS have been introduced into the Lower Mekong Basin (LMB) region for economic and aesthetic reasons, and that several others have entered accidentally. At present, the possible pathways for introduction of IAS in the region include aquaculture development, horticulture, aquariums and ornamental fish trades, and also mariculture, agriculture, forest plantation, transport systems (e.g. ship ballast water, fouling on the hulls of ships and other boats, transport of raw goods such	MOE, MAFF, TSA, CNMC, MRD, MLMUPC, MOI, MEYS, MOP, MEF, MWRM, MOEYS, MIH, MOC

[37] Namely themes 1, 2, 10, 11, 12, 15 and 24

[38] **Aichi Target 9**: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

[39] *http://cmsdata.iucn.org/downloads/mlb_ias_current_state_of_play.pdf*

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	as timber), and tourists. It is expected that development activities such as construction of dams, water stream diversions, urbanisation, agricultural expansion and impact of climate change will facilitate and aggravate the spread of the IAS if they are introduced in the region. The main objective of having this target is thus to prepare the country to face IAS if and when they are introduced by acquiring the knowledge and technology for halting their introduction and spread. CBD COP developed useful guidelines to be considered. This target is a cross-cutting issue particularly relevant to NBSAP Themes 1, 2, 9 to 13. It is important to note that ecosystem degradation and climate change impacts are particularly favorable to the establishment and spread of invasive alien species. Implementation of this target 18 can be in synergy with implementation of activities under Targets 1 (awareness raising about causes of biodiversity loss), 4 (sustainable management of fisheries and aquaculture), 5 (sustainable management of areas under agriculture, forestry and aquaculture), 6 (ecosystem restoration), 8(protected area system), 10 (protection of threatened species), 11(ecosystem restoration and resilience), 12 (reducing the rate of loss of natural habitats), and 15 (reducing anthropogenic pressures including IAS on vulnerable ecosystems impacted by climate change). Cambodia has some training materials on its CHM for *Mimosa pigra*	
Target 19 (Aichi Target 19[40]): **By 2020, an interoperable and user-friendly information system containing data and information on biodiversity (including its associated ecosystem services) values, functions, status and trends, and threats, and the consequences of its loss has been established and maintained in the**	In order to be able to raise awareness about biodiversity and its values, its status and future dynamics, to facilitate dissemination of information, in particular the key messages needed by policy- and decision-makers, Cambodia has been investing resources to improve its clearing house mechanism (CHM). One of the targeted improvements is to make the CHM linked to other information management systems in the country and elsewhere, and more accessible to a wide range of users. Taking advantage of the UNDP/GEF project "*Generating, Accessing and Using Information and Knowledge Related to the 3 Rio Conventions*", Cambodia established a	MOE

[40] **Aichi Target 19:** By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
responsible institutions for wide sharing among stakeholders.	web portal that is being used as a pilot in identifying the best ways and means to handle biodiversity data of relevance to people beyond the biodiversity constituency. The CHM is important for all the targets and the whole NBSAP. It is expected that if information can be managed, disseminated and accessed effectively and efficiently, that will encourage and support the generation of useful data in the country.	
Target 20 (Aichi Target 13[41]): **By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals, as well as the genetic diversity of their wild relatives is protected and conserved *in-situ* and *ex-situ*.**	Agriculture (including crop and livestock production and fisheries) is the dominant livelihood in Cambodia. It contributed close to 30% to the GDP in 2015. Rice is by far the most important crop. The production of other food crops is expanding particularly in areas poorly suitable to lowland rice. Industrial crops include rubber, sugarcane, cotton, tobacco and jute. Cambodia has also a treasure of local knowledge regarding so-called 'neglected and underutilized plant species'. These plants, including a long list of native cereals, roots and tubers, pulses, fruits, vegetables, nuts, seeds and spices, can be grown on marginal and degraded lands while contributing to increased agricultural production, crop diversification and a better environment. In addition, they are usually nutrition-dense, climate-resilient, economically viable, locally available and/or adaptable as 'Future Smart Food.' As such, they are attracting more and more interest in research and mainstreaming into plans for the implementation of the sustainable development goals. Also, Cambodia is strengthening its research capability at the genetic level, for species identification and monitoring of animal and plant populations in the field. This target should thus be seen as part of a wide strategy for sustainable development. It is in line with NBSAP themes 1 to 3 and 9 to 14, but the other themes are also relevant. It is also linked to many other national targets, in particular Target 1 on raising awareness about the status, trends and values of biodiversity components; Targets 4 and 5 on sustainable management of ecosystems that include the protection of genetic resources and genetic diversity in those ecosystems; Target 8 on establishment of effectively managed protected areas and conservation areas that will protect, particularly in their core areas, representative components of biodiversity; Target 10 for the protection of threatened species and thus the genetic diversity of these species; and Target 12 for the	MOE, MAFF, TSA, CNMC, MRD, MLMUPC, MOI, MEYS, MOP, MEF, MWRM, MOEYS, MEYS, MIH, MOC, MME

[41] **Aichi Target 13**: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Cambodia Biodiversity Target (and the Aichi Biodiversity Target equivalent)	Why country chose to set this particular target	To which level of government, the target applies
	reduction of the loss of natural habitats where wild relatives of genetic resources can be found. Cambodia decided to build on activities already under way in the framework of the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture[42], the Global Plan of Action for Animal Genetic Resources and the Interlaken Declaration[43] and the International Initiative on Biodiversity for Food and Nutrition adopted by the Conference of the Parties to the CBD[44]. The herbaria, as well as seed *ex situ* and *in situ* collections that exist (e.g., seed banks, gene banks, botanical and zoological gardens etc. at the local, provincial and national levels) are being considered under this target. Efforts are being made to highlight the value of these genetic resources and thus raise awareness and interest for them. The Cambodia CHM as well as the Rio conventions web portal are ready to handle data and information on plant genetic resources for food and agriculture, other plant genetic diversity and animal genetic diversity. Many laws and regulations exist to guide the planned actions under this target.	

[42] www.fao.org/agriculture/crops/core-themes/theme/seeds-pgr/gpa/en/
[43] www.fao.org/docrep/010/a1404e/a1404e00.htm
[44] http://www.cbd.int/agro/food-nutrition/elements.shtml

Annex 1: List of themes covered in the 2016 updated National Biodiversity Strategy and Action Plan

GROUP 1: PROTECTION OF BIODIVERSITY (Themes 1 to 8)
- Theme 1: Protected Area System
- Theme 2: Threatened Species
- Theme 3: Ex situ Conservation
- Theme 4: Mineral Resources Management and Mining
- Theme 5: Environmental Security
- Theme 6: Sustainable Land-Use Planning
- Theme 7: Sustainable Water Resources
- Theme 8: Biodiversity and Climate Change
- Theme 9: Sustainable Forest Resources Management

GROUP 2: SUSTAINABLE USE OF BIODIVERSITY (Themes 9-16)
- Theme 10: Sustainable Freshwater Fisheries and Aquaculture
- Theme 11: Sustainable Coastal and Marine Resources Management
- Theme 12: Sustainable Animal and Wildlife Management
- Theme 13 Sustainable Agriculture and Animal Production
- Theme 14: Sustainable Energy Resources Management
- Theme15: Access and Benefit Sharing
- Theme 16: Customary Sustainable Use and Traditional Knowledge

GROUP 3: ENABLING ENVIRONMENT (Themes17 to 24)
- Theme 17: Industry, Technology and Services (Manufacturing, Biotechnology and Biosafety, and Tourism)
  a. Sustainable Manufacturing Industry Management
  b. Biotechnology and Biosafety
  c. Sustainable Tourism
- Theme18: Resource Mobilization
- Theme 19: Community Participation
- Theme 20: Awareness, Education, and Research Coordination and Development
- Theme 21: Legislation and Institutional Structure
- Theme 22: Quality of Life and Poverty Reduction
- Theme 23: Landscape and Seascape Management and Coordination
- Theme 24: Clearing-House Mechanism for Technical and Scientific Cooperation, Knowledge Sharing and Information Exchange

SECTION II

IMPLEMENTATION MEASURES TAKEN, ASSESSMENT OF THEIR EFFECTIVENESS, ASSOCIATED OBSTACLES AND SCIENTIFIC AND TECHNICAL NEEDS TO ACHIEVE NATIONAL TARGETS

This section focuses on measures to be taken under each National Biodiversity Target. These measures were identified in the National Biodiversity Strategy and Action Plan and are cross-referenced when they are applicable to more than one target. They are also put in their specific contexts in light of the thematic biodiversity priorities of Cambodia. In this framework, they include measures taken in other sectors; in other agreements to which Cambodia is a Party, such as the Ramsar Convention on Wetlands of International Importance and the Convention on International Trade in Endangered Species of Wild Fauna and Flora; and under other relevant strategic and action plans such as the National Action Plan to Combat Land Degradation (NAP) 2018-2026, the Intended Nationally Determined Contribution to the United Nations Framework Convention on Climate Change (UNFCCC), the Second National Communication to UNFCCC or the National Strategic Development Plan.

Target 1 on raising awareness about biodiversity values and their integration in people's behavior

1.1. Gather information on the value of biodiversity (at the genetic, species and ecosystem/landscape levels) found in Cambodia;
1.2. Gather methods for assessing awareness and assess the current level of biodiversity awareness in the country; and thus, identify gaps in knowledge and awareness, and those groups (i.e. priority groups for awareness raising programmes) whose awareness of biodiversity values is most important to the status of biodiversity;
1.3. Gather information on (i) methods of communication, awareness raising and education actions, (ii) messages and (iii) organisations/agencies, involved in communication, education and public awareness identify any gaps;
1.4. Gather all partners to identify and prioritize the types of needed awareness raising, communication and education actions, and design communication, education and other actions to strengthen awareness of biodiversity values and/or fill the gaps as part of a communication, education and public awareness strategy; and carry out the identified actions so as to ensure integration of biodiversity knowledge in the way people deal with genetic resources, species and ecosystems/land- and sea-scapes while operating in various sectors (agriculture, mining, forestry etc.);
1.5. Mainstream the CEPA strategy on biodiversity into the curricula of all levels of education.

Target 2 on increasing by 20% the budget allocated to biodiversity conservation and sustainable use, including the implementation of the National Biodiversity Strategy and Action Plan

2.1 Develop, following the guidance in CBD COP decision X/3 on resource mobilization, a framework and guidelines for reporting on biodiversity related expenditures.
2.2 Estimate past and current budget allocation for biodiversity conservation and sustainable use and the main sources of this financing i.e. taking into account resources from government, the private sector, and nongovernmental organizations including resources from domestic as well as international sources, and identify NBSAP activities that are currently funded;

2.3 Assess financial needs for additional activities from the NBSAPs and their relative priority
2.4 Calculate 20 percent of amount currently allocated for biodiversity conservation and sustainable use, and, with the involvement of key stakeholders, develop, disseminate and implement a strategy to mobilize that amount in addition to the current allocation.

This target is in line with Theme 18 on Resource Mobilization, Strategic Objective 2. Achievement of Target 1 and all the other targets will depend greatly on financial resources that will be mobilized

Target 3 on enhancing integration of biodiversity values in national planning and strategies

3.1. Gather information from all sources on the value[45] of biodiversity in the country and thus on the most important components of biodiversity and their ecosystem services, starting with the critical values of "flagship" species and ecosystems. Methods for biodiversity valuation have been published but the country will develop national guidelines for biodiversity valuation to ensure coherence in the values allocated to components of biodiversity;
3.2. Raise awareness on opportunities and constraints for integrating biodiversity values into local and national planning, decision-making and reporting processes, based on experiences in Cambodia and in other countries;
3.3. Identify group of people in charge of integrating into national and sub-national development and poverty reduction strategies and planning processes. Mobilize them and develop guidelines to assist them in the inclusion first of those values of biodiversity which are easiest to account for. Development of national guidelines for the application of biodiversity-inclusive environmental impact assessment (EIA) and strategic environmental assessment (SEA) using the voluntary guideline developed under the Convention on Biological Diversity (CBD COP decision VIII/28) would be among the first areas for integrating biodiversity values.
3.4. Building on the National Green Growth Roadmap[46] , which has been developed for furthering development to benefit the people and conserve and restore the natural capital base to continue economic growth within the limits posed by the ecosystem carrying capacity, enhance consideration of biodiversity in key economic sector development plans and landscape level planning. Coordination among government ministries and different levels of government at the national and local levels. In addition, time, financial resources and both technical and administrative capacity will be needed.

Target 4 on sustainable freshwater fisheries and aquaculture

This target is directly in line with Theme 10 on Freshwater Fisheries and Aquaculture, Theme 2 on Threatened Species, Theme 7 on Water Resources, Theme 8 on Biodiversity and Climate Change, and Theme 16 on Customary use and Traditional Knowledge. Progress toward the achievement of this target will benefit from the implementation of a number of targets such as targets 1, 2, 3, 6 to 10, 12, and 16 to 19.

4.1 Gather information on freshwater fisheries and aquaculture, their impact on fish stocks and on aquatic threatened species and vulnerable ecosystems; on management plans already in place; on factors driving freshwater fisheries and aquaculture; and on stakeholders, including the level and trend of demand for fish;
4.2 Gather representatives of all stakeholder groups to design and agree on management plans that could include catch reductions, quotas to gear restrictions, partial, periodic or full fishery closures, establishment of conservation areas or recovery plans, and other measures that will rebuild fisheries

[45] Decision X/3 The COP considers […] that All Parties provided with adequate financial resources, will have, by 2015 assessed and/or evaluated the intrinsic value, ecological, genetic, social economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components
[46] http://www.greengrowth.org/?q=publication/national-green-growth-roadmap-cambobia#sthash.2XqbfMJ7.dpuf

stocks that have been overexploited or depleted, taking into account the status and trends of fish stocks, aquaculture, fishing methods used, the law on fisheries, and the ecosystem approach, and bearing in mind that a target in the 2009 NSDS stated that by 2015, the use of sustainable fishery practices was to be achieved in 70 percent of the fishing waters of the country.

4.3 Support decision-making with research in particular on fish stock sustainability and harvesting within safe ecological limits[47].

4.4 Establish and support community-based fisheries and fish sanctuaries/conservation areas; and expand aquaculture

Target 5 on sustainable management of areas under agriculture, animal production, aquaculture and forestry

- Assess the main areas in the country used for agriculture including animal production, aquaculture and forestry;
- Demarcate clear agriculture, aquaculture and forest management unit boundaries, and ensure enforcement of legal frameworks for the protection of resources in these areas;
- Identify measures that are in place to ensure sustainability and describe their effectiveness. Encourage successful measures and scale them up as needed;
- Undertake research to describe and agree on national sustainability criteria (building on Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity developed under the Convention on Biological Diversity) for agro-ecosystems and aquaculture because there is no universally agreed sustainability criteria except for sustainable forest management;
- Carry out research to describe the opportunities and constraints to enhancing sustainable management of agriculture including animal production, aquaculture and forestry (bearing in mind that the 2009 NSDS targeted a forest cover of minimum 60 % managed in a sustainable way with participation of the local community by 2015);
- Increase education, practical training and awareness raising activities to promote involvement / engagement of all including local communities and indigenous ethnic minorities, public and private sectors, and civil and religious societies;
- Carry out research on the role of modern biotechnology in agriculture including animal production, aquaculture and forestry;
- Enhance cooperation with CGIAR centers, ITTO, FAO and other organisations working on sustainable management in agro-ecosystems, forestry and aquaculture;
- Improve enabling environment:
    - Improve water management for agriculture, forestry, animal production and aquaculture;
    - Improve tenure security and land markets;
    - Improve infrastructure for market accessibility and promote marketability of the products;

Target 6 on restoration of 10 % of pressured protected areas, conservation areas, agro-ecosystems and forest ecosystems including mangroves

- Identify protected areas and conservation areas (including Ramsar sites and biosphere reserves), agro-ecosystems and forest ecosystems that have been degraded and require restoration in order to recover the lost ecosystem services;
- Identify and assess the pressures and underlying factors supporting these pressures;
- Identify and demarcate10% of these areas that can be considered as priorities areas for reasons such as urgency because they can be lost for ever or that they are having the most significantly adverse impact on local communities' women, old persons, children and indigenous peoples' or because their

[47] i.e. harvesting at levels which do not undermine the long-term sustainability of the ecosystem

restoration can have the most significant benefits and yield the most significant secondary benefits for the ecosystems and the populations depending on them, and for the country's economy and development;

- Undertake restoration activities [48] and follow them up to ensure their success while controlling the pressures that led to the degradation of the ecosystems and constrained their provision of ecosystem services, including through the removal of negative incentives and the promotion of positive ones;
- Put in place mechanisms for monitoring the improvement of ecosystem services and their impact particularly on local communities' and indigenous ethnic minorities' women, old persons and children,
- Strengthen the enabling environment (policy, financial resources);
- It is important for success that local communities and indigenous ethnic minorities, the private sector and other stakeholders are involved as much as possible at every step; and that awareness is raised among the populations at all levels of the society regarding the value of ecosystems and their services so that there is a transformational change in the way people should consider biodiversity and ecosystem services as national capital/assets;

Target 7 on reduction of negative impacts unsustainable production and consumption activities.

Bearing in mind that although Cambodia has currently a relatively small ecological footprint[49], its small biocapacity results in a deficit of about 0.1 global hectare per person[50]. Cambodia has adopted strategies and plans (e.g. the National Strategic Development Plan Update and the Green Growth Roadmap) favorable to the well-being of the people of Cambodia in a sustainable manner. In order to meet Target 7 i.e., to develop an ecologically sustainable system of production and consumption in all economic sectors (agriculture, food production, garments, energy, mining, fisheries, forestry, transport, transformation), the country will:

- Compile information and undertake research on the impact of current production methods and consumption patterns on ecosystems and their services;
- Assess the ecological footprint of industries operating in Cambodia;
- Raise awareness of Government, the private sector and other stakeholders regarding negative impacts of unsustainable production and consumption;
- Formulate and implement a national strategy for sustainable production and consumption building on best practices, the voluntary 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns adopted at the Rio + 20 Conference, the Green Growth Roadmap and other development strategies adopted earlier by the country.
  The strategy will contain *inter alia*: standards for sustainable production and consumption, and for a better quality of life; for the protection of natural resources and the promotion of a more efficient use of natural resources, products and recovered materials; for the promotion of the life cycle approaches, including resource efficiency and sustainable use of resources; as well as science-based and traditional knowledge-based approaches, and the 3-R concept (reduce, reuse and recycle) and other related methodologies, as needed.

[48] Forest restoration includes restoring forest functionality and productive capacity so that the restored forests can provide food, fuel, and fiber, improve livelihoods, store carbon, improve adaptive capacity, conserve biodiversity, prevent erosion and improve water supply. Restoration will usually include (as much as possible community-based) replanting, thinning, reintroduction of fires, closure and obliteration of unnecessary roads and control of alien species

[49] The ecological footprint (EF) is a measure of the area needed to support a population's lifestyle. This includes the consumption of food, fuel, wood, and fibers. Pollution, such as carbon dioxide emissions, is also counted as part of the footprint (*http://www.worldmapper.org/posters/worldmapper_map322_ver5.pdf*)

[50] Cambodia is among the countries with the smallest ecological footprint. In 2002, Cambodia was ranked 197 over 200 countries, with a value of 0.55 Global hectares per capita against 10.6 for United Arab Emirates, ranked 1. Cambodia had an ecological footprint of 1.0 and a biological capacity of 0.9 in 2010. This means the country had a deficit of 0.1 global hectare per person (*http://11saekre.wordpress.com/2010/11/15/cambodia-ecological-footprint/*).

The Strategy will call for the engagement of all, in particular the private sector, along the life cycle of products in efforts to achieve a shift towards sustainable consumption and production, particularly sectors with a high environmental and social impact

The national strategy for sustainable production and consumption will be supported by the promulgation of legislation or regulations on sustainable production and consumption in line with existing laws[51]; a strong information system at the interface of science and policy that will facilitate exchange of information and cooperation; a programme on communication, education, and public awareness building on ongoing initiatives[52], and on scientific and technological capacity building for the acquisition and adaptation of green technology; and the establishment of financial mechanisms to support investments for the recycling of wastes, adoption of cleaner production methods and, in general, sustainable consumption and production patterns.

- The creation of green jobs and market opportunities will serve as incentives for the adoption of sustainable production and consumption

Target 8 on protected areas: coverage expansion, valuation, improved management effectiveness, and enhanced connectivity

In 2020, at the latest, existing protected areas and conservation areas, including community-based natural resource management areas, have management plans and have started effective implementation.

By 2020,

(i) **the coverage of marine and coastal protected areas and freshwater protected areas has at least doubled as compared to the 2010 levels;**

(ii) Currently unprotected areas of particular importance for biodiversity and ecosystem services that are under a lot of pressures from human activities are identified and integrated in the protected area system; and

(iii) Protected areas and conservation areas have been valued, are part of a well-connected protected area system and have been integrated in national sustainable development goals and national green growth strategies, plans and programmes;

By 2029, protected forest covers 3.0 million hectares, in line with the objectives of the National Forest Programme 2010-2029

Regarding development and implementation of management plans for each protected area and each conservation area

- Conduct a rapid/coarse assessment of management effectiveness such as the WWF Rapid Assessment and Prioritization of Protected Areas Management (RAPPAM) so as to identify strategic actions with regard to protected areas, conservation areas and their network for achieving more surely and effectively national conservation and development objectives.
- Develop subsequently the strategic management plan called for in the 2008 Protected Area Law, which should include *inter alia:*
  - A time schedule for conducting (rapid and more comprehensive) assessments of protected area and other conservation area management effectiveness;

[51] Law on Environmental Protection and Natural Resource Management, 1996; Land Law, 2001; Law on Fisheries; Forest Law, 2002; Law on Mineral Exploitation and Mining Resources, 2001; Law on Water Resource Management; Law on Biosafety, 2008; Law on Protected Areas, 2008.

[52] E.g., the 3-R Concept is being promoted through environmental education programmes

- Plans for identifying an agreed set of standards, baselines and best practices for management methods and methods for ensuring effective and efficient management of protected areas and other conservation areas, taking into account regional experiences;
- Plans for setting in place a mechanism for monitoring and reporting on protected areas, conservation areas and the whole national protected areas system;
- A proposed budget or a strategy for mobilizing financial resources for all these activities and ways and means for the mobilization of the needed funds and other resources

- Develop management plans for respective PAs and conservation areas

For doubling marine and coastal PAs and freshwater PAs from the 2010 levels:

- Assess the 2010 coverage of marine and coastal PAs and freshwater i.e. the Gulf of Thailand MPA (covering 9,210 ha, as per 2014 WDPA data) and four of the seven national parks and one of the three multiple use protected areas, which are coastal and marine protected areas. When planning to double this area, it is useful to consider connecting with the MPA planned for the protection of the coral reefs around Koh Rong and Koh Rong Samloem islands[53] and along Preah Sihanouk province's coast.
- Regarding freshwater protection, it is necessary to bear in mind that the country adopted in Strategic Planning Framework 2010-2019 for Fisheries – Cambodia the following targets:
  - At least 35% of the area of inland flooded forest and at least 75% of the area of coastal flooded forest are protected through physical demarcation by the end of 2019.
  - At least 40 of the 97 Upper Mekong deep pools are effectively protected and conserved and at least 80% of Great Lake fish sanctuaries are improved through boundary demarcation, protection and public awareness by the end of 2019.
  - Post-2019, it will be a goal to complete the protection of all flooded forest, deep pools, sanctuaries and other critical habitats.

Regarding integration in the protected area system of currently unprotected areas of particular importance for biodiversity and ecosystem services that are under a lot of pressures (see Annex 3)

- Bearing in mind that all terrestrial ecoregions are under protection (20 to 62% coverage of the respective ecoregions) except the Tonle Sap-Mekong peat swamp forests, of which only 0.6% is protected, while a significant portion (>90%) of this ecoregion is under human pressure adversely affecting the remaining native vegetation, a study will be carried out urgently to demarcate an area of this ecoregion for designation as a protected area. A management plan containing, among other points, guidelines for the participation of local communities and indigenous ethnic minorities, and an assessment of the resources required to ensure the protection and restoration of this ecoregion will be developed and used.
- In addition, although most Important Bird Areas (IBA) are covered by protected areas, the following five sites are in critical situations due essentially to agricultural expansion and intensification, human intrusions and disturbances, energy production and mining, overexploitation of some species, in particular wood harvesting and collection of non-timber products: Kampong Trach, Lomphat, Sesan River, Stung / Chi Kreng / Kampong Svay and Western Siem Pang. Studies and consultations will be undertaken urgently to demarcate areas for protection, assess the resources needed as well as the value and possible revenues from these protected areas. Plans will be developed for the effective management of these areas, including guidelines for the participation of local communities and indigenous ethnic minorities as well as plans for strengthening institutions and human capacities.
- Both these IBAs and the Tonle Sap-Mekong peat swamp forests ecoregions include wetlands/-freshwater that will also be protected (as part of the first part of sub-paragraph (i) of this target).

[53] http://www.phnompenhpost.com/national/coral-reef-areas-gain-protection-cambodia

To ensure connectivity among protected areas and conservation areas, corridors will be considered after a spatial analysis of conservation areas.

Regarding valuation of PAs and conservation areas

- Carry out an assessment of the full range of ecosystem services provided by PAs which are critical to the economy and social wellbeing of the populations. This assessment will also estimate the costs associated with the loss of these services, and the costs of managing the PAs.

Regarding integration in national sustainable development goals and national green growth strategies, plans and programmes

- Compile information on integration of PAs in national sustainable development goals from relevant initiatives such as the landscape integration project, called "CALM"[54]. Building on those experiences:
  - create a group of partners and decide on a core group; and set the goals to achieve by integrating PAs in sustainable development goals, as well as parameters;
  - assess the broader context consisting of a review of the protection context (existing PAs and their effectiveness, additional PAs needed), the ecological context (ecosystems/habitats and their value; key biodiversity and connectivity gaps in ecosystems and PAs), the socio-economic, policy and sectoral opportunities and constraints;
  - develop and implement strategies and actions taking into account the gaps and opportunities
  - establish monitoring, evaluating and adapting mechanisms
- Also see actions under Target 3 for additional actions

Regarding achievement of the objective of the National Forest Programme 2010-2029 to have 3.0 million hectares of protected forest cover by 2029

- Bearing in mind that currently, the surface area of protected forests is about 1.63 million ha, a study will be carried out to identify forest areas of significant ecological, biological and socioeconomic importance requiring protection or restoration. These areas will be mapped out taking into account land tenure and access rights issues, demarcated and submitted for designation.
- As noted in the NFP, given the diversity of legal status ascribed to different land units in Cambodia such as forest reserves, wildlife reserves, protection forests and national parks, efforts should be made to ensure coherence and synergy in respect of conservation value.

Target 9 on promotion of payment for ecosystem services (PES) country as an incentive for the conservation and sustainable use of biodiversity

- Raise awareness about PES schemes, opportunities, requirements, risks and constraints, and build/strengthen capacity for valuation of ecosystem services;
- Identify ecosystem service prospects including their marketable value, and potential buyers / beneficiaries in the country and region;
- Assess and build/strengthen institutional (including legal, policy, land ownership context and existing rules for PES markets and deals) and technical capacity;
- Review options for payment and contract types, and develop PES agreements;
- Implement PES agreements, and set in place mechanisms for monitoring as well as ensuring compliance and enforcement, and for evaluating the deal/agreement;
- Compile experiences/case studies in the national clearing–house mechanism for awareness raising and education programmes.

[54] *http://www.cbd.int/doc/pa/tools/Making%20Protected%20Areas%20Relevant%20A%20guide%20to%20Integrating%20Protected%20Areas.pdf*

Target 10 on identification of all species of fauna and flora threatened at national level and improvement of their status.

- Compile a list of threatened species of fauna and flora, assess their status and trends, and describe their ecological and socioeconomic importance;
- Identify and describe their direct and underlying threats;
- In a participatory way and taking into account the knowledge, know-how and practices of local communities and indigenous ethnic minorities, put forward and implement measures to address the direct and underlying threats. Some of the direct threats were considered under other strategic themes in this NBSAP such as mining (Theme 4), climate change (Theme 8), overharvesting and ecosystem degradation (Themes 9 to 14), pollution (e.g., Themes 17 and 22), invasive alien species (Themes 12 and 13), and manufacturing industries, biotechnology / biosafety and tourism (theme 17), while the themes in Group 3 dealt in general with underlying threats. Both *ex-situ* and *in-situ* conservation or establishment and effective management of PAs are among actions required to conserve and improve the status of threatened species;
- Raise awareness about threatened species;
- Monitor and assess effectiveness of measures taken.

Target 11 on enhancing ecosystem resilience and the contribution of biodiversity to carbon stocks

- Identify and assess the status and trends of degraded forests including mangroves, degraded PAs, degraded conservation areas and other degraded ecosystems such as agro-ecosystems and wetlands;
- Identify and assess the direct and underlying causes of ecosystem degradation;
- Enhance awareness about climate change mitigation and adaptation measures in the country;
- Undertake studies on ecosystems resilience and restoration in Cambodia and in the region;
- Apply best practices to identified degraded ecosystems for their restoration and resilience, and assess their contribution to carbon stocks, taking into account ongoing initiatives implementing, among other national strategies and plans, the 2006 National Adaptation Programme of Action on Climate Change, and the Cambodia Climate Change Strategic Plan 2014 – 2023, and in synergy with ongoing initiatives in the context of the Clean Development Mechanism (CDM), REDD^{+} and other carbon financing mechanisms for climate change mitigation and adaptation;
- Legislation and incentives;
- Strengthen human, institutional, technological and financial capacities building;
- Actions identified for Target 8 are also relevant here.

Target 12 on halving the loss of coral reefs by controlling their threats:

- Conduct biodiversity assessments/inventories of natural habitats, with emphasis on natural forests including mangroves, coral reefs, wetlands, areas around riverbanks, lake shores, and un-protected biodiversity hotspots;
- Compile information on their status and trends from diverse sources including scientists, local communities, indigenous ethnic minorities and citizens at large, bearing in mind that information on forests has been being submitted regularly in the context of the FAO Forest Resource Assessment;
- Conduct studies to assess the rate of loss of these natural habitats / ecosystems and calculate the end point to half the rate of loss;
- Identify the direct and indirect causes of loss of these natural habitats / ecosystems. Among these, document and assess in particular the impact of the following drivers: habitat degradation and fragmentation, pollution, overharvesting, introduction of invasive alien species. Other drivers of biodiversity loss should be kept in mind, including coastal development, agricultural conversion, water diversions, channelization, construction of dams and roads, and climate induced sea level rise;

- Describe and assess the effectiveness of measures taken to address the causes of habitat / ecosystem loss, in particular habitat degradation and fragmentation, pollution, overharvesting, introduction of invasive alien species, and document best practices.

Measures to be considered will include actions to be taken under other targets such as Targets 1 and 3 (valuation of biodiversity, awareness of the values and integration in development plans), Target 5 (sustainable aquaculture to reduce the stress on fisheries , and sustainable forest management), Target 7 (sustainable production and consumption and emphasis on efficiency and the 3-R concept), Target 8 (Protected area system) including designation of heritage sites under UNESCO or wetlands under the Ramsar Convention, Target 10 (protection of threatened species), Target 15 (reducing anthropogenic pressures on natural habitats impacted by climate change), and Target 18 (control of invasive alien species).

These measures can be prioritized using such criteria as (i) measures with immediate impacts on the ground in addressing the drivers of change, (ii) starting with actions having zero or negative costs; then actions having a relatively low cost but high impact; and finally actions that are expensive to carry out especially if their impact is limited; and (iii) actions that can simultaneously help achieve other Targets.

- Develop plans to control the causes of loss, in particular habitat degradation and fragmentation, pollution, overharvesting, introduction of invasive alien species, including through the strengthening of some of the measures taken and application of new ones;
- Build and strengthen the capacities, including human, institutional, technological and financial capacities, needed for the implementation of the plans:
    - Develop and implement communication plans and integrate consideration of natural habitats/ecosystem issues in education and awareness raising programmes;
    - Enhance the enabling conditions including by strengthening participation, cooperation and coordination (within the country, at the regional and international level) and other actions described under the NBSAP themes in Group 3;
    - Law enforcement is of fundamental importance to stop illegal activities such as illegal logging and fishing methods;
    - Apply biodiversity-inclusive environmental impact assessments on all projects and design and implement mitigation measures;
    - Participation in REDD+ and application of payment for ecosystem services and product certification can support the actions identified in the plans;
- Implement the plans.

Monitor and evaluate progress and adapt the plans as needed for improved effectiveness.

Target 13 on the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS)

- See actions under Strategic Objective 2 of Theme 15, with the support from actions under the other strategic objectives as part of the enabling conditions.

Target 14 on updating and implementation of the National Biodiversity Strategy and Action Plan (NBSAP): ongoing.

Target 15 on reduction of pressure coral reefs and other ecosystems impacted by climate change

- Inventory annually and describe ecosystems that are vulnerable to climate change in Cambodia, including in particular coral reefs, and describe factors determining vulnerability;
- Identify and assess impact of anthropogenic pressures on these vulnerable ecosystems;

- Develop plans to reduce these pressures and restore the degraded ecosystem and enhance management to build up ecosystem resilience. Generic measures are identified essentially under Targets 8, 11 and 12 above, but also under many other Targets;
- Implement plans;
- Monitor impact of measures taken, evaluate progress and adapt the plans as needed for improved effectiveness.

Target 17 on respect and integration of knowledge, innovations and practices of indigenous ethnic minorities and local communities

Building on the guidance provided in various CBD COP decisions on Article 8(j) and related provisions, and building also on actions being carried out under various strategic themes in particular themes 16 and 19,

(a) Develop and strengthen national level strategies, including *sui generis* systems, for promoting and protecting traditional knowledge and the customary sustainable use of biological diversity, taking into account the standards adopted by the CBD COP including the Akwe: Kon Guidelines for Environmental Assessment, the Code of Ethical Conduct;

(b) Strengthen capacity building initiatives to foster effective participation of indigenous ethnic minorities and local communities in the implementation of the CBD, in particular Articles 8(j), 10(c) and related provisions, and the NBSAP whenever relevant traditional knowledge, innovation and practices are required;

(c) Strengthen capacities for the implementation of Articles 8(j), 10(c) and related provisions under the CBD including for co-managing protected areas and conservation areas.

Target 18 on control of invasive alien species (IAS)

Bearing in mind that

- as stated in the 5th National Report under the CBD, there are not documented cases of detrimental effects of invasive alien species (IAS) in Cambodia;
- however, a number of known aggressive invaders have been reported, and
- according to IUCN[55],
  - many IAS have been introduced into the Lower Mekong Basin (LMB) region for economic and aesthetic reasons, and that several others have entered accidentally;
  - at present, the major pathways for introduction of IAS in the region include aquaculture development, horticulture, aquariums and ornamental fish trades, bearing in mind that other pathways include mariculture, agriculture, forest plantation, transport systems (.e.g. ship ballast water, fouling on the hulls of ships and other boats, transport of raw goods such as timber), and tourists;
  - the spread of IAS in the region has been aggravated by development activities such as construction of dams, water stream diversions, urbanisation, agricultural expansion.

Cambodia will undertake the following actions to achieve the target by preventing the introduction, spread and establishment of IAS:

- Monitor the behaviour of potential IAS and set in place a mechanism for this monitoring;
- Monitor the known pathways for introduction of possible IAS in the LMB region (in particular trade of species introduced for aquaculture, horticulture and as pets);
- Reinforce the quarantine services at borders and regional cooperation and coordination to ensure that effective mechanisms are in place for inspection at borders, rapid detection and enforcement of quarantine regulations so as to prevent introduction of invasive alien species;

[55] http://cmsdata.iucn.org/downloads/mlb_ias_current_state_of_play.pdf

- Develop and disseminate national policies on the management and prevention of IAS, building on existing legal frameworks and ongoing work in the context of the CBD and other international and regional agreements[56] ratified by Cambodia;
- Develop education and awareness raising programmes for decision-makers, administrators, researchers, the private sector and the general public, so that informed decisions about how to limit introductions and their spread can be taken at all the stages. Education and awareness raising materials will include impact of IAS on human health and socio-economies, information on the spread and impacts of IAS in the LMB;
- Enhance preparedness of the country to face IAS when they have been introduced by acquiring the knowledge and technology for halting IAS spreads e.g. through their containment and control of their density and abundance, preventing their re-introduction, mitigating their damage, eradicating them if they have been introduced and have established, and restoring damaged ecosystems;
- Develop and implement a financial mobilization plan.

Target 19 on Enhancing the effectiveness of the Clearing-House Mechanism

- Improve the existing Clearing-House Mechanism and its accessibility to serve at the science-policy interface and facilitate more informed decision-making;
- Strengthen institutions and research providing data and information on biodiversity (including its associated ecosystem services) values, functions, status and trends, and threats, and the consequences of its loss.

Target 20 on Enhancing in-situ and ex-situ conservation of plant and animal genetic diversity

Drawing essentially on the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture[57], the Global Plan of Action for Animal Genetic Resources and the Interlaken Declaration[58] and the International Initiative on Biodiversity for Food and Nutrition adopted by the Conference of the Parties to the CBD[59], Cambodia can undertake the following actions to achieve its target on the protection of genetic diversity of cultivated plants and farmed and domesticated animals, as well as the genetic diversity of their wild relatives:

- Survey and inventory
    - plant genetic resources for food and agriculture and genetic varieties of other cultivated plants (e.g. ornamental); and
    - animal genetic resources for food and agriculture;
- Collect the wild relatives of plant genetic resources including in particular landraces on the verge of extinction, and related scientific information, including traditional knowledge with the consent of local communities and indigenous ethnic minorities in accordance with national legislation and policies;
- Characterize and classify
    - the genetic diversity of cultivated plants and their wild relatives for morphological and agronomic traits, including at the molecular level if possible,
    - the genetic diversity of farmed and domesticated animals,

  and organize the results in user-friendly databases;

- Inventory gene and seed banks existing in the country and in the region;
- Undertake an inventory of traditional plant breeders, animal breeders and curators of *ex-situ* collections, and involve them in the activities identified under this target;

[56] See an indicative list at *http://www.cbd.int/invasive/done.shtml*
[57] *www.fao.org/agriculture/crops/core-themes/theme/seeds-pgr/gpa/en/*
[58] *www.fao.org/docrep/010/a1404e/a1404e00.htm*
[59] http://www.cbd.int/agro/food-nutrition/elements.shtml

- Review plans and strategies that are in place to maintain the plant and animal genetic diversity for food and agriculture and genetic diversity of other planted species *in-situ* and *ex-situ;*
- Develop and implement plans and policies for *ex-situ* and *in-situ* conservation, and for the distribution of germplasm (seed, tissues etc.).
    - For *in-situ* conservation, support farmers' *in situ* conservation of traditional and local plant varieties, animal breeds, and efforts to conserve crop wild relatives.
      Support farmers' *in situ* conservation of traditional and local plant varieties, animal breeds, and efforts to conserve crop wild relatives;
    - For ex-*situ* conservation, expand existing facilities and establish new ones (seed banks, gene banks, botanical and zoological gardens etc.) at the local, provincial and national level for maintaining, evaluating, documenting and the distribution of germplasm. Maintain genetic materials in ways that will preserve viability and genetic stability over long periods of time and evaluate them regularly.
      Support collections and exploration for the collection of wild relatives with emphasis on threatened genetic resources.
      Consider opportunity of placing some accession in-trust with FAO so that they can be maintained at international standards;
- Enhance protection of genetic diversity of cultivated plants and farmed and domesticated animals, as well as the genetic diversity of their wild relatives by ensuring their sustainable use through:
    - the sustainable use of economically valuable local wild plants and animals, as an income generating activity for local inhabitants
    - the marketing of products from rare and threatened plant species and animal breeds
    - the development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species,
    - seed production and distribution,
    - promotion of traditional knowledge and customary sustainable uses, and
    - the establishment and strengthening of national sustainable use policies;
- Enhance the enabling conditions, including by:
    - fostering collaboration and coordination at the national, regional and international levels e.g., with the Universities and research institutions, and Consultative Group of International Agricultural Research centres,
    - strengthening the national clearing-house mechanism to handle data and information on plant genetic resources for food and agriculture, other plant genetic diversity and animal genetic diversity,
    - developing and strengthening systems for monitoring,
    - creating economic incentives for *in situ* conservation by farmers,
    - developing and strengthening biodiversity-friendly breeding and seed laws, regulations and standards,
    - strengthening public awareness of the importance of plant and animal genetic resources for food and agriculture and other cultivated plant varieties,
    - Mobilizing funds from diverse sources.

SECTION III

ASSESSMENT OF PROGRESS TOWARDS NATIONAL TARGETS

NATIONAL TARGETS 1 AND 3 ON CONSCIOUSNESS ABOUT BIODIVERSITY VALUES AND THEIR INTEGRATION IN BEHAVIOR AND NATIONAL DEVELOPMENT PLANNING AND STRATEGIES

Target 1
By 2020, every Cambodian

(i) **is conscious about the environmental, economic, health, social and cultural value of the services derived from ecosystems**, in particular the value of protected area systems as well as the value of terrestrial and aquatic animal and plant resources including animal wildlife, livestock, agricultural, forest, freshwater and marine resources, and the biomass used for energy production, **and**

(ii) **integrates this knowledge in the way they deal with these ecosystems and resources.**

Target 3:
By 2020, at the latest, biodiversity values have been integrated into national and sub-national development and poverty reduction strategies and planning processes.

1. Introduction

1.1 Scope of the section

This subsection will consider both targets 1 and 3; they are interrelated. It will present an overview of biodiversity valuation assessments as well as awareness-raising initiatives in Cambodia. It will then describe how biodiversity values have been and continue to be integrated in the people's daily lives and how they have been integrated in the country's development strategic plans and policies, and the impacts of this integration in economic sectors.

1.2 Main findings from the 5th National Report on protected areas

The Fifth National Report indicated that the following were considered: (i) the number of educational and media materials, and programs that were developed and provided to educators and learners; (ii) number of stakeholders at all levels aware of the biodiversity values (method to evaluate capacity building and knowledge of the relevant stakeholders); (iii) number of people whose behavior has been changed due to awareness and knowledge of biodiversity values; and (iv) identification of biodiversity knowledge location, provider and receiver. The Report concluded that the knowledge of the stakeholders on biodiversity values (economic, social, health, recreational etc.) was well on track to be improved.

2 Overview of progress towards enhanced awareness about biodiversity values and integration in behavior and national planning and strategies

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	During this reporting period (2014 -2018), the Government (essentially MoE, MAFF and MOEYS) with many partners (UN organizations, bilateral cooperation agencies, intergovernmental organizations, national and international non-governmental organizations and the media) organized many events to inform and raise awareness about environmental, economic, health, social and cultural values of biodiversity. The training workshops or just awareness raising initiatives were organized for all groups in the society, with particular focus on rural communities who depend more directly on nature for their livelihoods and who are the primary custodians of biodiversity. These awareness-raising and capacity-building sessions occurred as part of the programmes on protected area management; on rescue, recovery and protection of threatened wildlife; on sustainable use of natural resources in aquatic or terrestrial ecosystems; or in agricultural system including animal production. Cambodia has participated in a number of initiatives as one of the pilot countries. One such initiative is the UNESCO 'Learning about Biodiversity: Multiple-perspective Approaches'. Integration of biodiversity values in schools and higher institutions is particularly critical for the future of conservation and management of natural resources. Cambodia introduced the Eco-School Programme following ASEAN guidelines. In order to make sure that biodiversity, among other things, is well integrated in school curriculums, the Government increased substantially MOEYS budget in the past years. Research on valuation of ecosystem and their services is gaining momentum in Cambodia; the results are needed for policy and decision-making in many areas. Strategies and action plans adopted after 2014 contain more and more references to the value of biodiversity and importance to manage this natural asset sustainably. Cambodia Climate Change Strategic Plan 2014-2023, the Second National Communication to UNFCCC, the National Action Program to Combat Land Degradation 2018-2027, the voluntary targets for Land Degradation Neutrality, the National Environment Strategy and Action Plan 2016-2023, and the Environment and Natural Resources Code of Cambodia are some examples of that integration. The few assessments that have been conducted e.g., to understand the impact of the nest protection programme or the Ibis Rice programme indicate some behavioral changes towards a better management of the environment and biodiversity. More systematic assessments need to be carried out at wider scale

3. Background

Cambodia possesses one of the richest biodiversity in Southeast Asia. The country is part of the Indo-Burma hotspot. It consists of four Global Ecoregions and has a large number of Key Biodiversity Areas and many of the best remaining forests and wetlands in mainland Southeast Asia, with a large number of endemic and globally threatened species. Conscious about the fact that knowledge of Cambodian biodiversity is limited, scientists in recent years are generating a lot of data and information on the taxonomy, status and trends of plants, animals and microorganisms; on the ecosystems (landscapes and seascapes) harbouring them as well as the factors that are impact them.

It is expected that increased awareness of biodiversity and the impact of its loss will ultimately lead to behavioural change by individuals, organizations and governments and influence them in the kind of actions they can take to conserve and use biodiversity.

Although close to 80% of the population leave directly or indirectly primarily on biodiversity and as such, they are aware of the importance of biodiversity components they use and/or interact with, there is a need to design ways and means to have an idea of what they know and how they perceive biodiversity and how they use that knowledge and perception to deal with biodiversity. It is also necessary to find out the gaps in knowledge i.e. what people should know to better conserve and use biodiversity sustainably and/or recover degraded ecosystems or recover dwindling populations of some plant or animal species.

With the new media and various campaigns e.g., on the occasions of international world environment, biodiversity, dolphin days, people's awareness is increased on a specific aspect of biodiversity; and numbers of people who participated in a specific information/training workshops can be counted/tracked in small communities or in organisations or in Ministries. But comprehensive data on all the different themes of biodiversity at the provincial or national level remains difficult to obtain. In addition, there is limited track of how people use the knowledge gained through the campaigns.

Thus, assessment of progress made on this target will be rather qualitative and only indicative and indirect through the consideration of availability of data on the environmental, economic, health, social and cultural value of biodiversity and related ecosystem services, in particular on the value of protected areas, forests, freshwaters, marine areas, terrestrial as well as aquatic animal and plant resources including wildlife and livestock, agricultural resources, and the biomass used for energy production.

As the country is swiftly moving towards greater development and prosperity, it faces the challenge of developing its economy and reducing poverty without compromising its natural resources. There needs to be a clearer understanding of the value of the country's natural heritage so that the best choices can be made to progress on the economic development path while environment is managed wisely for the present and future generations. Natural resources are the mainstay of Cambodia's economy: more than 80 % of Cambodians depend directly on them for subsistence and income, and all utilize wild resources such as fish and timber. As a result, the need for reliable data on biodiversity and its value has been included in all recently adopted priorities.

The Royal Government of Cambodia is conscious that raising public awareness of the value of biodiversity is essential in guaranteeing the effectiveness of measures taken to achieve the conservation and sustainable use of the country's natural assets. Raising awareness about the value of biodiversity and the related ecosystem services is particularly important if people's behaviour in the way they deal with biodiversity has to change. Since the last report to the Convention on Biological Diversity (the 5th National Report drafted in 2015), Cambodia has been pursuing, in partnership with various national and international organisations, its initiatives to gather information on its rich biodiversity, in particular on agrobiodiversity, forestry as well as on threatened species and ecosystems. The RGC and partners used

different approaches, tools and products to reach out to the targeted audiences. Although it is not possible to provide a comprehensive assessment of the progress made in achieving the first of the 20 targets Cambodia adopted in its 2016 National Biodiversity Strategy and Action Plan, examples of achievements will give an idea of the range of relevant actions undertaken or carried out by the Ministries and their partners as well as the type of impacts achieved through these actions.

4. Assessment of the information on biodiversity value in Cambodia

4.1 Ecosystem

The value[60] of biodiversity components is generally well perceived in Cambodia. Economic studies have been carried out to provide decision-makers at every level with opportunities to make informed choices and trade-offs. There exists a number of economic valuation studies for forest, fishery, and mountain ecosystems as well as for protected areas and corridors linking protected areas and /or other conservation areas in Cambodia. Not all ecosystems are covered equally. There seem to be more such studies in forest ecosystems in Cambodia and very limited in marine areas. WWF is one of the organizations that have supported economic valuation studies in Cambodia. Although the different methods used may not allow comparisons between studies, the results provide relative information useful to decision-makers. That information can lead individuals or communities to modify their behavior towards the components of biodiversity under consideration.

The lack of information and/or the lack of understanding of the values of biodiversity and ecosystem services has generally led to their omission or undervaluation in public decision-making. There is a need to compile these studies and synthesize them in a language accessible to many, and for use in communication, education and awareness-raising programmes. An IPBES-type of assessment at the national level is being considered by the Government of Cambodia. Due to rapid development and land use changes currently occurring in Cambodia, pressures on wetland resources have also increased tremendously as well as the need for more information on wetland values to assist decision-makers and law enforcement. Also, while there are many valuation studies on forest ecosystem services in Cambodia, it appears that deciduous dipterocarp forests across the Northern Plains are generally understudied and also under-protected[61]

4.2 Species

There are also studies of the value of plants and animals[62] traded as food products or for medicinal purposes or considered as assets for tourism. Protection or recovery of threatened species is often poorly understood when it is done at the expenses of food or livelihood security. Conservationist have at time difficulty to get across their messages. There are efforts in the Ministry of Health to share with students in particular some of the traditional knowledge on medicinal plants. But the Ministry does not get information about how the sharing of traditional knowledge impact those who benefit from this traditional knowledge.

[60] Valuation of ES in protected areas: *http://ageconsearch.umn.edu/bitstream/37920/2/15512IIED.pdf*; in protected forests: *https://www.sciencedirect.com/science/article/pii/S2212041616301231*; for forest: *http://d2ouvy59p0dg6k.cloudfront.net/downloads/mapping_and_valuing_ecosystem_services_in_mondulkiri_full_report_6_9_2016_1.pdf*; for Mekong Basin: *https://www.cbd.int/financial/doc/wwf-mekongecosystemservices2013.pdf* (WWF); for mangroves: *https://www.dockside-kh.eu/rt_mangrove/*;

[61] Wohlfart, C., Wegmann, M. & Leimgruber, P. 2014. Mapping threatened dry deciduous dipterocarp forest in South-East Asia for conservation management. Tropical Conservation Science, 7, 597–613.

[62] Examples of value of fish economic and welfare values of fish in the Lower Mekong Basin can be found at *http://ifredi-cambodia.org/reports/*

4.3 Genetic level

Very little work is taking place in Cambodia at the genetic level. Some information exists on animal and plant genetic resources for food and agriculture, in reports submitted by Cambodia to FAO. IRRI conducts some work on the germplasm of *Oryza sativa*, *O. glaberrima* and their wild relatives conserved at IRRI. There is much to gain by studying and disseminating information on the agronomic and other values of genetic resources. Much genetic diversity of *Glycine max* remains uncollected in Cambodia.

5. Awareness raising materials and activities

5.1 Awareness-raising materials

Awareness raising activities in Cambodia use a wide range of materials and tools including zoological and botanical gardens, Press Releases, Newsletter, presentations, scientific Publications, popular publications, newspaper articles e.g. Phnom Penh Post, radio, banners, TV spots, video, brochure, leaflets, posters, T-shirt, bags or cap prints, calendars. More formal events such as training seminars and capacity building workshops, production of manuals on environmental education for primary school teachers, TV spots, posters, conducting a national environment day[63], annual reports, national reports under the CBD, other biodiversity-related conventions and UNCCD, Facebook, the MOE clearing house mechanism. The clearing house mechanism is the official repository of official information on biodiversity[64]. Most of these materials and tools have been translated in Khmer.

5.2 Cambodia Clearing House Mechanism (CHM)

Cambodia established its CHM in 2011 with the mandate to "to provide the efficient exchange of information on biodiversity in Cambodia between involved persons and institutions", and to "facilitate international access to information on the status of biodiversity studies and biodiversity management in Cambodia". After these years of experience and in light of the findings of the project on "Generating, Accessing and Using Information and Knowledge related to Three Rio Conventions," Cambodia is reviewing the mission of its CHM and considering ways and means to improve its accessibility, friendliness and services as a repository of official information and data relating to biodiversity in Cambodia and as a tool for scientific and technical cooperation among scientists, policy makers and other stakeholders in country including in particular the youth and practitioners in the field. The Mechanism will also be designed to promote cooperation in the training of personnel and exchange of experts and promote the establishment of joint research programmes.

5.3 Activities and achievements[65]

The following are examples of awareness raising activities that took place since the fifth national report with information on their impacts, when available.

MOE, MAFF, MOEYS and partners in international cooperation

In his message introducing the Cambodia's Curriculum Framework of General Education and Technical Education of 2015, the Minister of Education draw attention to the fact that "the development of human resources with adequate knowledge, competencies and skills is aligned with Cambodia's national aspiration, which is to develop its economy and become 'a medium-high income country by 2030 and a developed country by 2050'" (MoEYS, 2015, p. I). Biodiversity and ecosystem services being central to the

[63] National Biodiversity Day, International Wetland Day, World Water Day, National Fish Day and National Tree Planting Day are celebrated annually throughout the country to enhance awareness

[64] http://www.chm.gdancp-moe.org/

[65] NB: The list does not have pretention to be comprehensive.

economic development of Cambodia, in particular through agricultural production and forestry, it is necessary to make sure that biodiversity is fully mainstreamed in education curriculum.

Cambodia participated in some pilot projects designed to test ways and means to improve national education in line with the sustainable development goals and to integrate biodiversity perspectives into learning and teaching activities:

(a) As a follow-up to the Call for Action in the 2009 Bonn Declaration on Education for Sustainable Development, UNESCO carried out pilot projects in 8 countries including Cambodia to strengthen existing education and outreach programmes on biodiversity in UNESCO Biosphere Reserves[66]. Actions included capacity building workshops to support teachers, students, community members, the media, professionals and decision-makers. Cambodia was selected among the 8 countries to test the "Learning about Biodiversity: Multiple-perspective Approaches" toolkit on teachers in lower secondary schools located in Tonle Sap Biosphere Reserve. The Biosphere with its extraordinary biodiversity-richness gives the best opportunity to learn about biodiversity, its value for the people, and the principles for its sustainable management in support of the community livelihoods and well-being. The introduction of the concepts of "ecosystem" and "sustainability" was particularly significant.

The training workshop organized in Siem Reap yielded very positive feedback from participants and other beneficiaries, including in terms of behavioral change:

(i) Teachers became more aware of the importance of our natural assets and felt more empowered to include in their teaching, not only of biology but also the other subjects (e.g., Khmer literature, history, chemistry, morality, geography, and physics), references and linkages to biodiversity and related ecosystem services with some emphasis on the values;

(ii) Encouraged by the practical training they receive on the value of biodiversity and how they can protect this richness while reaping benefits for the community, students are more and more engaged in rural activities (hunting, fishing, collection of non-timber forest products) while noting and providing advice on best management practices (sustainability perspective). They replicate at home the vegetable gardens learned in school and participate in the creation of green spaces;

(iii) To ensure some follow-up to the pilot project, a competition has been established among schools for the best ESD programme and Eco Clubs created, with support from DoEYS, Provincial office of Education, Youth, and Sport (PoEYS) and MoEYS.

However,

(i) Supporting materials such as visual aid for teaching remain poorly available and accessible;

(ii) Teachers who were not involved in the pilot project are reluctant to be trained by their peers;

(iii) Follow-up support from MOE and MOEYS remains limited and compromises the sustainability of the project.

(b) The UNESCO Asia-Pacific Centre of Education for International Understanding (APCEIU) and International Bureau of Education (IBE) initiated in 2016 a 3-year cooperation project "Global Citizenship Education Curriculum Development and Integration" with the aim to mainstream Global Citizenship Education (GCED) in 4 pilot countries including Cambodia[67]. When this project began in 2016, the Ministry

[66] Chou, Phanith & NOP, Sothun. 2014. Education for Sustainable Development Biodiversity Education Project Case Study of Integration of "Learning about Biodiversity: Multiple-Perspective Approaches" into Teaching and Learning at Tonle Sap Biosphere Reserve. 10.13140/2.1.4910.9761, also accessible at *https://www.researchgate.net/publication/266387767_Education_for_Sustainable_Development_Biodiversity_Education_Project_Case_Study_of_Integration_of_Learning_about_Biodiversity_Multiple-Perspective_Approaches_into_Teaching_and_Learning_at_Tonle_Sap_Bi*.

[67] *http://unesdoc.unesco.org/images/0026/002643/264359e.pdf*

of Education, Youth and Sport of Cambodia (MoEYS) had just finalized the draft of its national curriculum framework and released it at the beginning of 2017. While mainstreaming GCED into the new framework, the MOEYS also wanted to make sure that the learners are provided with the core knowledge and skills to act as responsible citizens able to address global issues such as climate change, biodiversity loss and sustainable development. It is expected that the syllabi that will are being drafted as part of the project will include some key messages about biodiversity, its value and needs for conservation and adequate management;

(c) In June 2018, MOE requested MOEYS to integrate more environmental awareness subjects into school curriculums, especially in regard to plastic pollution as it poses a serious threat to terrestrial as well as marine ecosystems;

(d) The Mekong River Commission Secretariat (MRCS) and the United States Agency for International Development (USAID) co-organised in June 2018 in Siem Reap a training and workshop of the PEER (Partnerships for Enhanced Engagement in Research) under the Project titled "Building Mekong Genetic Biodiversity Network" to initiate a systematic genetic sampling methodology of important fish of the Mekong River and thus build a strong biodiversity research network among scientists from Cambodia, Lao PDR, Thailand and Viet Nam;

(e) In 2016 the Ministry of Environment (MoE) and the Ministry of Education, Youth and Sports (MoEYS) jointly developed a National Guideline on Eco-schools in Cambodia. The guideline offers schools a set of criteria that recognizes the value of natural resources and implements environmental sustainability practices. The guideline is being used by other institutions dealing with education such as VVOB (education for development);

(f) As part of raising awareness about the biological importance of the Cardamom Mountains, MOE with assistance from the UNESCO Bureau has started discussions and consultations for the nomination of the Mountain as the second biosphere reserve in the country. The Cardamom Mountains hold some of the last intact wild forests and are thus an important ecosystem for wildlife and for people. They represent some of the region's largest remaining habitats for threatened species including tiger and guar. However, Illegal logging, wildlife hunting, forest clearing, etc. are threatening the Mountains. Nomination as biosphere reserve will provide additional international credit for conservation and protection;

(g) Building on the Royal Government's "Education for All" Plan, 2003-2015.,MOEYS integrates the environmental issues especially biodiversity and ecology into national school curriculum to upgrade knowledge and skills, and to change students' behaviour regarding biodiversity conservation and sustainable use, and its value relating to human health, agriculture (e.g. home garden, rice cultivation, string bean growing, organic vegetables, mushroom farm, fish, frog and chicken raising), forestry (timber and non-timber forest products), water resources, tourism and sustainable development. Japan International Cooperation Agency (JICA) and UNDP are particularly active in assisting Cambodia to incorporate environmental education programme into the primary and secondary curriculum. A range of train-the-trainer materials on environmental topics have been developed and used, and many training materials have been developed in Khmer or translated from English to Khmer;

(h) The government has also substantially increased the budget for the education sector[68] and achieved remarkable progress in improving cooperation in education with development partners including NGOs and the private sector.

UN organizations and bilateral partners (international cooperation)

[68]Budget expenditure doubled in 2007 from 2003 level, accounting then for approximately 19 percent of the total budget. In 2014, the budget of the Ministry of Education was allocated $335 million budget for 2015, up from the $280 million budgeted for in 2013. That represented a 19.6 percent increase.

UNESCO

In 2015, the Natural Sciences team focused on the promotion of biodiversity by developing a biodiversity toolkit as well as by publishing a richly illustrated book for teenagers on the four main ecosystems in Cambodia[69]. A cartoon made for the anti-plastic bag campaign had a resounding success. The Natural Sciences Unit continued collaboration with other UNESCO units towards the implementation of projects e.g., on Biosphere Reserves as learning places for sustainable development or on raising awareness towards sustainable development:

(a) UNESCO supported different science, technology and innovation festivals and conferences. For example, (i) in 2014 and 2015, UNESCO supported the celebration of the Science Film Festival, in close cooperation with the Ministry of Education, Youth and Sports, in different provinces; and (ii) in December 2014, UNESCO supported the 8th South East Asian Biosphere Reserve (SeaBRnet) meeting, the 2nd Asia-Pacific Biosphere Reserves Networks (APBRN) Strategic Meeting and the Asia Pacific Workshop on Strengthening Capacity for Management of Biosphere Reserves and Protected Areas, in Siem Reap;

(b) UNESCO, Ministry of Environment, SIPAR and supported by the Japanese-Funds-in-Trust, produced and launched in 2016 the "Biodiversity Book in Cambodia: A Treasure to Protect", for distribution to all secondary schools in the target areas, some Eco-Schools in Mondulkiri province, and many other libraries throughout Cambodia. The Biodiversity Book focuses on five biodiversity hotspots in Cambodia, i.e. the Tonle Sap Biosphere Reserve, Cardamom Mountains, Mangroves, Coral Reef and Mekong Region Ecosystems. The main objective of the book is to raise awareness on biodiversity among Cambodian youth and students;

(c) As reported in 2017, UNESCO contributed to the overall implementation of Sustainable Development Goals through its Natural Science programme by assisting Cambodia in strengthening its scientific and technological capacity, and designing effective policies based on the best available knowledge so as to enhance the natural resource and sustainable development accomplishments;

(d) UNESCO also helped to put the importance of Prek Toal in the news by assisting the country to control the threatening forest fire in 2016. The Prek Toal Core Area of the Tonle Sap Biosphere Reserve is an internationally recognized priority site, the habitat for globally important bird colonies;

(e) UNESCO is supporting the Eco-Schools Programme in Cambodia. In compliance with the ASEAN Eco-schools Guidelines, UNESCO supported the Ministry of Environment and the Ministry of Education, Youth and Sports for the drafting and publication of the Cambodian Eco-Schools Guideline. The Eco-Schools Programme is an international initiative which recognizes schools that strive to make environmental sustainability an integral part of school life, helping schools combine learning and action to work towards environmental sustainability for both the schools and the community;

(f) In 2016, The National Institute of Education (NIE) was provided UNESCO technical and financial support and has successfully reviewed the Teacher Training Curriculum and developed guidelines for introduction of ESD concepts and practices in different subject areas.

USAID[70]

During the period 2012 and 2018, USAID 'Supporting Forests and Biodiversity' (SFB) focused, under the focal area "Environmental Education and Awareness" on improving access to information on biodiversity and natural resource management issues to a broad range of stakeholders, particularly urban youth to increase public awareness on the need to conserve forests and biodiversity. The basis for this focus is that (i) 68 percent of the population are under 30 years of age; (ii) Cambodia is experiencing fast population growth and rapid urbanization; (iii) Agricultural production is decreasing, while contributions of tourism, manufacturing and service industries to overall GDP are increasing; and (iv) Poverty and knowledge gap between rural and urban areas has widened.

[69] *http://unesdoc.unesco.org/images/0024/002468/246833e.pdf* UNESCO Report 2014-2015 Phnom Penh Office

[70] *https://www.usaid.gov/sites/default/files/documents/1861/SFB_Final_Report.pdf*

USAID SFB organized hundreds of events, public awareness campaigns, miniconcerts, trainings, workshops and debates, and produced a variety of communication materials, including project snapshots, newsletters, press releases, photo captions, radio messaging, short videos, films and Facebook live chats. The following activities are noteworthy:

(a) The successful 4-year Campaign for Protection and Subsequent Designation of the Prey Lang Wildlife Sanctuary in partnership with MOE. The campaign led to the designation in May 2016 of 431,684 hectares of previously unprotected lowland forest as the Prey Lang Wildlife Sanctuary—now Cambodia's largest protected area;

(b) The Chapey Theater production in collaboration with ministries, including the Ministry of Culture and Fine Arts, and NGO partners such as Fauna and Flora International, Conservation International, and Wildlife Alliance. The Chapey Theater production communicated forest protection messages and the importance of Cambodian natural heritage to more than 700 audience members in April 2017.

Table 1 summarizes the achievements in numbers. USAID reports that overall "USAID SFB project communications has broadly built engagement among civil society organizations (CSOs), government officials, donors and the public through effective strategies and materials produced."

Education and research institutions

Universities and other higher-learning institutes have well established departments and/or programmes that deliver courses and short-term training programmes to enhance knowledge on biodiversity. The Centre for Biodiversity Conservation (CBC) and 10-year old "Cambodia Journal of National History" at the Royal University of Phnom Penh are worth mentioning:

(a) The CBC established in 2011, in partnership with Fauna & Flora International, has emerged as an important repository for specimens and a national centre of excellence and capacity building for taxonomic research and conservation. The CBC offers a MSc in Biodiversity Conservation course and produces a dozen Master's theses annually on a vast range of biodiversity issues. Some graduates of this programme are now instructing their own degree courses and/or continue to be involved in local biodiversity research. The number of students enrolled at CBD is increasing every year;

(b) The "Cambodia Journal of National History" is playing an important role in documenting the composition, ecology and conservation status of Cambodia's biodiversity. Its primary role has always been to encourage and enable environmental scientists in Cambodia to share their findings and address the critical need for reliable information on the conservation status and management requirements of Cambodian biodiversity. It is not clear whether the topics covered reflect the information needs in the country: 55% of the articles focus on forests, 25% on freshwater ecosystems, 11%, 5% and 4% respectively on marine, grassland and agricultural environments. However, it is interesting to note that approximately one third of all authors have been female, and that about 20% of articles over the last decade have focused on natural resource management and use, protected area management and environmental education. Also noteworthy is the list of new species identified in the country;

Table 1: USAID SFB achievements in numbers from 2012 to 2018 in Cambodia

Item	Number
Number of students trained	1,251 (645 Female)
Number of teachers trained	97 (17 Female)
Number of people reached by radio messaging	~420,000
Number of eco-club members received text message alerts from the IVR system	300
Number of people call in the IVR system seeking information on forest topics	500
Number of people participating in awareness activities for Prey Lang protection status	~5,000
Number of moviegoers to view Prey Lang images and animal sound clips	20,000

Number of people reached out to other materials promoted online	80,000
Number of short films/ documentaries	15
Number of Project Snapshots	120
Number of Project Photo Captions	107
Number of key stakeholders on SFB mailing list	1200
Number of likes on SFB Facebook	~10,000
Number of views on social media (Facebook page, YouTube and videos)	~100,000
Number of news items/reports broadcasted on National TV channels	100
Number of newsletters	7
Number of press releases	10

Source: *https://www.usaid.gov/sites/default/files/documents/1861/SFB_Final_Report.pdf*

(c) The Royal University of Agriculture has a number of centers and divisions: e.g., Information Technology Center, Ecosystem Services and Land Use Research Centre (ECOLAND) (with extensive collaboration in Europe and Australia etc.), Center for Agricultural and Environmental Studies (CAES)[71] ;faculties of agronomy, of fisheries, forestry etc. The courses and training offered at RUA emphasize the value of biodiversity in Cambodia, in particular many aspects of relevance to the country's economic development. As such RUA contribute a lot to the achievement of Cambodia Biodiversity Targets 1 and 3. As a strategy, curriculums are regularly updated to meet the market needs at national and international level. As an example, the Faculty of Agricultural Economics and Rural Development (FAERD) introduced recently the courses of rural tourism, rural entrepreneurship, adaptation to climate change and payment for ecosystem services. The questions of poverty alleviation and sustainable agriculture, sustainable land management and sustainable development are fully integrated in the curriculums of many Faculties and mainly the specialized centers and divisions e.g., the Division of Research and Extension, and the ECOLAND or Ecosystem Services and Land Use Center, created in 2014 through a collaboration with the French Research Institute for Sustainable Development (IRD) in France.

National and international non-governmental organizations

BirdLife[72]:

(a) BirdLife Tokyo has been supporting the Government of Cambodia to designate the Stung Sen wetland as Cambodia's fourth Ramsar site under the Ramsar Convention. In 2017, the national meeting was held to obtain endorsement of the designation from the relevant Ministries and stakeholders. A training program was also organized for local rangers to improve their monitoring and patrolling capacity in the wetland;

(b) BirdLife cooperates with local partners as well as Japan Environmental Education Forum, BirdLife Tokyo and Conservation International Japan to implement the SATO-YAMA-UMI Project funded by the KNCF 25th Anniversary Special Fund Grand Programme. The project addresses global challenges by implementing multitiered programmes on capacity building for future generations. It aims to contribute to the sound development of human societies built on conservation and sustainable use of natural resources for life in harmony with nature. The project was started in 2017.

[71] The Center for Agricultural and Environmental Studies was established in 2011. CAES spans to amend and prevent the entire biosphere deterioration, both environment and livelihoods. CAES contributes to the national and international capacity building and researches by assessing the available scientific evidences. It participates in national, regional and global observing and monitoring systems, collecting and disseminating data.

[72] *https://tokyo.birdlife.org/sites/wp-content/themes/birdlife/pdf/partnership/ar2017en.pdf*

Free the Bears[73]

(a) The Awareness, Communication and Education team spent time with over 200 local and international students in the past few months, to raise awareness of wildlife conservation, the environment and sustainability;

(b) The organization published a paper in the Oryx Journal of Conservation which was subsequently covered by National Geographic. It is also working on a campaign designed to change Cambodian attitude and behaviour towards the use of bear products for medicinal purposes.

Wildlife Alliance[74]

Wildlife Alliance works with the Government to protect the Cardamom Rainforest Landscape. It invested in environmental education to protect nature for future generations.

(a) The organisation created Cambodia's only mobile environmental education unit, the Kouprey Express (KE), in 2005. The KE does not just raise awareness or educate people on the value of conservation and biodiversity protection; it fosters positive behavioural changes towards environmental sustainability and actively encourages children and adults to be front line defenders of their natural resources.[…] In collaboration with the Ministry of Education, Youth and Sport, the KE works directly with students, teachers, schools, and villages, providing creative, fun and tailored hands-on lessons and activities to improve knowledge about the environment and what people can do to protect it. In 2017, KE provided wildlife and environmental lessons to a total of 5699 students at 36 schools and 10 NGOs throughout Cambodia and Eastern Thailand;

(b) Throughout 2017, working with MOE, Wildlife Alliance led as awareness campaign on the impact of snares on the country's wildlife. The organization also published papers and held two major outreach events and raised awareness to more than 250,000 of people in person or through social media.

Sam Veasna Center for Wildlife Conservation (SVC)

Sam Veasna Center is a Wildlife Conservation Society (WCS) Partner was created in 2014 to educate children about their environment and its importance for sustainable development. Conservation through community-based ecotourism is at the heart of the Center's model, mission and vision. The Center believes that bringing sustainable livelihoods to communities through birding and wildlife ecotourism is a major contributor to the conservation of habitats and species in some of Cambodia's most vulnerable areas. With a curriculum consisting of 10 sessions covering environment, conservation and protection, pollution, climate change, painting, bird watching and ecotourism. The Center started with 405 students around Tmatboey, Prolay and Ang Trapaeng Thmor areas. In 2016 the Center reached 1,200 youth and significantly expanded the communities reached.

Mlup Baitong

Mlup Baitong[75] is a Cambodian NGO working to increase environmental awareness and conservation, seeking solutions for sustainable and equitable use of natural resources through education, training, advocacy, community-based natural resource management, and eco-tourism activities. Mlup Baitong, literally translated as "Green Shade", was established in 1998 to address the problem of deforestation in Cambodia with a focus on educating the general public on the conservation of natural resources. Mlup Baitong notes that Cambodians still have limited awareness about the country's environment while natural resources continue to be threatened by large commercial enterprises, forest land encroachment and unsustainable exploitation. Awareness raising is important to gain understanding and support particularly from local communities. Knowledge empowers people to create lasting change.

[73] *https://cdn.shopify.com/s/files/1/0015/8135/0959/files/Bears_Print_November_2018C.pdf?12628731742873172729*
[74] *https://www.wildlifealliance.org/education/*
[75] *http://mlup-baitong.org/awareness/*

(a) During the last 5 years, Mlup Baitong supported 595 beneficiaries, protected 659 km^2 of forest, and their radio show reached 9 million listeners;

(b) With support from Keidanren Nature Conservation Fund (KNCF), Mlup Baitong is implementing a conservation and education project in Cambodia's Southern Kampot province (SATO YAMA UMI (SYUMI) 2017-2020). These coastal wetlands are an important feeding ground for the endangered Sarus Crane (*Antigone antigone*), which are a vulnerable bird species that has already gone extinct in several Asian countries. Up to 30% of Cambodia's Sarus Crane population visits the wetlands in Kampot during the dry season to feed. Degradation and loss of wetlands, use of pesticides and hunting all contribute to dwindling populations of these large birds in Cambodia. The project thus focuses on protecting these valuable wetlands and educating local people about environmental issues and conservation. By creating materials for education and awareness raising at schools (10 environmental lessons; Teacher's booklet on environmental education and Sarus crane conservation (Khmer), and Student's booklet on environmental education & Sarus crane conservation (Khmer)) and working with teachers to deliver the lessons, the project is aiming to engage the young generations first, followed by capacity building for local communities in general;

(c) The "Environmental Education for Conservation of Sarus Crane in Cambodia" (EEC-SCC)[76] project completed its last phase in 2016. It facilitated previously trained teachers to teach environmental lessons to students in grades 4, 5, and 6 at three target primary schools. The project also constructed three Sarus crane Conservation Education Centers, and established large maps showcasing the boundary of the Sarus Crane Conservation site;

(d) Through the project "Community Capacity Building for Climate Change Adaptation" (CCB-CCA), Mlup Baitong designed and delivered in 2016 a training programme to support government officials and communities to develop awareness, skills and knowledge that would enable them to adapt to the effects of climate change. It is being implemented in 40 communities Forestry (CFs) and Communities Protected Areas (CPAs) in and around Prey Lang Wildlife Sanctuary, Phnom Prich and Tonle Srepok Wildlife Sanctuaries. Three components constitute the heart of the training: (i) awareness raising on ways to adapt to climate change; (ii) demonstration of livelihood options for agriculture and non-timber forest products to adapt to climate change; and (iii) joint identification of a set of collective climate change adaptation actions for each community;

(e) In 2016, Mlup Baitong conducted its environmental awareness raising also through the Environmental Resource Center & Media (ERC&M) unit, which is composed of an environmental radio program and environment-related consultancy services. The radio programmes (on the invasive *Mimosa pigra*, on environmental education and on *Sarus crane* conservation) covered about 70% of Cambodian territory and 9 million potential listeners.

Save Cambodia's Wildlife[77]

Save Cambodia's Wildlife sponsored the 36th Youth Debate that was joined by over 120 students in Phnom Penh in 2016. The debate organized in cooperation with MOE was also broadcast by TVK in May 2016.
Save Cambodia's Wildlife believes that they throughout all their projects in 2017, they were able to facilitate a change in mindset, behavior and practice of communities and the civil society. They succeeded by (i) increasing the capacity of rights holders and duty bearers in the areas of sustainable natural resource management, land rights and gender, community-based protected area management, environmental and biodiversity protection; (ii) facilitating stakeholder dialogues (forums, workshops, awareness days) at the national, sub-national and communal levels; and (iii) engaging communities in alternative livelihood options (NTFPs, Eco-Tourism, etc.) and sustainable energy systems.

[76] *http://mlup-baitong.org/wp-content/uploads/2017/07/MB_annual-report-2016websize.pdf*
[77] See CJNH 2016 vol 1

5.4 Challenges

In order to generate information on environmental, economic, health, social and cultural value of biodiversity and services from the multiple ecosystems found in Cambodia, a first step will require an assessment of existing data/information through an IPBES -type of assessment. This first step will allow the country to be aware of the finding from the many studies that have already been carried out and to identify gaps that universities and other research institutions can consider in their research programmes. Valuation of protected areas, other conservation areas, including community-based conservation areas and privately-owned concessions, marine ecosystems will require spatial monitoring and reporting tools (SMART) little used in the country.

Innovative sources of funding will have to be identified in addition to the traditional ones. The private sector, payment for ecosystem services and REDD+ are some possibilities under testing in the country.

Scope: The range of matters to be aware of is so wide that a strategic and well-coordinated approach is required to be able to cover all the needs efficiently and effectively. Those needs range from basic information on occurrence of distinct components of biodiversity (e.g., presence of an invasive species like *Mimosa pigra*) through to the complexity of an ecosystem going through adaptation to climate change (e.g., Tonle Sap wetland responding to the sequence of droughts and high rainfall). Coordination can allow sharing expertise and awareness materials.

Communication, education and public awareness programmes need to be evaluated regularly to make sure they respond to the real needs. Despite the efforts of many organizations to develop training and awareness-raising materials and organise events that can facilitate the dissemination of key messages, there is still a feeling that materials and awareness events are insufficient. In many cases awareness materials still need to be adapted to local conditions and be translated in simple languages and in Khmer language.

Sustainability: Often support for awareness activities derive from foreign organisations. At the end of projects, they activities tend to stop

Short-term and long-term impact: Evaluations conducted just at the end of training activities do not provide information about the targeted behavioral changes. Long-term evaluation and monitoring need to be mainstreamed in the projects

Cambodian scientists and the youth are the path for generating a lot of scientific data regarding biodiversity and some of its threats including climate change and land degradation. Information at the science-policy level is still needed to enable well-informed decisions. These should include valuation studies and studies on trends and projected changes in natural resources in face of different realistic scenarios. Information of the impact of measures taken is also lacking in many cases

6. Integration of biodiversity values into national and sub-national development and poverty reduction strategies and planning processes (Cambodia Biodiversity Target 3)

6.1 Integration of biodiversity in national and subnational development and poverty reduction strategies and planning processes

Cambodia recognizes the importance of mainstreaming biodiversity in national and subnational development and poverty reduction strategies. Integration of biodiversity values is done from the planning stage and mobilization of resources through the implementation of measures taken to the monitoring and evaluation phase. The participatory approach used in updating the National Biodiversity Strategy and Action Plan (NBSAP) launched in 2016 should help in the integration process because many partners in the development of Cambodia and implementation of the poverty reduction strategies and plans participated in the identification of the NBSAP strategic objectives. However, it is also recognized that in some cases, the proper expertise may be unavailable to identify the key links and operationalize them on the ground.

At the national level, the Rectangular Strategy for Growth, Employment, Equity and Efficiency should be the main guide, while at the subnational level there may be a need to first adjust the NBSAP to suit the needs at the provincial and local/community level. However, various studies and observations of biodiversity components, in particular threatened species, have given ideas about ways to integrate conservation objectives and other subsistence activities of local communities.

Biodiversity in national development and poverty reduction strategies documents

The Rectangular Strategy for Growth, Employment, Equity and Efficiency is the policy instrument for attaining *Cambodia Vision of* becoming an upper-middle income country by 2030 and a high-income country by 2050. The document is also the foundation for any strategy for development and poverty reduction. The country adopted last September the 4th Phase of the strategy, which is qualified as a "blueprint to guide the activities of all development stakeholders to remain within the "Dynamics of Stakeholder System" to step up development in the medium and longer terms in a sustainable manner by ensuring efficiency and effectiveness of the public institutions and management of all the resources."

The importance of biodiversity and ecosystem services is stated or implied in Rectangle 1 "Human resource development" (Improving public healthcare and nutrition) and Rectangle 4 "Inclusive and sustainable development" (1). Promotion of agricultural and rural development; 2). Strengthening sustainable management of natural and cultural resources; 3). Strengthening management of urbanization; and 4). Ensuring environment sustainability and readiness for climate change). The objective under Sustainable Management of Natural Resource and Culture calls in particular for striking "a balance between the development and preservation aimed at promoting the contribution to the development of agriculture, industry and tourism sectors, strengthening the management of mineral resources, ensuring the sustainability of forest and fisheries resources and ecological system along with the protection and development of the national cultural heritage." Under Side 4. Ensuring the environmental sustainability and pre-emptive response to the climate change, the Strategy calls for "further strengthening the management of protected areas, biodiversity conservation, natural resource conservation, especially the ecosystems of Tonle Sap Lake, Mekong River and the coastline areas." The Strategy therefore contains a recognition of the value of biodiversity and this needs to be and is already extended/reflected in more details in the various specific or targeted strategies and plans. Just like for the previous phases, the new Rectangular Strategy will be operationalised with the adoption of a new national strategic development plan for the coming 5 years.

Here are some examples of integration of biodiversity in some recently adopted strategic documents (It should be noted that the national strategic development plan 2013-2018 and strategies on components of biodiversity e.g. on forestry, animals etc. were not considered here):

(a) The "National Policy on Mineral Resources 2018-2028" prepared by the Ministry of Mines and Energy, and adopted in May 2018 has in Objective 2 "Promoting Sustainable and Responsible Mining Operations," provisions for (i) implementing sustainable development approaches where economic, social and environmental dimensions have to be balanced; (ii) good environmental management making sure that ecosystems, including animals, plants, soil layer, water and air, are not affected excessively affected; and (iii) ways and means to exploit responsibly mineral resources within protected areas, with a possibility to develop a separate procedure that will include "due regard to environmental impacts on forests, ecosystems, biodiversity, flora and fauna," including "measures for protecting the environment, ecosystems, biodiversity, flora and fauna."

(b) The National Action Program to Combat Land Degradation 2018 – 2027 developed under the UNCCD is articulated around 5 strategic objectives[78] that recognize the value of land resources including biodiversity, agricultural land, and watershed and forest ecosystem services. The vision[79] of the NAP encapsulates well areas of biodiversity importance in relation to the UNCCD;

(c) Cambodia's National Voluntary Land Degradation Neutrality Targets and Measures: The 4 targets[80] adopted by Cambodia clearly recognize the importance of forests, including mangroves, and the multiple services we get from them, as well as agroecosystems. For the implementation of the targets, there is a need to consider the establishment of protected areas and to restore the ecosystems when they are degraded and recover the services they provide;

(d) Cambodia Climate Change Strategic Plan (2014-2023): One of the 8 strategic objectives of the Plan is to" ensure climate resilience of critical ecosystems (Tonle Sap Lake, Mekong River, coastal ecosystems, highlands, etc.), biodiversity, protected areas and cultural heritage sites;"

(e) Second National Communication to UNFCCC (2015): The 2nd communication identified REDD+, reforestation and agroforestry among the most attractive mitigation options, and protected forests, climate smart agriculture and establishment of windbreaks along the coast as the most attractive adaptation measures. They all rely on plant diversity in Cambodia, including wild plants and wild relatives that can be used in breeding programmes.

As noted above, Cambodia was selected to participate in UNESCO projects aiming at integrating more biodiversity in school curriculums. The experience indicated that it was possible to integrate biodiversity in various subjects (e.g., Khmer literature, history, chemistry, morality, geography, and physics).

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[78] The 5 strategic objectives in the Cambodian National Action Program to Combat Land Degradation (NAP) under United Nations Convention to Combat Desertification (UNCCD) are: (i) To facilitate the expansion of technical practices for sustainable and efficient land management, especially agricultural land based on the actual situation in each area; (ii) To ease or facilitate relevant stakeholders to contribute in restoring watershed and forest ecological system services; (iii) To develop relevant policies and regulatory norms to ensure effective and sustainable management and use of land; (iv) To strengthen human resource capacity for planning and implementing sustainable land and watershed management; and (v) To develop and implement strategic policies for watershed management with effective financial mobilization to support the implementation of priority activities as described in Chapter 5 of the National Action Program.

[79] The vision of the NAP is to effectively and sustainably manage land aimed at maintaining and improving the land productivity in response to the need for agricultural development, food production, improving peoples' livelihoods, and contributing to climate change mitigation and adaptation.

[80] Cambodia has set the following voluntary national LDN Targets: 1. Increase forest cover will be increased to 47% of the total land area; 2. Increase agricultural growth by 5% per annum as compared to 3% in 2016; 3. Increase soil organic carbon (50C) stock in forest and cropland by 1.2% per year as compared to 2015; and 4. Maintain and enhance ecosystems and their services by establishing 23,500 sq. km of protected forest and 3,900 sq. km of production forest, and restoring at least 8% of degraded and depressed protected areas, conservation areas, agroecosystems and forest ecosystems including mangroves (*https://www.unccd.int/sites/default/files/inline-files/Cambodia_1.pdf*).

Implementation of the NBSAP is contributing to the implementation of the sustainable development goals (SDG), particularly Goals 2 (End hunger, achieve food security and improved nutrition and promote sustainable agriculture), 12 (Ensure sustainable consumption and production patterns), 13 (Take urgent action to combat climate change and its impacts), 14 (Conserve and sustainably use the oceans, seas and marine resources for sustainable development) and 15 (Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss).

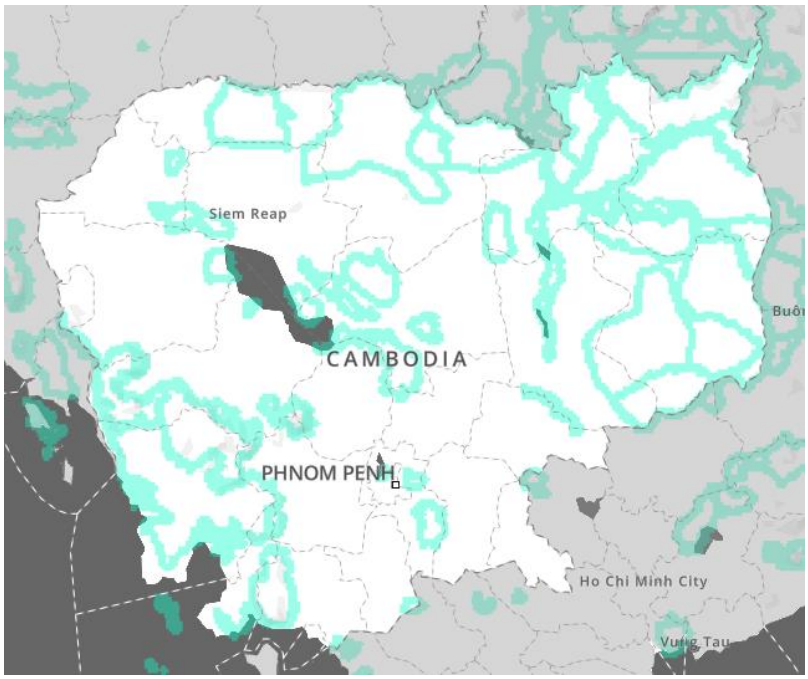


Figure 1: Distribution of key biodiversity areas (KBA) in Cambodia

Sources: UN Biodiversity Lab: The World Database of Key Biodiversity Areas, with reference to *http://www.keybiodiversityareas.org/site/results?reg=0&cty=36&snm= The World Database* lists 45 areas (Accessed on 19 March 2019)

KBA and IBA

Non-governmental organizations are playing an important role in collaborating with the ministries (e.g., MOE and MLMUPC) to develop maps showing areas where important biodiversity is located. Development of maps of Key Biodiversity Areas (KBA) and Important Birds Areas (IBA) was an important step that complements and supports the work to identify areas requiring protection in Cambodia. Figure 1 shows the distribution of KBA in Cambodia.

Integrated ecosystem maps

Strategic objective 2.2 of the "National Protected Area Strategic Management Plan 2017-2031" is about connecting the Protected Area system in Cambodia. Bearing in mind the recent expansion of the protected area estate under MOE jurisdiction and the establishment of biodiversity conservation corridors that would facilitate movements of large wildlife or migratory species between areas designated for protection and conservation, the Plan indicates that to ensure that protected areas are actually in the "right places" (i.e. science-based selection), "spatial planning using GIS and integrated ecosystem mapping based on best available information will be done to strengthen management effectiveness of existing protected areas and fill gaps in representation of key ecosystems.Tools like InVEST (Integrated Valuation of Environmental Services and Trade-offs) or SMART (Spatial Monitoring and Reporting Tool) have been used in Cambodia

to map ecosystem services and thus provide national and provincial governments with valuable information and scenarios for economic and land use decision-making (see case studies mentioned below). Both tools can help (i) identify gaps in coverage of protected areas when a map of existing protected areas is overlaid on a map of areas of high conservation values; (ii) identify existing land uses in the recently established conservation corridors; (iii) cross-check the suitability the boundaries of existing protected areas to make sure they include the ecosystems/habitats or species/communities requiring protection, also in the face of changes that would occur in the future due to climate change (e.g., shift in the range of some species) or unplanned development (e.g., uncontrolled urban expansion).

Spatial planning is in its infancy in Cambodia, at a time when integrated ecosystem maps are critically needed to support large-scale land-use decision-making and conservation assessments. Practitioners note the existence of gaps in data and that some datasets currently in use are outdated.

Prioritization in the planning process is a delicate process that requires the engagement of local communities, local government and land owners, bearing in mind that local communities depend strongly on the nature around them. As such any decision on the conservation of landscapes must be in line with their needs. Where conflicts may arise, negotiations could take place at the local level.

With the GIS Department being located within MOE, the MOE clearing-house mechanism could serve as the central repository of relevant data.

6.2 Integration of biodiversity in planning at the provincial and local levels

Integration in awareness raising materials

Integration of biodiversity value in awareness raising activities has been very effective in Cambodia (see above). Another example is about the video[81] on "The Value of the natural capital" developed by WWF to raise awareness about ecosystem services in the Eastern Plains Landscape and make a case that ecosystem services should be valued and incorporated into decision-making processes. The success of the video is however limited. It was posted on Youtube in 2015. As of November 2018, only 1022 viewed it.

Integration at the provincial level

Spatial plans have been developed in Battambang, Preah Sihanouk, Takeo and Kampoung Chhnang provinces. However, Mondulkiri Spatial Planning was the first that had a dedicated focus on the protection of biodiversity while paying attention to other factors in the province. The Provincial Government of Mondulkiri has been able to integrate the value of biodiversity and related ecosystem services in the spatial planning of the Province. Working with the Mondulkiri Provincial Government and partners and building on the spatial planning in Battambang and Takeo, WWF-Cambodia[82] used the InVEST tool to assess the values of ecosystem services in the Eastern Plains Landscape (EPL) and develop a map that can inform about ways to balance development and natural resources conservation. In 2015, WWF-Cambodia[83] organised the first InVEST workshop to inform about the tool, and present the findings, as part of its European Union-funded project 'Sustaining Biodiversity, Environmental and Social benefits in the Protected Area of the EPL' project, funded by the European Union. The provincial spatial planning (PSP) was fully participatory and brought together all relevant stakeholders to *agree upon a vision for the province that integrates different land uses and reaches a balanced territorial development ensuring economic efficiency, social justice, environmental sustainability and cultural identity. The spatial plan was fully supported by the* Ministry of Land Management, Urban Planning and Construction.

[81] *http://cambodia.panda.org/projects_and_reports/sustaining_biodiversity_in_the_epl/understanding_the_value_of_ecosystemservices/*

[82] *http://d2ouvy59p0dg6k.cloudfront.net/downloads/invest_workshop_snapshot.pdf*

[83] *http://wwf.panda.org/?301578/Provincial-Government-promotes-an-integrated-and-sustainable-development-in-the-Mondulkiri-province-Launch-of-Provincial-Spatial-Planning-Process*

NATIONAL TARGET 2 ON INCREASING BY 20 % THE BUDGET ALLOCATED TO BIODIVERSITY CONSERVATION AND SUSTAINABLE USE (INCLUDING NBSAP IMPLEMENTATION)

Target 2:

By 2020, at the latest, the national budget allocation for biodiversity conservation and sustainable use (including NBSAP implementation) has increased by 20 percent through the development and implementation of a resource mobilization strategy based on identified needs and taking into account international and national guidance and policies

1. Introduction

1.1 Scope of the sub-section

Insufficient financing is a major constraint to the achievement of the objectives of the Convention on Biological Diversity. Cambodia has been carrying out some reforms to improve natural resources management and conservation. The Government has also been allocating funds to support the reforms. This subsection considers whether the increased budgets allocated to biodiversity met the target of 20 percent budget increase.

1.2 Main findings from the 5th National Report on protected areas

The Fifth National Report noted that the following had not been started as of 2014: (i) establishment of mechanism ensuring the sustainable management of natural resources; (ii) increase in the national budget allocation for biodiversity conservation; (iii) identification of additional sources of funding (government, development partners or donors, and private sectors) for managing biodiversity sustainably; (iv) establishment of biodiversity Trust Fund has been established; and (v) implementation of a financial mechanism modality for Cambodia and development partners on biodiversity management and conservation. The report concluded that initiatives for reaching the target had not started.

2 Overview of progress towards a 20% increase in the budget allocated to biodiversity conservation and sustainable use (including NBSAP implementation)

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	The public financial management has continued to improve in Cambodia. Between 2013 and 2018, state's current revenue increased more than twofold, from USD 2,264 million to USD 4,560 million, which has allowed the total expenditure to be increased nearly twofold. It is not possible to assess exactly how much of the national budget was allocated to biodiversity. Increases in the budgets of ministries dealing with biodiversity can be used as indicators of possible budget allocations to biodiversity plans and programmes. The Ministry of Environment (MOE) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) are the main government ministries dealing with the management of biodiversity. In recent years, the Ministry of Education, Youth and Sport has also stepped up its activities

	to integrate biodiversity in school curriculums, in line with the Royal Government's strategic goal to develop a "quality, equitable and inclusive education system." Among the main achievements from the implementation of the "Rectangular Strategy-Phase 3", budgets of MOEYS and the Ministry of Health have been increased significantly. In 2019 MOE, MAFF and MOEYS budgets have almost tripled with increases of 3.3, 2.9 and 2.7 times the respective 2014 budgets. This is a clear suggestion that Cambodia has already exceeded its 2020 target of increasing by 20 % its national budget allocation for biodiversity conservation and sustainable use. However, because more financial resources are needed for the conservation and sustainable use programmes described in the strategic documents, this target will be adjusted for the period to 2020.

3. Budget allocated to biodiversity

The Government has in place various mechanisms to mobilize funds for sustainable natural resource management. The 2018 National Action Program to Combat Land Degradation described three major financing sources of relevance to sustainable natural resource management: domestic sources, international cooperation and innovative means. Cambodia Biodiversity Target 2 deals with domestic sources of financial resources, which are in other words available within the country. They include the national budget and the budget of the private sector and other local stakeholders. Innovative means such as payment for ecosystem services (PES), reduced emission from deforestation and forest degradation (REDD+) and the Clean Development Mechanism (CDM) contribute to the national budget.

Although the national budget is limited, the Government has expressed its commitment to supporting the conservation and sustainable use of biodiversity, including essentially through the promotion of sustainable agriculture, forestry, fisheries and rural development, sustainable land management as well as rural and urban development, and environmental sustainability and climate change resilience. In a nutshell the government is committed to supporting inclusive and sustainable development as stated in the National Strategic Development Plan 2014-2018, the Agricultural Strategic Development Plan 2014-2018 and the 2018 Rectangular Strategy for Growth, Employment, Equity and Efficiency (Phase IV).

Notable progress in public financial management has been made. Between 2013 and 2018, state's current revenue increased more than twofold, from USD 2,264 million to USD 4,560 million, which has allowed the total expenditure to be increased nearly twofold[84]. It is not possible to assess exactly how much of the national budget was allocated to biodiversity. Increases in the budgets of ministries dealing with biodiversity can be used as indicators of possible budget allocations to biodiversity plans and programmes.

The Ministry of Environment (MOE) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) are the main government ministries dealing with the management of biodiversity i.e. the conservation and use of the various (i) ecosystems found in the country, in particular agricultural lands, forests, mangroves, coral reefs, lakes and other aquatic systems; (ii) animal and plant species as well as their genetic diversity providing the basic components of our daily lives such as fish, rice as well as many other crops, meat, fibers, and shelter materials; and (iii) microorganisms in particular pathogens that threaten humans, crops and livestock. They also address climate change impacts through mitigation and adaptation activities and

[84] *http://cnv.org.kh/wp-content/uploads/2012/10/Rectangular-Strategy-Phase-IV-of-the-Royal-Government-of-Cambodia-of-the-Sixth-Legislature-of-the-National-Assembly-2018-2023.pdf*

other threats posed to natural resources such as land degradation/drought/desertification, pollution and invasive alien species while protecting and enhancing the value of traditional knowledge and practices.

In recent years, the Ministry of Education, Youth and Sport has also stepped up its activities to integrate biodiversity in school curriculums, in line with the Royal Government's strategic goal to develop a "quality, equitable and inclusive education system" that supports the national socio-economic development.

As recognized in the Rectangular Strategy - Phase III (2013-*2018*) and - Phase IV (2018-2023), Cambodia's medium term socio-economic development and transition from the least developing country status to a middle-income country requires further stepping-up of the effectiveness of the protection, conservation and restoration of ecosystems; the sustainable use, transformation and commercialisation of natural resources; and the sharing of benefits from the utilization of natural assets for the well-being of all in Cambodia.

Among the main achievements from the implementation of the "Rectangular Strategy-Phase 3" during the fifth Legislature of the National Assembly, MOEYS budget[85] has been increased by more than threefold, the Ministry of Health budget was increased by nearly 2.5 times, the MAFF budget increased by nearly threefold and locally financed direct investments increased by nearly 2.5 times. In addition, the national budget system has been improved through better and more effective management of the budget at both allocation and operation levels.

The trend in the budgets of the Ministry of Environment (MOE), the Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Ministry of Education, Youth and Sport (MOEYS) were considered between 2014 and 2019 as compared to the 2014 budgets (for which a value of 100 was given). The 2014 budgets were 31080.7 for MOE, 159219 million Riels for MAFF and 1342049 million Riels for MOEYS. The period between 2015 to 2017 saw MOEYS budget increased from 10.8% to 12.3% (MOEYS budget became 2473673 M Riel) of the total budget (of 20,184,457 million Riel or US$4,984 million in 2017). In 2019, MOE, MAFF and MOEYS budgets almost tripled with increases of 3.3, 2.9 and 2.7 times the respective 2014 budgets. This could be an indication that Cambodia has already exceed its 2020 target of increasing by 20 % its national budget allocation for biodiversity conservation and sustainable use.

In addition to the internal or domestic financing sources, Cambodia benefits from bilateral and multilateral development partners who contribute funds to specific projects or programmes. Multilateral agencies include the Global Environment Facility (GEF), the International Fund for Agricultural Development (IFAD), the World Bank, UNDP, UNEP, FAO and the Asian Development Bank. Bilateral cooperation takes place at the country and organisation (essentially universities) levels and include financial contributions and support through experts.

[85] *https://campaigns.savethechildren.net/sites/campaigns.savethechildren.net/files/Education%20Budget%20analysis%20-policy%20brief%20Final.pdf*

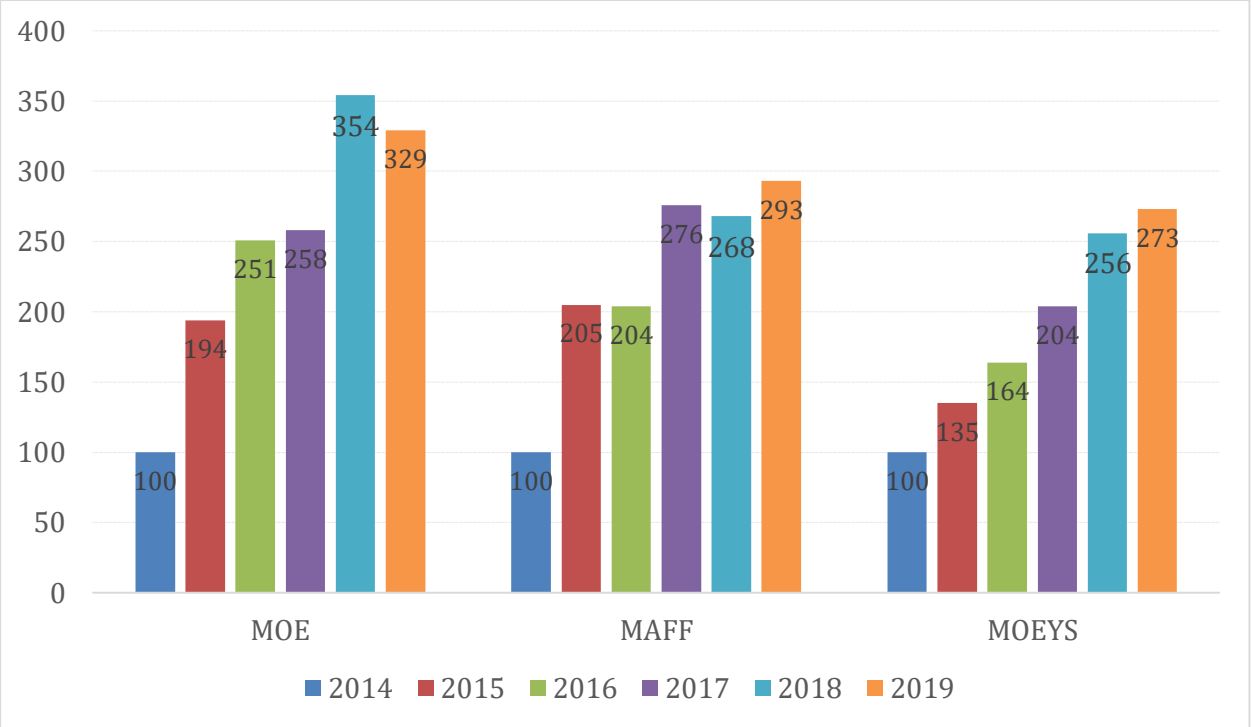


Figure 2: Trend in the budgets of MoE, MAFF and MOEYS between 2014 and 2019

Source: Cambodia Budget's Law (http://mef.gov.kh . Accessed on 15 January 2019)

NATIONAL TARGET 4 ON SUSTAINABLE MANAGEMENT OF FRESHWATER FISHERIES AND AQUACULTURE

Target 4:
By 2020, freshwater fisheries and aquaculture are managed sustainably by addressing their constraints, and by reducing and preventing their possible negative impact on fish stocks and on aquatic threatened species and vulnerable ecosystems

1. Introduction

1.1 Scope of the subsection

This subsection presents progress made towards the achievement of Cambodia Biodiversity Target 4, which calls for the sustainable management of freshwater fisheries and aquaculture by 2020 by addressing their constraints, and by reducing and preventing their possible negative impact on fish stocks and on aquatic threatened species and vulnerable ecosystems. Development and improvement of the sustainable management of freshwater fisheries and aquaculture implies implementation of actions of relevance to almost all the other national targets, in particular targets 1, 3, 5 - 8, 10 – 12, 15, 16 and 18.

1.2 Main findings from the 5th National Report)

1. Freshwater fisheries made Cambodia one of the four largest fish producers in South-East Asia, fish being an important food for Cambodian people. With the observed decline in capture fish production, Cambodia was promoting aquaculture to offset the decline;
2. Fisheries counted for 25.4% in the contribution of agriculture to the economy of Cambodia in 2012. Forestry represented 5.7%; livestock, 14.1%; and crop production, 54.8%;
3. Inland water capture, marine capture as well as aquaculture productions have all been increasing between 2009 and 2013. However, increases in the effort per catch and the decrease in fish diversity and size were becoming a concern, bearing in mind the threats from upstream dams being built or planned on the Mekong River;
4. Fisheries play an essential role in poverty reduction in Cambodia. The sector requires relatively little investment and no land ownership. As such the sector benefitted from strong government's support: (i) closure of 35 fishing lots in 2012; (ii) establishment of 516 community fisheries (NB: elsewhere the information given is: 469 community fisheries (126,490 ha[86] corresponding to IUCN management category VI)), 328 of which are officially registered with the Ministry of Agriculture, Forestry and Fisheries; (iii) establishment of 31 (or 58 covering 120,003 ha as per Table 5 in the 5th National Report) fish conservation areas of IUCN management categories II and IV, 8 fish sanctuaries supported by its Fisheries Administration/MAFF; (iv) demarcation of fisheries conservation areas; (v) strengthening of cooperation among ministries and with neighbouring countries for transboundary water resources; and (vi) initiation of projects such as the Tonle Sap Environmental Management Project/Sustainable Livelihoods Project and ECOSORN sought to support integrated management of the Tonle Sap including: environmental education and training; land use planning; resource zonation; community development; small scale industrial development; fish and agriculture products processing; and involvement of local authorities;
5. There are overlaps across legislation (including the Law on Fisheries) and across various multilateral environmental agreement ratified by Cambodia. Adoption of the Rectangular Strategy

[86] Fisheries Administration, data in 2010 as reported in 5th National Report

- Phase 3 and its operationalization in the "National Strategic Development Plan" supported by the "National Policy on Green Development" and the "National Strategic Plan on Green Development 2013- 2030" provides the needed guidance to ensure coherence in the actions identified in the 2002 National Biodiversity Strategy and Action Plan while implementing the various laws, regulations and policies relating to biodiversity and its services;

6. Regarding fisheries, the 5th National Report emphasized two particular threats: invasive alien species (noting the Fish Base list of 13 fish species introduced into the country) and climate change (loss of habitat and salinization of waters as a result of the impact of sea level rise);
7. Overall, the 5th National Report noted good progress in improvement and sustainable management of aquatic biodiversity and ecosystems based on increases in (i) the number of fish sanctuaries; and (ii) annual yields from fisheries. Other identified indicators, such as extent of law enforcement, the reduction in illegal fishing, and the maintenance of fish stocks at adequate levels, were not described clearly.

2. Overview of progress

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	The future of the fisheries sector in Cambodia is set in the context of growing demand due to population growth and economic development with increased size of fish export. The sector must rise to the challenge of meeting demand while making sure that this supply continues to be available for future generations. Among the relevant strategic documents, the Strategic Planning Framework for Fisheries: 2015-2024 and Cambodia's National Biodiversity Strategy and Action Plan (2016) contain detailed actions and guidance for a sustainable future of the fisheries sector in Cambodia, in line with the country's Rectangular Strategy and the global Sustainable Development Goals. We reviewed the inland capture fisheries and aquaculture with some reference to marine capture fisheries and marine aquaculture in Cambodia. Generally, the amount of fish produced has been increasing with time while the diversity of fish has been declining due to fishing practices, some of which are not sustainable. We thus identified factors along the fish value chain that can make fisheries unsustainable and reported on actions that Cambodia has been taking to manage fisheries in a sustainable manner. Some of the points highlighted in the report are: (a) Many valuation studies are being carried out to understand factors that need to be controlled for the economic sustainability of the value chain, which is currently threatened e.g., by the low profits at farm-level, competition from neighbouring countries that sell cheaper fish of low quality and high costs of inputs (such as feed that need to be imported); (b) Laws and regulations are available, but enforcement can be limited due to insufficient financial and human resources; (c) The Ministry of Agriculture, Forest and Fisheries promoted the establishment of Community fisheries (CFi) to improve management and use the fishery resources in a sustainable manner. 516 CFi have been created with total members of 332,168 persons (35% of women) from 475 households. Some of these CFi have been demarcated with conservation zones; (d) In 2016/2017, 644 fishery conservation areas including the community fisheries were created; (e) Guidelines for post-harvest handling to reduce losses were disseminated during awareness--raising and capacity-building workshop; (f) In accordance with the Strategic Planning Framework for Fisheries 2010-2019 and the provisions in the Environment and Natural Resources Code of Cambodia, environmental impact assessments and restoration measures have been

	taken when developing new infrastructure (industry, mining, land-use change etc.) that can affect the aquatic environment. When the Ministry of Agriculture, Forestry and Fisheries carried out a mid-term assessment of progress toward the implementation of actions identified in the Strategic Planning Framework for Fisheries 2010 – 2019, the identified constraints to sustainable freshwater fisheries and aquaculture included for example the use of illegal fishing gear; the adverse effects from hydro-dam construction in Mekong and its tributaries; community fishery groups not having all the needed capacities, including financial resources and management plans; imports of inputs for aquaculture poorly regulated and expensive; sanitary and phytosanitary (SPS) measures not well integrated in production chains; limited equipment and funds for research.

3. Status of freshwater fisheries and aquaculture

3.1 Freshwater fisheries

The 2016 National Biodiversity Status Report[87] indicates that Cambodia featured 775 freshwater species, 582 marine species and 26 species found in both environments i.e. a total of 1,357 fish species in 2015. These numbers were expected to increase as new species were being discovered, and to vary slightly between studies as estuarine or diadromous species are sometimes counted as marine and sometimes as freshwater species. Cambodia has thus one of the largest and most diverse freshwater fisheries in the world. Its wetlands, both seasonal and permanent, cover more than 30% of the country. FAO[88] reported in 2018 that Cambodia was one of the 34 countries driving the growth in global inland fisheries catch over the past decade. These countries represented, in 2015, 80% of global total inland fishery catch i.e. 9,190,291 tonnes, to which Cambodia contributed 7%.

Cambodia's freshwater fisheries productivity stems from the annual inundation by the Mekong River of the large floodplains around the Great Lake (Tonle Sap) and the Tonle Sap and Mekong River floodplains, where important ecological habitats such as flooded forests are found[89]. The Great Lake area is the only continuous natural wetland remaining in the Mekong system that UNESCO approved as a Biosphere Reserve in 1997. Located in this area, Boeng Chhmar and Prek Toal were also designated respectively in 1999 and 2015 as Ramsar wetlands of international importance. The Tonle Sap is known for its unusual hydrology. Its size expands significantly during the monsoon season and covers around 6% of Cambodia's total land area. This expansion results mainly from the flow reversal of the Tonle Sap River. During the rainy season, the shallow flooded areas created have an extremely high fisheries productivity and diversity. At the beginning of the dry season the Tonle Sap River level decreases and water begins to drain from the Great Lake (see Box 1 for more details). In addition, along the Cambodian part of the Mekong River, there are many deep pools, particularly between Kratie and Stung Treng, where a large number of fish species congregate during the dry season. Some of the pools are also the habitat of the river dolphin, *Orcaella brevirostris.*

[87] GSNCSD 2016. Cambodia's Biodiversity Status Report Update 2015. Royal Government of Cambodia, National Council for Sustainable Development/Ministry of Environment, Phnom Penh, Cambodia. Also accessible at http://www.chm.gdancp-moe.org/publications/national-reports.html

[88] FAO 2018 Review of The State of the World Fishery Resources: Inland Fisheries. Accessible at http://www.fao.org/3/ca0388en/CA0388EN.pdf

[89] http://www.fao.org/fishery/facp/KHM/en

Box 1: Tonle Sap River System

The Tonle Sap River System (TSRL) is a flood pulse system, the only continuous area of natural wetland habitats remaining in the Mekong system, and the largest wetland in Southeast Asia. This unique area embedded in the history, culture, ecology and economics of the region was approved by UNESCO as a world Biosphere Reserve in 1997.

During the dry season, the lake depth falls to 0.5 meter in late April with a surface area of about 2,000 km^2. During the wet season (June-October), the Tonle Sap River, whose normal flow is from the Tonle Sap Lake to the Mekong River, changes its direction when the Mekong waters rise faster than the Lake. The Lake expands its size four to six times (10,000 to 15,780 km^2), inundating vast terrestrial floodplain areas surrounding the TSRL. The TSRL's biological productivity reaches its peak during this period as both migratory fishes from the Mekong and resident fishes in the Lake invade the floodplains for feeding, reproduction and nurseries. Eggs, larvae and fry of fish that spawn upstream in the Mekong mainstream are also carried by the flow and dispersed into the TSRL's surrounding floodplains through numerous channels, streams and man-made canals for feeding, nurseries and growth. When the Mekong flood recedes (September/October) and the Tonle Sap River reverses to its normal flow, large numbers of fish migrate back to the Tonle Sap Lake, then the Tonle Sap River and Mekong River for dry-season refuges. It is during this period of receding water (October – March) when *Dai* fishery operates to target these migratory fishes. The fishery usually peaks in December and January in a short time window before full moon during which the river is described as packed with fish.

Extracted with minor modifications from Ngor, P.B., K. S. McCann, G. Grenouillet, N. So, B. C. McMeans, E. Fraser and S. Lek. 2018 Evidence of indiscriminate fishing effects in one of the world's largest inland fisheries, Sci Rep. 2018; 8: 8947, Supplementary Information. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997758/)

Scientists from MAFF and partners[90] studied and described the spatiotemporal fish diversity and community variation in the Tonle Sap River and Lake (TSRL) using daily records from 2012 to 2015 on fish abundance from six sites covering the TSRL system. They found that high fish diversity occurred in sites located in the middle of Tonle Sap Lake, and the lowest diversity was observed in the southern section. The spatial abundance distribution patterns displayed a river–lake gradient, with three fish assemblages that were clustered based on their composition similarities and were characterized by 96 indicator species. In the southern section, fish assemblages were characterized by longitudinal migratory fishes; in contrast, in the middle system, fish assemblages were represented by species with combined ecological attributes (i.e. longitudinal and lateral migratory species and floodplain residents). Towards the northern section, fish assemblages were composed of lateral migratory and floodplain resident species. Species richness and abundance peaked at approximately 2–2.5 and 4 months, respectively, after the peak flow in early October, during which Tonle Sap River resumes its normal flow direction (outflow). This suggests that seasonal flood pulses (i.e. rising and falling water levels) play a pivotal role in structuring spatiotemporal variation in the TSRL fish assemblages. The data collected will guide on the best management of TSRL. Similar studies are considered in other aquatic system in the country.

The volume of freshwater fisheries production in Cambodia was 445,000, 449,000 and 308,750 metric tonnes in 2011, 2012 and 2013 successively[91]. Total volume of capture fisheries in Cambodia was 629950

[90] Ngor PB, Grenouillet G, Phem S, So N, Lek S. 2018. Spatial and temporal variation in fish community structure and diversity in the largest tropical flood-pulse system of South-East Asia. Ecology of Freshwater Fish. 27 (4): 1087-1100. https://doi.org/10.1111/eff.12417

[91] https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_446505.pdf

tonnes in 2016 (from 35000 in 1960).[92] Cambodia has the highest catch of inland fish per inhabitant and the highest consumption of freshwater fish per inhabitant[93] in the world. Figure 3 shows the differences in total fish catch between provinces.

Scientists[94] have been observing in recent years a decline in catches of medium and large-sized fish species. This observation supports the general perception by fishers throughout the Lower Mekong Basin that some giant- and large-sized fish populations in the Mekong region have declined since the 1900s. For example, the Mekong giant catfish (*Pangasianodon gigas*), which was common and abundant in the 1900s, has almost disappeared from the Mekong River System. Tonle Sap River is one of the last few places where a small number of individuals of this species are still occasionally captured. Also known as Mekong Giant Catfish, this species is now in the critically endangered category[95]. In contrast, the catch of some small-sized species such as *Labiobarbus* spp. (or *Dangila* spp.) increased significantly over the last two decades (refer to Figure 4 and photos 1 and 2).

In line with the Strategic Planning Framework for Fisheries 2010–2019 and the National Fisheries Policy, which detail mechanisms to help realize the vast potential of fisheries in the country, Cambodia actively continued its fisheries reform[96] during the reporting period. As reported in 2017, MAFF had established 516 community fisheries to ensure sustainable management of fisheries resources with the slogan of "Communities Fisheries without illegal fishing practices." With support from partners, MAFF carried out programmes to strengthen and build the capacity of communities in participatory management and conservation of fisheries. In addition, following a request to the Government, MAFF re-introduced the previously banned culture of mudfish and Chdor (snakehead) fish.

In a recent study[97], scientists analyzed a 15-year time-series (2000–2015) of fish catches for 116 species obtained from an industrial-scale '*Dai'* fishery[98] (Figure 5**).** They found that: (i) 78% of the species exhibited decreasing catches through time; (ii) downward trends in catches occurred primarily in medium to large-bodied species that tend to occupy high trophic levels; (iii) a relatively stable or increasing trend in catches of small-sized species, and; (iv) a decrease in the individual fish weights and lengths for several common species (Figure 4).

[92] *https://data.worldbank.org/indicator/ER.FSH.CAPT.MT?view=chart*

[93] Baran, Eric & Phen, Chheng & Vuthy, Ly & Nasielski, Joshua & Saray, Samadee & Bunthang, Touch & J, Tress & Khim, Kaing & Sokhom, Tan. 2014. Fish resources in Cambodia (2001-2011). Atlas of Cambodia.

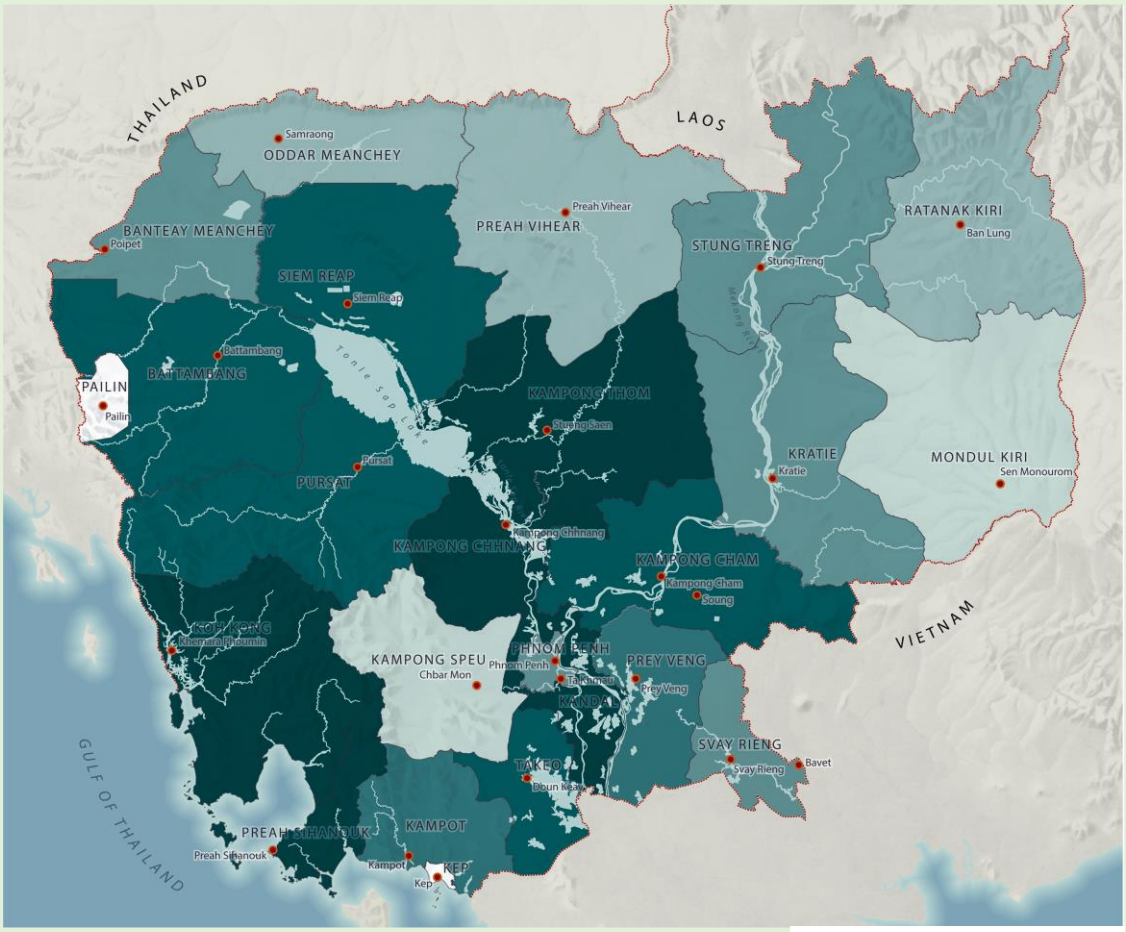
[94] *https://www.nature.com/articles/s41598-018-27340-1*

[95] https://www.iucnredlist.org/species/15944/5324699

[96] MAFF Annual report for 2016 and 2017

[97] *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5997758/* Ngor, P.B., K. S. McCann, G. Grenouillet, N. So, B. C. McMeans, E. Fraser and S. Lek. 2018 Evidence of indiscriminate fishing effects in one of the world's largest inland fisheries, Sci Rep. 2018; 8: 8947.

[98] The *Dai* fishery or *Loh Dai*, was established around 140 years ago and resembles a stationary trawl net anchored within the river channel. At present, it is the only industrial-scale inland fishery remaining in the Lower Mekong Basin (LMB). The *Dai* fishery seasonally operates in a specific location along the lower section of the Tonle Sap River, stretching about 4-30 km north of Phnom Penh. Between the 2000 and 2015 fishing seasons, the number of *Dai* seasonally operating in the Tonle Sap River varied between 60 and 64 units. Generally, a *Dai* unit is between 100 and 120 meters long and 25 meters wide. (From Ngor *et al.* 2018)



Source: Inland Fisheries Research and Development Institute, 2013. http://arunatechnology.com (Aruna Technology Ltd.). Department of Geography (DoG), 2005 (Reproduced from Baran et al., 2014[99])

In 2011, four provinces produced more than 50,000 tonnes of fish each: two inland provinces (Kandal and Kampong Chhnang) and two coastal provinces (Koh Kong and Preah Sihanouk). Kampong Thom, Siem Reap, Battambang and Pursat provinces were also large suppliers of freshwater fish with 39,000 to 45,000 tonnes each, while Mondul Kiri, Oddar Meanchey and Preah Vihear were the least productive provinces, with a few hundred tonnes of fish each per year.

Figure 3: Fish Production per Province in 2011

[99] Baran, Eric & Phen, Chheng & Vuthy, Ly & Nasielski, Joshua & Saray, Samadee & Bunthang, Touch & J, Tress & Khim, Kaing & Sokhom, Tan. 2014. Fish resources in Cambodia (2001-2011). Atlas of Cambodia.

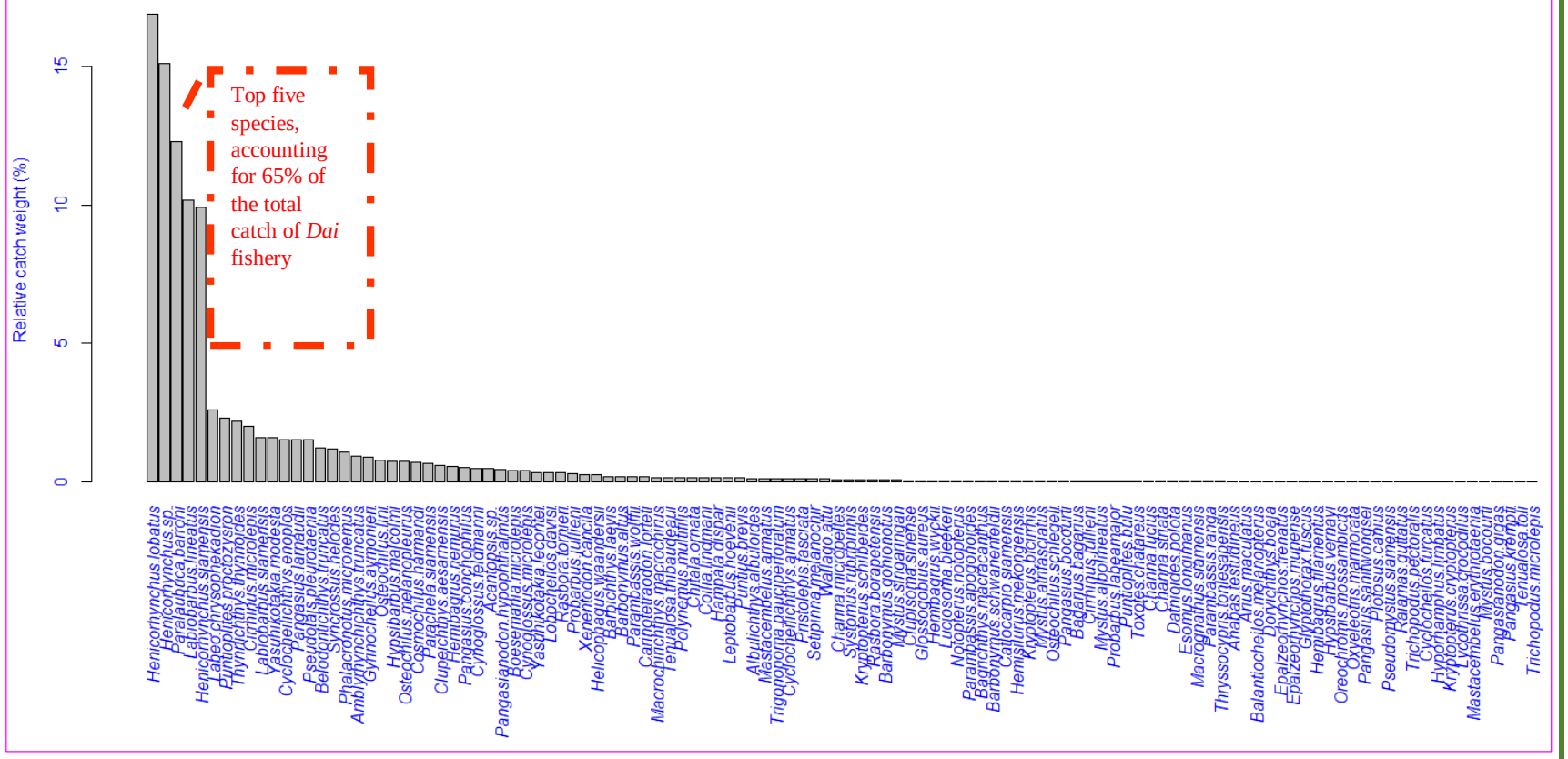


Figure 4: Relative catch weight (%) of 116 fish species recorded at the Dai fishery between 2001 and 2015

(Source: Ngor *et al.*, 2018[100])

[100] Ngor, P.B., K. McCann, G. Grenouillet, N. So, B. McMeans, E. Fraser, S. Lek 2018. Evidence of indiscriminate fishing effects in one of the world's largest inland fisheries. Supplementary Information. Sci Rep. 2018; 8: 8947. Published online 2018 Jun 12. doi: 10.1038/s41598-018-27340-1

Photo 1: *Pangasianodon gigas*



(Photo author: Chaiwut Grudpan *https://ffish.asia/?p=none&o=ss&id=672*)



Photo 2*: Labiobarbus siamensis* (*https://www.seriouslyfish.com/species/labiobarbus-siamensis/*).
Maximum standard length: 150 – 200 mm

They noted that because total biomass of the catch has remained remarkably resilient over the last 15 years, the increase in catch of smaller species has compensated for declines in larger species. They concluded that the sustained production but altered fish community composition was consistent with predictions from recent theory of indiscriminate fishing pressure. This is a warning signal to fisheries managers and conservationists that current fishing practices in the Tonle Sap were unsustainable. Species evenness that was around 0.77 in 2001 had declined to 0.57 in 2015 (Figure 6) and increased indiscriminate fishing is reducing the population of large-sized and slow-growing fish species and replacing them with smaller-sized, faster-growing species. As a result, the body size and, consequently, the overall trophic level of the fish assemblage remaining in the ecosystem decline (Figure 7). These changes are reflected in catch composition with more and more small-size fish constituting the largest part of the catch.

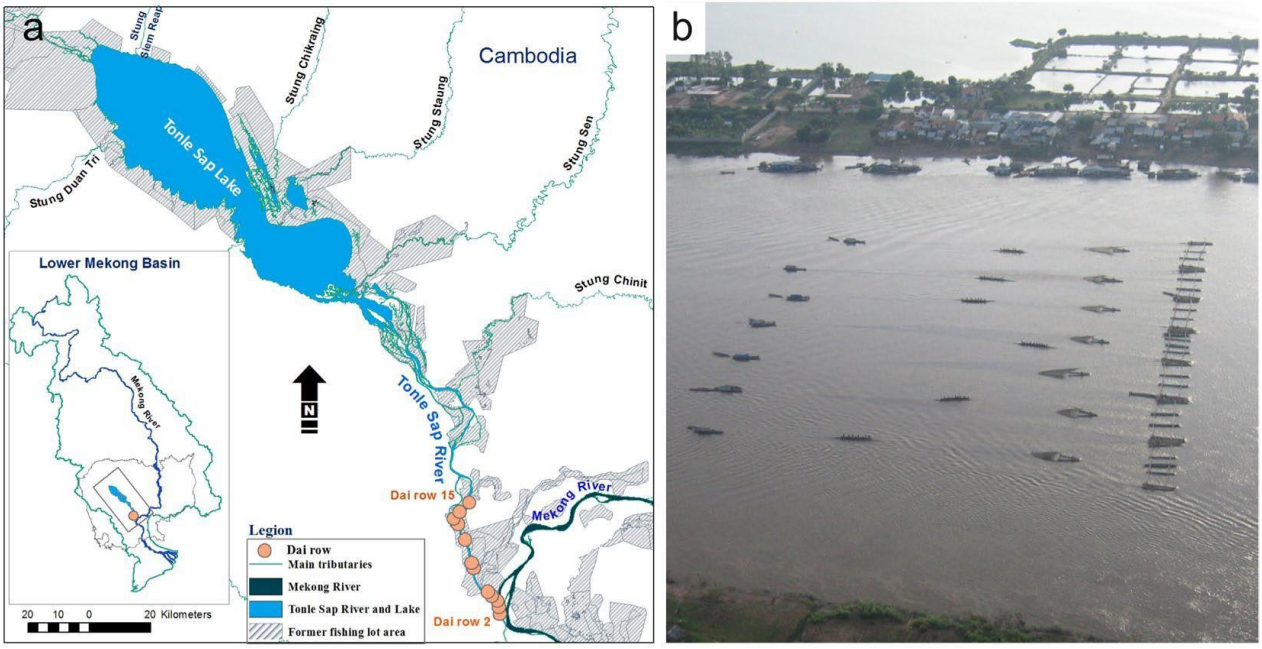


Figure 5: Dai fishery in the Tonle Sap River: (a) location of Dais; (b) an aerial photo of a Dai row with seven units in operation.

Source: Ngor *et al.*, 2018

3.2 Aquaculture

Fisheries play an important role in supporting food security and livelihoods throughout Cambodia. Fish consumption in Cambodia is on the increase due to growing demand related to population growth and changing fishing technologies. The fish consumed is primarily from wild capture in the Great Lake, the Mekong, Tonle Sap and Brassac rivers and their associated floodplains. These areas are under increasing pressure, including unsustainable fishing practices, overfishing and ecosystem degradation. The promotion of aquaculture has been put forward as a proactive way to address food insecurity, bearing in mind that fish is the most important source of animal protein in the country (Figure 8).

Cambodia has many water resources, such as the Great Lake Tonle Sap, the Mekong River, the Tonle Sap River, the Bassac River and their tributaries. Many of these water resources are potential sites for aquaculture. Most of the aquaculture activities are located in areas which have abundant water resources, or which are irrigated. In recent years, fish culture areas have spread beyond these areas, including the upland areas (Figure 9).

Aquaculture development includes fish, crocodiles and freshwater prawn. This sector is showing sustained growth e.g., increasing from 50,000 tonnes in 2009 to 120,000 tonnes in 2014[101]. The focus in the past has been on small-scale production systems. However, there is considerable potential for more commercially oriented production systems. There is already interest from the private sector for large-scale aquaculture development in both coastal and inland areas.

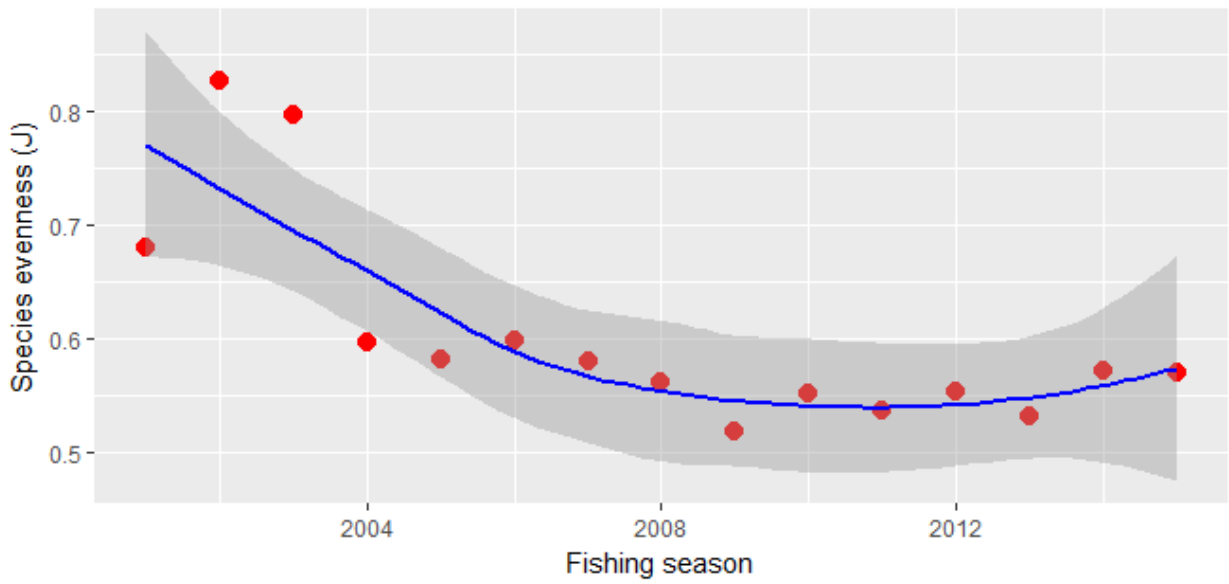


Figure 6: Variations in species evenness recorded at the Dai fishery between 2000 and 2015.
(**Source**: Ngor *et al.*, 2018)

The value of species evenness varies between 0 and 1, with 0 signifying no evenness and one indicating a complete evenness (i.e. species communities are numerically the same). Red points are the species evenness values representing fish community for each fishing season. Blue solid line with shaded area around the smooth curve is loess fitting with 95% confidence interval.

Overall, declining trend of species richness is discerned over the study period between 2001 and 2015.

[101] Strategic Planning Framework for Fisheries 2015-2024 accessible at http://extwprlegs1.fao.org/docs/pdf/cam143042.pdf

Cultured fishes include both native and exotic species[102]. As noted in the 2014 FAO overview of the aquaculture sector, the major cultured species are *Pangasius* spp. (73 %) followed by giant snake head (*Channa micropeltes*) (21 %) (Table 3). Other species produced include *Puntius* sp., Philippine catfish (*Clarias batrachus*), marble goby (*Oxyeleotris marmorata*), *Cirrhinus* sp., red tailed tinfoil (*Barbonymus altus*) and Hoven's carp (*Leptobarbus hoeveni*). Hoven's carp is often caught during times of abundance, and then stocked and fattened for a few months before being sold at a better price during lower fish catches. Some species introduced for aquaculture have been found in the Mekong River mainstream and its tributaries[103]. *Hypophthalmichthys molitrix, Labeo rohita, Cyprinus carpio* and *Oreochromis niloticus* sp. have been found in the Mekong River in the provinces of Kratie, Stung Treng Kompong Cham and Kandal. *Hypophthalmichthys molitrix, Labeo rohita* and *Cyprinus carpio* have been reported in Tonle Sap, Se Kong, Se San, Srepok and their tributaries in the provinces of Kandal, Kompong Chhnang Stung Treng, Ratanakiri and Mondokiri.

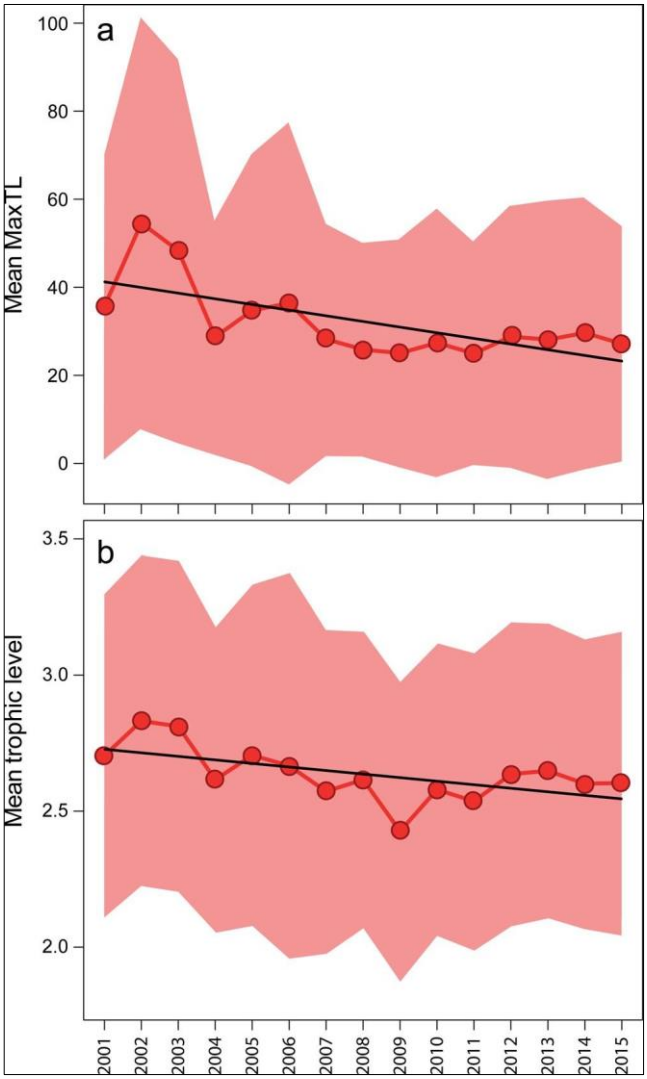


Figure 7: Decline in fish (a) maximum total length (maxTL) and (b) trophic level in seasonal catches of the Dai fishery from the fishing season of 2000/01 to 2014/15

Pink shaded area denotes standard deviation around the mean values. 2001 represents the fishing season of 2000/01 and the same for other years. Source: Ngor *et al.*, 2018

Culture based fisheries is particularly important in the rural remote areas in the upland region of the country where non-native species have been introduced into small water bodies.

Small-scale aquaculture has considerable potential to enhance household food security and supplement household incomes through the sale of surplus fish. However, aquaculture depends heavily on water and nutrient provisioning. In the case of Cambodia, there are two major biophysical limits to small-scale aquaculture: water scarcity during the dry season and flooding during the rainy season. Technologies needed should allow reducing losses during flooding, conserving water during the dry season and mitigate the effects of prolonged drought periods. It is also important that aquaculture extension services be strengthened, and fish market be improved.

[102] http://www.fao.org/fishery/countrysector/naso_cambodia/en

[103] Bartley, D.M. 2005. International Mechanisms for the Control and Responsible Use of Alien species in aquatic ecosystems. Food and Agriculture Organization of the United Nations

Marine aquaculture gives lower yields than freshwater aquaculture both in terms of volume and value. The continued development of marine aquaculture in Cambodia has high potential, especially the possibilities for shrimp, finfish and crustacean farming in the coastal zone[104]. The status of shrimp/fish farming was recently evaluated as being composed of mostly semi-intensive culture systems. The main species used in marine aquaculture are sea bass and groupers. The major finfish species currently cultivated are groupers and Asian seabass; the major crustacean species is mud crab. They are usually reared in cages, ponds and pens. The breakdown of marine aquaculture is 218 ha of earthen ponds (10232 ponds), 1571 ha of pens (292 pens) and 14 ha of floating net-cages (1898 cages) (FiA, 2014).

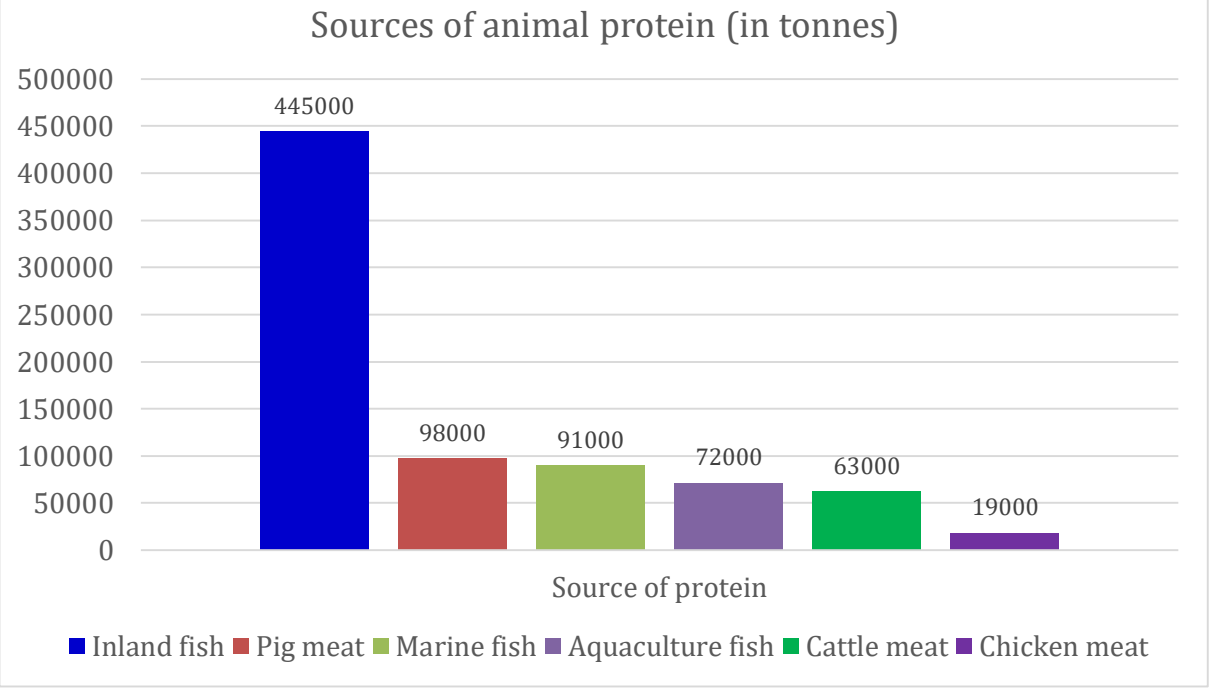


Figure 8: Sources of animal protein production in Cambodia
Source: FiA 2011 and 2011 online FAOStat data as reported by Baran *et al.*, 2014

[104] From FAO National aquaculture sector overview http://www.fao.org/fishery/countrysector/naso_cambodia/en

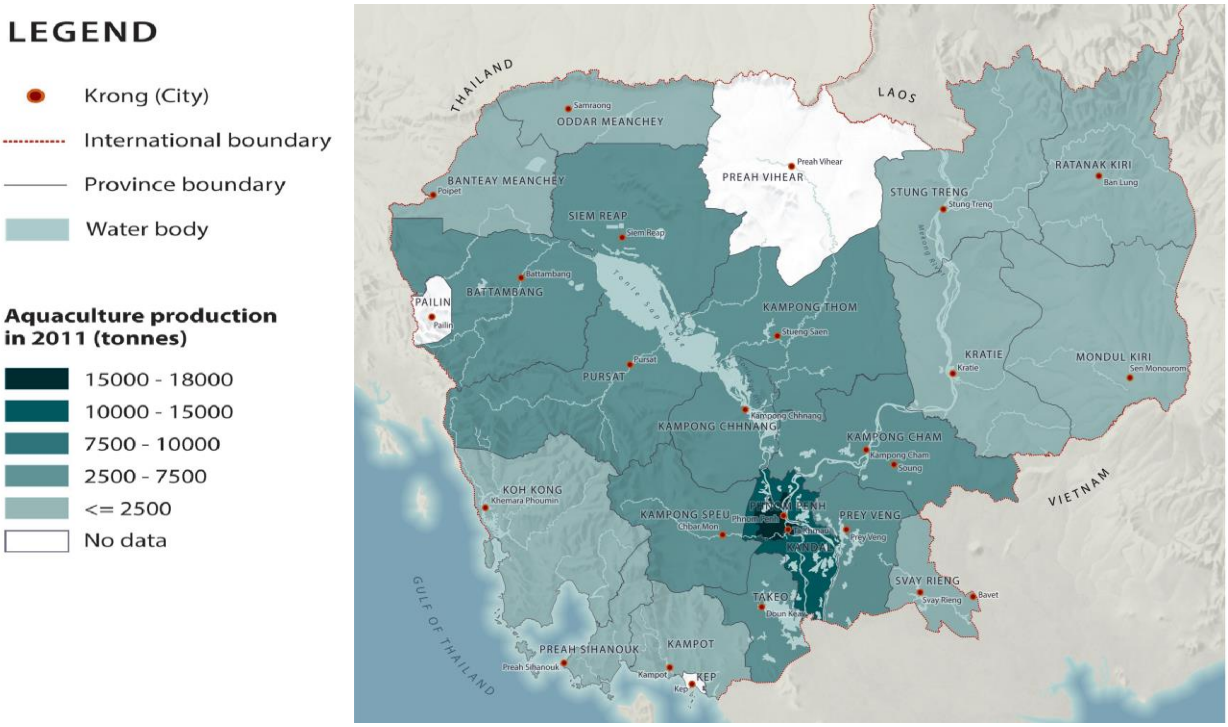


Figure 9: Geographical distribution of aquaculture production in Cambodia (in 2011)

Source: Fisheries Administration, 2011 http://arunatechnology.com (Aruna Technology Ltd.) Department of Geography (DoG), 2005 (as reported by Baran *et al*., 2014). Freshwater aquaculture production is particularly concentrated around the Tonle Sap Lake and River, while it is less developed along the Mekong River upstream from Phnom Penh

4. Management of inland fisheries and aquaculture

In 2016, the Fisheries Administration (FiA) estimated at 802450 tonnes the annual yield from inland capture (63.5%), marine capture (15.0%) and aquaculture (21.5%). Aquaculture's relative contribution to fish production in the country is relatively low compared to capture fisheries but increasing annually (estimated by FAO at 172 500 tonnes in 2016) (Figure 10). As noted in the National Strategic Development Plan 2014-2018, "aquaculture has been implemented through pursuing diverse approaches including enhancing rice-field fisheries and establishing Community Fish Refuge Ponds which can help increase farm aquatic production by up to 15% per annum."

4.1 Farming systems and species

Fish farming requires a reliable source of water, space and the required infrastructure, fish seeds and feed. Feed and, to a lesser extent, seed are the two major inputs for fish farming in Cambodia[105]. Two types of feed are used: homemade feed and pelleted commercial feed. There is no commercial feed production in Cambodia, although at least one company is considering it. Almost all commercial feed is imported. Low value fish (often referred to as trash fish) from capture sources and seafood processing waste are being used as protein inputs into home-made feed. For seed, there are three main sources: local hatcheries (mainly carps, tilapias and barbs), imported from Vietnam (mainly pangasius, snakehead and clarias species), and wild. Significant numbers of snakehead fingerlings are imported informally.

[105] Value Chain Analysis for Development 2018. Aquaculture value chain analysis in Cambodia, EC. This document is based on the report "Aquaculture Value Chain Analysis in Cambodia 2017", by Froukje Kruijssen (KIT), Adrienne Martin (NRI), Marnix Poelman (WUR), Viryak Sem (national expert) Only the original report binds the authors.

Table 2: The most common fish species used in aquaculture and their respective culture method and seed source

(**Source**: FAO, 2014[106])

Species name	Farming system	Source of seed	Production volume
Native			
Striped catfish *(Pangasius hypophthalmus*)	Floating cage, Pond	hatchery, wild	High
Basa fish (*Pangasius bocourti*)	Floating cage	wild	High
Spot pangasius (*Pangasius larnaudii*)	Floating cage	wild	Low
Trey pra ke (*Pangasius conchophilus*)	Floating cage	wild	Low
Giant snake head (*Channa micropeltes*)	Floating cage	wild	High
Snake head (*Channa striatus*)	Floating cage	wild	High
Silver barb (*Barbonymus gonionotus*)	Floating cage, Pond, Rice field	hatchery, wild	High
Hoven's carp (*Leptobarbus hoeveni*)	Floating cage, Pond	hatchery, wild	Medium
Trey khya (*Mystus wyckiode*)	Floating cage	wild	Low
Marble goby (*Oxyeleotris marmorata*)	Floating cage, Pond	wild	Low
Snakeskin gourami (*Trichogaster pectroralis*)	Pond, Rice field	hatchery, wild	Low
Red tailed tinfoil (*Barbonymus altus*)	Pond, Rice field	hatchery, wild	Low

[106] FAO, 2014 National Aquaculture Sector Overview , accessible at http://www.fao.org/fishery/countrysector/naso_cambodia/en

Table 3: The most common exotic species introduced in Cambodia for aquaculture
(**Source**: FAO, 2005[107] and Fishbase[108])

Species	Common and other names	Species	Common and other names
*Anguilla japonica**		*Hypophthalmichthys nobilis***	Bighead carp
Catla catla	Catla	*Labeo rohita***	Roho labeo, Rohu
*Cirrhinus cirrhosus**	Mrigal carp, Trey krawlang	*Oreochromis mossambicus***	Mozambique tilapia, Trey tilapia khmao
Cirrhinus mrigala	Mrigal	*Oreochromis niloticus***	Nile tilapia, Trey tilapia chhnoht
*Clarias gariepinus***	(North) African catfish, Trey andaing afrik	*Oreochromis niloticus x O. mossambicus*	Red tilapia
Clarias gariepinus x macrocephalus	Hybrid catfish	*Osphronemus gouramy*	Giant gourami
*Ctenopharyngodon idella***	Grass carp, Trey srokchen	*Pangasius pangasius**	Pangas catfish, Trey pra
*Cyprinus carpio***	Common carp, Trey carp samahn	*Piaractus brachypomus*	Silver pacu
*Gambusia affinis**	Mosquitofish	*Sarotherodon melanotheron**	Blackchin tilapia
*Hypophthalmichthys molitrix***	Silver carp	*Lutjanus malabaricus*	Snapper
Anabas testudineus	Climbing perch	Penaeus monodon	Tiger Shrimp
Epinephelus spp.	Grouper	*Eucheuma cottonii*	Seaweed
Lates calcarifer	Seabass		

Species whose names are followed by * are the 13 introduced species listed in Fishbase; ** means that the species is listed in both FAO and Fishbase lists; *** means that the species was mentioned in other documents

[107] FAO, 2005 =Present status of alien species in aquaculture and aquatic ecosystem in Cambodia. *Sam Nuov / Hav Viseth / Ouk Vibol* In Bartley, D.M.; Bhujel, R.C.; Funge-Smith, S.; Olin, P.G.; Phillips, M.J. (eds.). International mechanisms for the control and responsible use of alien species in aquatic ecosystems. Report of an Ad Hoc Expert Consultation. Xishuangbanna, People's Republic of China, 27–30 August 2003. Rome, FAO. 2005. 195p.

[108] http://www.fishbase.org/Country/CountryChecklist.php?c_code=116&vhabitat=introduced&csub_code= and https://www.oceandocs.org/bitstream/handle/1834/9168/LangO2015.pdf?sequence=1 (accessed on 16.01.2019)

Freshwater fish farming systems/aquaculture in Cambodia can be aggregated into main systems. Joffre et al.[109] in 2010 considered 6 main systems (Cage and pen culture, Intensive pond culture, Extensive homestead pond culture, Community Fish Refuge ponds, integrated rice-fish farming, and shrimp farming) while in a 2018 report[110] for the European Community these main systems were collapsed into 4 main systems (semi-intensive ponds consisting of low input (polyculture) and high input (monoculture) systems; intensive ponds; freshwater cages and pens; extensive ponds, rice-fish farming, freshwater prawn and frogs). The Cambodia Law on Fisheries gives in Chapter 10 the size of aquaculture operations that require FiA permits. In 2011, Takeo had more than 19000 aquaculture ponds or cages; Svay Rieng, Prey Veng and Kampot had between 9400 and 7000 each. The number of ponds and cages in the other provinces was much lower[111].

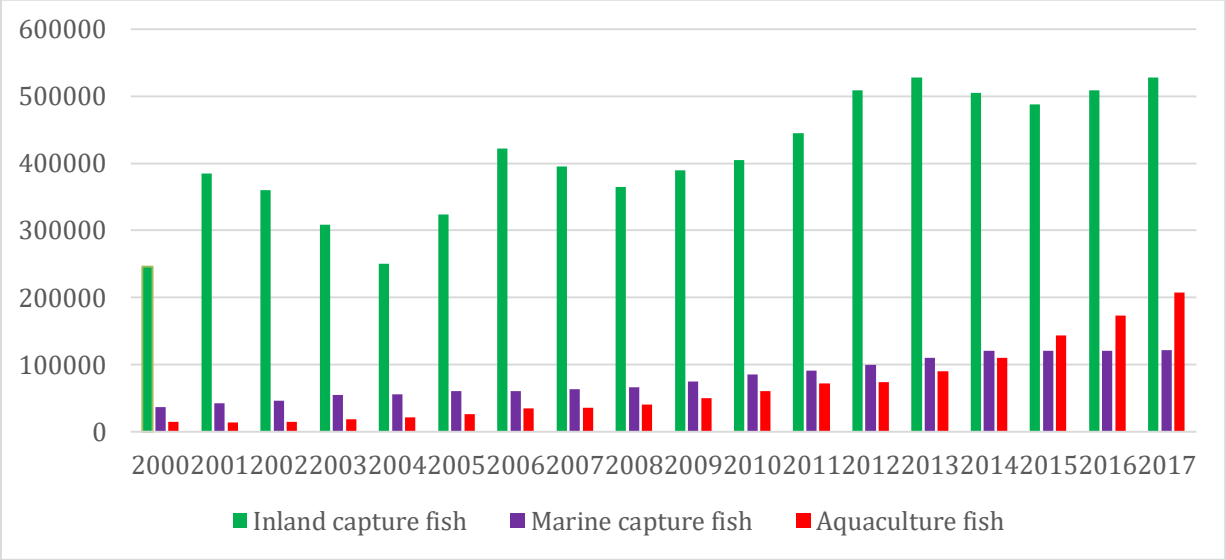


Figure 10: Total production of fisheries (in tonnes) in Cambodia from 2000 to 2017

Source of data: Fisheries Administration (as reported in *http://pubs.iclarm.net/resource_centre/WF-4074.pdf*) MAFF 2017 Report and Ministries cabinet (2018). Summary report on the Achievements by the Royal Cambodia Government for 2013-2017.

4.2 Cage and pen culture

Cage aquaculture is the most common fish production system in Cambodia (80% of total inland fish production (FAO, 2005[112])). It is believed that the system originated from Cambodia more than a century ago. Cages are generally made of wood or bamboo and are found primarily in Cambodia's major rivers and the Tonle Sap Lake. Their sizes depend on the farmed fish species. Large cages (from 48 to 540 m^3) are

[109] Joffre, O., Y. Kura, J. Pant and S. Nam 2010. Aquaculture for the Poor in Cambodia – Lessons Learned. The WorldFish Center, Phnom Penh, Cambodia. (Based on So et al. 2007; So et al 2005; Viseth and Pengbun 2005) (file:///C:/Users/ieljo/Downloads/AQBrief-AQforthepoorinCambodiasmall.pdf)

[110] Value Chain Analysis for Development 2018. Aquaculture value chain analysis in Cambodia, EC. This document is based on the report "Aquaculture Value Chain Analysis in Cambodia 2017", by Froukje Kruijssen (KIT), Adrienne Martin (NRI), Marnix Poelman (WUR), Viryak Sem (national expert) Only the original report binds the authors.

[111] FiA 2011 cited by Baran *et al.,* 2014)

[112] FAO, 2005 =Present status of alien species in aquaculture and aquatic ecosystem in Cambodia. *Sam Nuov / Hav Viseth / Ouk Vibol* In Bartley, D.M.; Bhujel, R.C.; Funge-Smith, S.; Olin, P.G.; Phillips, M.J. (comps./eds.). International mechanisms for the control and responsible use of alien species in aquatic ecosystems. Report of an Ad Hoc Expert Consultation. Xishuangbanna, People's Republic of China, 27–30 August 2003. Rome, FAO. 2005. 195p.

used for example for *Pangasius* catfish culture and smaller units (18 to 180 m^3) for snakehead. Like cages, pens are enclosures but stationery as their walls are fixed, and usually much larger. Fish culture in large pens tends to be less intensive. Cage and pen systems use primarily indigenous fish species collected from the wild. Two major species found in cage culture are the catfish, *Pangasianodon hypopthalmus* and *Channa micropeltes*, the red or giant snakehead. Other species are also cultured such as *Pangasius bocourti, Barbonymus gonionotus, Leptobarbus hoevenii,* and *Ostiochilus melanopleurus*. Some exotic fish are also cultured in cages, primarily *Oreochromus niloticus* and other tilapia species. Feeds are based mainly on low commercial value fish (the only food given to snakeheads), cooked rice bran, corn or aquatic plants, according to the species. Average yields are between 28 and 90 kg/m^3 for Pangasius and 75-150 kg/m^3 for snakehead cage culture.

4.3 Intensive pond culture

In intensive culture systems, ponds have a permanent access to a source of water. Their sizes may range from 100 m^2 to 10,000 m^2 (average 2,400 m^2), with a depth of 2 to 3 meters. *Pangasianodon hypophthalmus* is the main cultured species in ponds around Phnom Penh. Feed is based on rice bran and dried small-sized fish. Yields average around 67 tonnes/ha.

4.4 Extensive homestead pond culture

This system is the one that is widely promoted by NGOs and donor projects for food security and livelihoods. It is suitable in conditions where there is no permanent access to water and ponds are mostly rain-fed. Cultured fish species, usually collected from wild, include mainly carp polyculture, tilapia, *Pangasius* catfish, silver barb (*Barbonymus gonionotus*), walking catfish (*Clarias batrachus*) and climbing perch (*Anabas testudineus*) raised in small ponds of 80-300 m^2. They are fed with on-farm products such as rice bran and duckweed. Harvest takes place when there is water shortage in March or April. Community or collective ponds such as village, school or pagoda ponds, have also been used for extensive fish culture.

4.5 Integrated rice–fish farming

Rice field fishery is the practice of raising fish within and around flooded rice fields during the wet season from July to February. It constitutes another vital source of income and food for rural households in Cambodia [113] and contributes 20-25% of the country's inland fish catch. The system is an attractive livelihood option, particularly for the poor rural households. It requires relatively little capital investment and land ownership, and relies mainly on local stocking of *Pangasius catfish*, silver barb (*Barbonymus gonionotus*), tilapia (*Oreochromis niloticus*) and common carp (*Cyprinus carpio*). However, these fisheries have low productivity, are often poorly managed and are negatively impacted by the Intensification of rice farming with increased use of pesticides and damage to natural habitats. Also, because irrigation is limited and when fish are stocked in ponds connected to the rice fields, the practice may require improvement of dike systems and the allocation of rice land for a ditch system[114].

4.6 Community Fish Refuges

In partnership with WorldFish, Cambodia initiated in 2012 the "Rice Field Fisheries Enhancement Project" (RFFEP) to improve sustainable rice field fishery management practices in Cambodia by working closely with resource users, local authorities[115] and national universities, and by looking for ways to increase

[113] https://www.worldfishcenter.org/content/enhancing-rice-field-fisheries-cambodia
[114] FAO, 2005. See ref. under Table 3
[115] https://marineinstituteiyip.wordpress.com/2016/07/20/rice-field-fisheries-in-cambodia/

productivity, expand rice field fisheries while seeking innovative ways to increase biodiversity and protect ecosystems. The project ran from 2012 to 2016. It has established community fish refuges (CFRs) throughout the study region. The refuges provide important habitat for aquatic species during the dry season and are managed solely by local community volunteers. WorldFish[116] reported at the end of the project the following achievements:

- Physical improvements were made to 40 refuges, enabling better water retention and improving the connection between the pond and rice fields during the wet season;
- Over 400 various improvements were made at the 40 project sites in the Kampong Thom, Siem Reap, Pursat and Battambong provinces surrounding Tonle Sap Lake, where dependence on rice field fisheries in greatest. This directly benefitted an estimated 18,377 households, or 86,372 people;
- Training was given to 434 Community Fish Refuge (CFR) committee members (369 men and 65 women), who are local volunteers elected to oversee the CFR. Most CFRs are community-owned and on open access grounds, therefore require effective collective governance to prevent overfishing;
- Training was also provided to school teachers, local authorities, local police officers, and NGOs working in the same target areas;
- Communities developed action plans to manage and improve their CFR;
- As a result of the CFR improvements and training, households living around the 40 project sites experienced a 9% increase in fish catch, from 211 kg in 2012 to 230 kg in 2015. This was despite widespread drought conditions in 2015 that caused lower fish productivity throughout the country;
- The poorest quarter of households, who depend heavily on rice field fisheries, saw the biggest jump in production with a 71% increase over the same period;
- Fish productivity per hectare of rice field also increased by 20 – 120% between 2013 and 2015, on average from 78kg/ha/yr to 99kg/ha/yr;
- Cash income for households that reported selling fish increase in 2015 ten times as compared to 2012.

The system of Community Fish Refuge (CFR) ponds was developed by AIT-Aqua Outreach in the early 2000s. It is based on stock enhancement of the rice field fishery with perennial ponds that are protected as dry season refuges for fish and are managed by the local community[117]. Broodstock of snakeheads, clariid catfishes, climbing perch and gouramis that are stocked in the sanctuaries migrate and spawn in rice fields during the seasonal floods when pond and rice fields are connected. Fishing is prohibited in the refuge ponds, providing a sanctuary for fish in the dry season. Development of such systems is increasingly popular among governmental and non-governmental organizations and international cooperation agencies such as JICA and USAID.

An assessment of Community Fish Refuge Management Practice in the Siem Reap has just been published[118]. It confirms that Community Fish Refuge (CFR) was an enhanced inland capture fishery production system, a fish conservation measure that is intended to improve the productivity of rice field fisheries and provide safe refuges for fish during the dry season. One possible option to improve fish production in the lowland agricultural ecosystem and address the decline in fish capture and respond to

[116] *https://www.worldfishcenter.org/pages/community-fish-refuges/*
[117] FAO, 2005. See ref. under Table 3
[118] Chea Phala, Tey Sarin , Murari Suvedi,* and Ramjee Ghimire 2019. Assessment of Community Fish Refuge Management Practice in the Siem Reap Province of Cambodia. Environments 2019, 6, 1; doi:10.3390/environments6010001

the increasing fish demand, is the introduction of refuge and conservation areas for stock rehabilitation, which have been proven beneficial to the maintenance of fish stock diversity and yields. Cambodia's Fisheries Administration aims to develop one well-working CFR in each of the 1200 communes by 2019. In the reported study, it was observed that total household saving and income from fish production significantly increased after community members joined CFRs. Illegal fishing and budgetary constraint to implementing CFR interventions are the pressing problems facing the users.

4.7 Coastal marine aquaculture

Cambodia's coastal zone, located on the south-west edge of the country, extends for 435 km, and includes 85 100 ha of mangrove forests in three provinces: Koh Kong, Sihanouk Ville and Kompot. Coastal and marine aquaculture in Cambodia has high potential, especially the possibilities for shrimp, finfish and crustacean farming in the coastal zone. Shrimp/fish farming is essentially composed of semi-intensive culture systems. Marine finfish culture has been strongly promoted in Cambodia to meet the increasing domestic demand for marine fish at restaurants. Marine finfish culture can be very profitable. However, it requires significantly higher investment in seed and feed inputs, and more advanced technology than freshwater finfish aquaculture. Domestic production is limited, and demand is partially met by imported fish from neighboring countries. The government has emphasized the need for more research and development in order to support this newly growing sector, and some external assistance is being provided by the Southeast Asian Fisheries Development Center (SEAFDEC) and JICA. The major finfish species currently cultivated are groupers and Asian seabass. The major crustacean species is mud crab. They are usually reared in cages, ponds and pens[119]. Other forms of marine aquaculture, such as mud crab fattening developed by SEAFDEC, also face technical challenges such as feeding and disease control. In Koh Kong province, culture of green mussel (*Perna viridis*) on poles is expanding due to the relatively low risk (natural and human) and low cost[120].

The breakdown of marine aquaculture was in 2014: 218 ha of earthen ponds (10 232 ponds), 1 571 ha of pens (292 pens) and 14 ha of floating net-cages (1 898 cages)[121]. Shrimp farming in Cambodia is less widely practiced than in neighbouring countries, with less than 100 tonnes produced in 2003. The main species are *Penaeus monodon* and *P. mergersiensis*. Intensive farms (Koh Kong and Sihanoukville provinces) reached production levels of 7-8 tonnes/ha in the early 1990s, with high-level investment and technology, but also encountered a high incidence of disease, resulting in a decline of the sector (FAO, 2005).

4.8 Third water technique

In 2014, Cambodia started a project led by the Japan International Cooperation Agency (JICA) as part of the Freshwater Aquaculture Improvement and Extension Project. The project uses a Japanese know how to create artificial river and seawater and open three prawn farms in mountain villages in Takeo Province for breeding giant river prawns. The prawn sells for eight times the price of fish in Cambodia. 'Third water' consists of fresh water with a little sodium, potassium and other electrolytes added. The technique allows fish to be raised anywhere and could become a model for marine product farming in noncoastal areas.

The use of intensive culture systems is concentrated in areas around Phnom Penh and Kandal Province, while small-scale systems are in more wide spread use (FAO, 2005) The Department of Fisheries, with the assistance of a variety of development organizations has actively promoted small-scale aquaculture in the

[119] http://www.fao.org/fishery/countrysector/naso_cambodia/en FAO National aquaculture sector overview.
[120] FAO, 2005 . See ref. under Table 3
[121] FiA, 2014. The Department of Fisheries, Annual reports of the Fisheries sector in Cambodia

upland areas for food security. Most of this production occurs in impoundments behind small dams, some of which are linked to rice paddies. This type of aquaculture is predominantly based on introduced species of fish and their escape may present a serious threat to local biodiversity.

A recent report[122] published in 2018 aggregated freshwater fish farming systems/aquaculture in Cambodia into four main systems: semi-intensive ponds (33% of total volume produced) consisting of low input (polyculture) and high input (monoculture) systems; intensive ponds (29%); freshwater cages and pens (24%); extensive ponds, rice-fish farming, freshwater prawn and frogs (14%) (Figure 1bis). The report noted that the main species used were pangasius, snakehead, giant snakehead, clarias, climbing perch, and low-trophic-level species grown in polyculture.

5. Threats

The sustainability and productivity of both freshwater fisheries and aquaculture are threatened by multiple and interacting factors including:

- The degradation or loss of habitat/ecosystem that can be caused by the fragmentation of the water stream, infilling of lakes, conversion of the wetlands to other land-uses such as urban/settlement expansion. The Mekong ecosystem and the fisheries it supports are currently under increasing pressure from water-related development interventions. Loss of breeding habitats will lead to a decline in wild stocks that can be exacerbated by other factors such as climate change with the changes that can result, such as changes in water levels, salt levels, flow rates and flooding patterns. Fish stock in Tonle Sap is particularly affected by siltation, the destruction of flooded forests and the building of upstream dams which interfere with fish migration and climate change;
- Increased pressure on the resource due to human population growth increasing demand, and economic factors that can result from increased international trade competition and more stringent import regulations;
- Overexploitation, use of illegal and destructive fishing methods that can deplete or lead to unsustainable fish stocks. Increased efficiency of fishing gears and the use of monofilament nylon gillnets are becoming important stressors. In addition, the number of fishers has significantly increased because the investment needed to enter the fishing business is easily accessible;
- Alteration of water flow, which may in turn alter the characteristics of the habitat and/or cause the death of fish. Such alterations may be caused by the construction and operation of dams[123], water diversion, excessive water extraction for other uses such as industrial uses or crop irrigation;
- The damming of rivers and streams can result in loss of species, habitats and some ecosystem services. This cannot be safely offset by stocking with exotic species which displace indigenous species and spreads disease. Stocking of indigenous species that can tolerate the lake environment is often a better alternative, but the resulting fauna will tend to be less diverse and the stocking of large reservoirs has important cost implications. In addition, restocking of water bodies is not without risk as this can affect ecosystem functioning, cause changes in fish community structure and loss of genetic integrity. The temporal responses of local fish beta diversity to hydrologic modification by the upstream functioning dams were investigated in five sites of the Mekong-3S system (Sekong, Sesan, and Srepok (Mekong-3S) river system, a Ramsar wetland of international

[122] Value Chain Analysis for Development 2018. Aquaculture value chain analysis in Cambodia, EC. This document is based on the report "Aquaculture Value Chain Analysis in Cambodia 2017", by Froukje Kruijssen (KIT), Adrienne Martin (NRI), Marnix Poelman (WUR), Viryak Sem (national expert) Only the original report binds the authors.

[123] A study by the Mekong River Commission ('the Council study') found a large potential impact on the Kingdom's food security from dam development. Modelling work that assumed all the planned Mekong River system dams went ahead predicted a fall in fish production of up to 70 percent across the Mekong basin. For Cambodia, annual GDP losses of $3–5 billion were projected in scenarios going out to 2040

importance and critical fish migration route) by analyzing 7-year daily fish monitoring data (06/2007–05/2014) in two sites on the Mekong River displaying relatively undisturbed flow and three sites in the 3S displaying a gradient in flow perturbation caused by damming[124]. It was found that there were overall declining trends in local species richness and abundance, with strong temporal variability in local beta diversity. Undisturbed sites were characterized by seasonal assemblage variability, while disturbed sites were characterized by a seasonal assemblage change. Temporal shifts in assemblage composition suggested that dams alter seasonal flow patterns and favour generalist species. This study contributes to a better understanding of the temporal changes of freshwater fish beta diversity in regulated and unregulated rivers. It is thus relevant for fisheries planning and conservation;

- Different types of pollutions affecting adversely water quality and fish health. Growth of harmful algae is one of the major threats to aquaculture;
- Aquatic invasive species, which may threaten fish through competition, predation or habitat impacts;
- Climate change is expected to exacerbate most of the pressures with more impacts on aquaculture than capture fisheries (Box 2);
- More specifically for aquaculture, inadequate and unreliable supply of good quality seed and feed; lack of capital, fund or credit for aquaculture investment; inadequate knowledge of aquaculture technology; inadequate manpower for aquaculture extension service; and climate change, have adversely impacted aquaculture development in Cambodia.

There are many underlying factors that support the stressors listed above. From the Strategic planning Framework for Fisheries 2010-2019 Vol 1. SWOT and other recent publications, they include essentially:

(i) Limited knowledge of the science behind aquaculture and the fishery system particularly in the Great Lake area. Lack of understanding of the seasonal and annual variations in supply may lead to gluts or shortages, and over-exploitation of some species;
(ii) Limited skills and lack of guidance and training/information materials and events. Problems may not be diagnosed in time;
(iii) Limited knowledge of the laws and regulations, and limited law enforcement
(iv) Shortage of resources, including for investment in infrastructure and inputs;
(v) Poor post-harvest handling, limited quality control and disease management facilities; preventing to satisfy the fish demand;
(vi) Absence of supportive research and unavailability of data that can allow well-informed decisions;
(vii) Conflicts between land owners and local communities; and weak capacity of Community Fisheries (CFi) organizations.

[124] Peng Bun Ngora,b,∗ , Pierre Legendrec , Thierry Oberdorffb , Sovan Lekb 2018 Flow alterations by dams shaped fish assemblage dynamics in the complex Mekong-3S river system. Ecological Indicators 88 (2018) 103–114

Box 2: MAFF situation analysis of the impact of climate change on fisheries (for the identification of priority action plan for fisheries in the face of climate change)

Capture fisheries in the Lower Mekong Basin (LMB) is buffered against climate change by the exceptionally large aquatic ecosystem biodiversity. As a result, some species will likely benefit from the changing conditions, possibly maintaining the overall fisheries productivity, while other less adaptive species will decline. This is likely to lead to an overall loss in biodiversity

Cambodia fisheries are vulnerable to climate change. A recent global study of the vulnerability of national economies to the impact of climate change on fisheries ranked Cambodia as 30th most vulnerable in the world.

Aquaculture has been a long-established activity in parts of the LMB, particularly on the Tonle Sap Great Lake and the Mekong Delta. Aquaculture appears to be more vulnerable to climate change scenarios than capture fisheries, although it tends to have a high adaptive capacity.

The vulnerability assessments confirm the hypothesis that aquaculture will be more vulnerable to climate change scenarios than capture fisheries.

Extracted from Cambodia's Climate Change Priorities Action Plan for Agriculture, Forestry and Fisheries 2014-2018

Summarizing the threats, the Government recognized in the Strategic Planning Framework 2010-2019 for Fisheries that:

(a) Within Cambodia the effects of industrial development, draining of the aquatic environment, conversion of wetlands to rice fields, mining, agricultural intensification, deforestation and increasing population pressure are all straining the existing production system and the flow of wider ecosystem services;

(b) Whilst these challenges face the existing fishery, the future growth of the sector is further constrained by limited land tenure rights, poor general infrastructure, limited investment capacity, poor knowledge of opportunities and how to take them up, and an incomplete support, policy and regulatory environment.

A list of threatened fish is given in the Annex T4.1 to this subsection.

When the Ministry of Agriculture, Forestry and Fisheries carried out a mid-term assessment of progress toward the implementation of actions identified in the Strategic Planning Framework for Fisheries 2010 – 2019 in consultation with the private sector and Cantonment level staff, they identified constraints to freshwater fisheries and aquaculture and outlined them under the four pillars of the sector as follows:

Regarding capture fisheries and management:

- Community fishery groups do not have all the needed capacities, including financial resources and management plans, for the implementation of their planned activities. Many community members are poor. Some community fishery groups are not developing adequately, and their management is weak;
- The intensification of rice production resulting from increasing demand is likely leading to both increased chemical inputs to rice fields where fishery is taking place and to the degradation of rice fields that limits fisheries opportunities;
- Illegal, unreported and unregulated (IUU) fishing, including the use of illegal fishing gear is high.
- Deforestation has negative effects on coastal and inland fisheries habitats;

- The conversion of coastal habitats, including mangroves, into agricultural lands or areas for human settlement is reducing fishery areas;
- Sand and gravel extraction as well as many other infrastructural activities increase amounts of sediments in rivers and coastal waters;
- There are adverse effects from hydro-dam construction in Mekong and its tributaries.
- The effects of climate change on the fishery are likely to be considerable but largely unknown.

Regarding aquaculture,

- Incentives and the necessary resources for aquaculture development in the country are limited, and regulation of aquaculture production and input supply systems are weak;
- Some illegal aquaculture practices, especially associated with snakehead, have not been controlled;
- Technology to produce more commercial aquaculture species needs to be acquired;
- Land and water, when available, for expanded aquaculture are poorly managed;
- Feed and seed supplies for aquaculture are limited and poorly regulated;
- Imports of inputs for the sector are poorly regulated.

Regarding Fisheries Value Chain,

- Electricity costs for aquaculture intensification and fish processing are high;
- Cross-border collaboration among key players and cross border trade regulation and regulation enforcement are insufficient;
- Sanitary and phytosanitary (SPS) measures are not well integrated into production chains, and laboratory testing and certification systems are not well developed;
- There are few incentives for the private sector to enter into commercial post-harvest activities;
- Skills in modern post-harvest techniques are limited amongst the private sector in Cambodia;
- Neighbouring countries already have established production and market systems which limit options for Cambodia's market access.

Regarding regulations and services,

- Illegal fishing activities continue, especially the use of electrocuting fishing devices, fishing nets, use of Samras[125], cutting of flooded forest within community fisheries and state fisheries domains, and trawling within the inshore fishing area;
- There is widespread lack of understanding of the law and how it affects communities;
- There is limited law enforcement, compliance with regulations and a lack of awareness about the importance of fishery resources among fishers and other stakeholders.
- There are insufficient numbers of fisheries staff with the right skills and experience to address the current problems facing the sector;
- Equipment and funds to support the management, research activities, extension, conservation and protection of fishery resources are limited. There are also existing and planned hydropower and irrigation developments within Cambodia which have the potential to affect the resource base. There will be increasing pressure to expand electricity production to fuel the small and medium sized enterprise growth foreseen in the Rectangular Strategy.

[125] As described in the 2006 Law on Fisheries, Samras refers to stumps, trunks and branches of a tree and other equipment which fisherman brings to place in other dimensions of fishery domain in order to form habitat to attract fish to concentrate in one place, and takes care of this place until a suitable time to harvest using fishing gear by encircling devices (*http://extwprlegs1.fao.org/docs/pdf/cam82001.pdf*).

6. Measures taken to address the identified threats

Different types of measures have been or are being applied to manage these stressors and thus provide for sustainable and productive fisheries. While fisheries are under a lot of pressures, there are also opportunities to increase fish production in Cambodia such as the improvement in post harvest handling of fish and export stimulations that are taken into consideration in measures taken. An aspect that has become very important in Cambodia's planning strategies is the consideration of value chains so as to ensure inclusive development and sustainability in line with the Rectangular Strategy -Phase IV.

6.1 Valuation of fisheries

Fisheries production in Cambodia is given from 2000 to 2017 in Figure 10. Inland fisheries production fluctuated between 2000 and 2016 while production from aquaculture increased steadily around eightfold. Yet, capture fisheries still supply markets with six to eight times more fish than the aquaculture sector.

The value of capture fish production is not well known since there is no systematic assessment of the price of fish per kilogram. This results in an undervaluation of fisheries in the Gross Domestic Product (GDP) of Cambodia. The Inland Fisheries Research and Development Institute (*IFReDI*) estimated at USD 1.6/kg the total economic value of freshwater fish and aquatic products in 2013. The total value of fish production after processing and transportation is unknown but was thought by FiA to range between 8% and 12% of the GDP[126]. In terms of employment opportunities, fisheries provide easy access to income-generating activities with very little capital investment and no land[127]. It is estimated that the fisheries sector provides full-time, part-time and seasonal work to up to 6 million people and the fisheries sector contributes very significantly to domestic food security, providing over 81.5% of the animal protein in the national diet. Overall, the exact value of inland fish production remains unknown but is needed for decision-making.

Inland capture fisheries are valued as one of the most important ecosystem services and their systems positively contribute to other ecosystem services[128]. Fish provide a nutritious food source, medicinal products, income and livelihood options that improve health and food security, particularly for developing countries. Fish also support the functioning of the freshwater environment through regulating services such as biological and sedimentation regulation; supporting services such as playing a role in food web dynamics and supporting ecological balance; and cultural services such as being a cultural keystone species for cultural and spiritual identity and providing recreational fisheries. In the Lower Mekong Basin, inland fisheries were valued by FAO at USD 4.85 billion per year in 2014. Under development scenarios for hydropower and dam construction, fish catch could decline by 340 000 tonnes causing a loss of USD 476 million per year. Under hydropower development scenarios, losses in fish and their nutrients such as protein could not be replaced by current levels of livestock production.

Scientists[129] from the Inland Fisheries Research and Development Institute in Phnom Penh studied the economic value of fish in Cambodia and value added along the trade chain. They collected data in 2012-2013 in the Upper Mekong (Stung Treng and Kratie), the Tonle Sap floodplains (Pursat and Siem Reap), the Lowlands (Takeo and Svay Rieng) and in Phnom Penh. The study provided new information about the

[126] Baran E., Jantunen T. and Chong C. K. 2007 Values of inland fisheries in the Mekong River Basin. WorldFish Center, Phnom Penh, Cambodia. 76 pages.

[127] http://pubs.iclarm.net/resource_centre/WF-4074.pdf

[128] FAO 2018 Review of state of world fisheries. Source: Brugere, Lymer and Bartley, 2015 and Bartley, D.M., De Graaf, G.J., Valbo-Jørgensen, J. & Marmulla, G. 2015. Inland capture fisheries: status and data issues. *Fisheries Management and Ecology*, 22(1): 71–77

[129] Mille, G., Hap, N., & Loeng, N. 2016. *Economic value of fish in Cambodia and value added along the trade chain*. Phomh Penh, Inland Fisheries Research and Development Institute and WorldFish Center

monetary value of inland fish resources along the market chain. This information is needed to estimate the total market value of inland fisheries in Cambodia. The study found that:

(a) The species or species groups that generated the most value to fishers were not necessarily the same as for traders or exporters. Fish prices fluctuated with seasons (Figure 11).

(b) Fish was much more expensive in the Mekong zone than other zones, very cheap in the Tonle Sap floodplain zone and usually close to average in the lowland floodplain zone.

(c) Large volumes did not always correspond to high values. Gouramis (*Osphronemus*, *Trichopodus* and *Trichogaster* spp., i.e. trey kawmphleanh, trey kawnthor, trey romeas in Khmer), for example, represented 11% of sales volume but only 6% of the total value whereas Siamese mud carps (*Henicorhynchus* spp., trey riel) accounted for 5% and Bagrus catfishes (*Hemibagrus* spp.) 4% of volume with each making up 7% of the total value. Fishers appear to sell gouramis directly to consumers as these species are not among the top 10 species or species groups sold by traders or exporters.

(d) Prices for fishers and traders follow the same pattern with traders earning margins of around 50% (***Figure 11***). For exporters, the pattern is similar except during the dry season when fish is less expensive than during the main fishing season. The average price for exporters of $1 813/tonne is only more slightly than the price at the level of traders, meaning that exports add almost no value in the Cambodian fish market.

Another study[130] of the marketing system of inland fisheries products in Cambodia indicates that: (i) there is strong domestic demand not only for live fish but also preserved forms such as fish paste, fermented fish, salted-dried fish, smoked fish and fish sauce; (ii) all stakeholders in the inland fisheries marketing system – particularly fishers, *dai* owners, local collectors and local fish processors – operate without any organized information system regarding price, market demand or annual catch volumes. Therefore, they will be concerned by unsustainable fisheries only when they are affected individually; and the limited infrastructure (in terms of landing, storage, preserving, transport and retail facilities) for marketing and trading inland fisheries products affects market opportunities and can affect the sustainability of fisheries.

[130] http://pubs.iclarm.net/resource_centre/WF-4074.pdf i.e. Hap N., Un S., Nasielski J. 2016. A review of socioeconomic studies in the fisheries sector in Cambodia. Inland Fisheries Research and Development Institute (Fisheries Administration) and WorldFish. Phnom Penh, Cambodia. 14 pp.

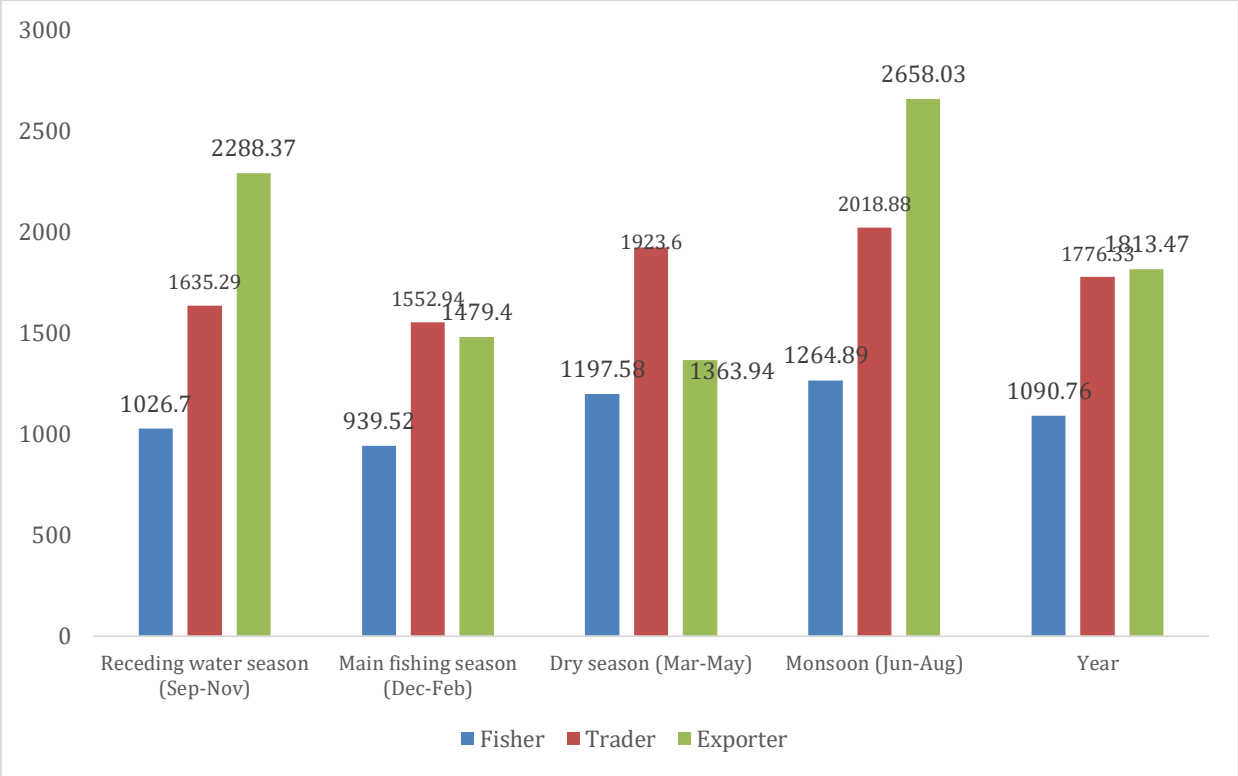


Figure 11: Evolution of fish prices (US$/tonne)

Source: Mille *et al.*, 2016[131]

A closer look at the value chain[132] indicates that:

(a) An informal market network with many intermediaries in the chain results in fish being transported extensively in the whole country. Processing is widespread in different areas, but the province of Battambang represents a processing hub. Major urban markets for farmed fish include the capital city Phnom Penh, and provincial capitals such as Ta Khmau (Kandal), Battambang, Siem Reap and Kampong Cham;

(b) The economic sustainability of the value chain (VC) in Cambodia is threatened by the low profits at farm-level, competition from neighbouring countries and high costs of inputs.

(c) Prices for farmed fish in Cambodia have seen a downward trend and this puts the long-term sustainability of the sector under pressure. Reliance on local resources (e.g., feeds in aquaculture) needs to be optimised;

(d) The natural fish is often used as the feed for the aquaculture because the cultured fish has higher market value. Cultured fish may threaten the livelihoods and food security of the poor, the small fish from capture being diverted from the human food to feeding high-value cultural stock[133]. Sociological aspects of the production and consumption are being considered to avoid creating food insecurity;

(e) Each of the cultural systems used particularly in aquaculture (e.g., ponds, cages, feeds), including the choice of cultured fish, has both socioeconomic and ecological advantages and

[131] Mille G., Hap N., Loeng N. 2016 Economic value of fish in Cambodia and value added along the trade chain. Inland Fisheries Research and Development Institute (Fisheries Administration) and WorldFish. Phnom Penh, Cambodia. 62 pp.

[132] VCA4D 2018. Aquaculture value chain analysis in Cambodia. EC. Accessible at *https://europa.eu/capacity4dev/value-chain-analysis-for-development-vca4d-/documents/study-brief-cambodia-aquaculture*

[133] FAO, 2011 *http://www.fao.org/fishery/facp/KHM/en*

disadvantages. Comparative studies are being conducted. The possible negative impacts need to be considered carefully to ensure that expansion of aquaculture and fisheries in general proceeds in a sustainable manner and with minimal or no negative impact on fish stocks, and on aquatic threatened species and vulnerable ecosystems. Introduction of exotic species that have proved invasive elsewhere such as tilapia[134], silver carp[135], common carp, bighead carp, grass carp, Mrigal, hybrid and African catfish require special care in their management, considering in particular prevention of escapes. Cages and pens can create navigational hazards and social disruption. Intensive ponds, extensive homestead ponds for shrimps and prawns, carps, catfish, milkfish, mullets and tilapias can become health risks to farm workers from waterborne diseases. Construction of ponds can require some destruction of ecosystems, especially mangroves. Integrated rice-fish farms can create competition from other users of inputs such as rice [husks]; and if pesticides are used for rice, they may accumulate in fish. Also, same as for ponds above

(f) Regarding inclusiveness, women are proportionately more represented in the semi intensive and small cage production systems than in the intensive ponds and large-scale cage production. Landless people can participate in aquaculture through cage production. These production systems could continue to create more inclusive opportunities. Inclusiveness is being further enhanced with interventions on credit and finance, technical information and advisory services for aquaculture made available to women and the youth.

Cambodia has increased its analysis of value chains as studies that assist in understanding ways for inclusive growth and socially and environmentally sustainability. In this framework, the EU supports the 'Cambodia Programme for Sustainable and Inclusive Growth in the Fisheries sector'.

6.2 Laws, strategies and policies

Laws and regulations are available, but enforcement can be limited due to insufficient financial and human resources.

A strong foundation of appropriate and enabling strategies, laws and policies is required to guide toward the sustainability of both freshwater fisheries and aquaculture. In the past three decades, the Royal Government has been striving to ensure that fish is available in sufficient quantities to all Cambodians, throughout the country and throughout the year. The Government enacted laws and adopted strategic plans and policies to ensure that the sustainability goal is reached. They include essentially:

(a) The *2006 Law on Fisheries,* which "aims to ensure fisheries and fishery resource management, enhance aquaculture development, the management of production and processing, and to promote the livelihood of people in local communities for the social-economic and environmental benefits, including the sustainability of the conservation of biodiversity and natural culture heritages in the Kingdom of Cambodia." This framework law provides guidance on a number of topics of relevance to the sustainable management of freshwater fisheries and aquaculture. The topics include for example: (i) Sustainability of Fishery Management (Articles 14 to 17 in Chapter 4); (ii) Fishery Protection and Conservation (Articles 18 to 25 in Chapter 5); (iii) Management of Mangroves and Inundated Forests (Articles 26 to 29 in Chapter 6); (iv) Management of Fishery Exploitation (Articles 30 to 38 in Chapter 7); (v) Inland Fishery Exploitation (Articles 39 to 44 in Chapter 8); (vi) Aquaculture Management (Articles 53 to 58 in Chapter 10) and (vii) Fishery Communities (Articles 59 to 63 in Chapter 11). The Law also proclaimed 1 July as "National Fish Day." Among the provisions that will ensure sustainability of freshwater fisheries and aquaculture, the following actions can be mentioned: eliminate over-fishing, reduce the levels of pollutants and limit new

[134] https://www.cabi.org/isc/datasheet/72086
[135] https://www.cabi.org/isc/datasheet/79036

settlements within the fishery domains; use scientific data to maintain fish stock, and increase knowledge on fisheries with the participation of local communities.

(b) In 2017, the Government amended some articles of the Law to limit the use of narrow fishing nets and introduce licences for some mechanised equipment and empower provincial departments of agriculture to enforce the Law. According to MAFF, in the first half of 2017, they investigated 1,653 cases of illegal fishing, of which 1,553 were on rivers and 100 at sea. The investigations led to the destruction of 704,432 metres of illegal fishing nets and 274 banned tools and issued about US $ 40,000 of fines.

(c) Regarding the dolphins, the government continued to enforce the ban on gillnets with the deployment of well trained and informed River Guards. The mortality rate continued to decline since the ban. Recent observations indicate nine deaths in 2015, six in 2016, and only two in 2017 with nine calves born in the same year. The results of a WWF/FiA census released in April 2018 show that the dolphin population in the Mekong has risen from 80 to 92 in the past two years.

(d) The Spatial Monitoring and Reporting Tool (SMART) was first introduced into Cambodia's Koh Rong Archipelago some 3 years ago. The tool combines GPS technology with software for measuring, evaluating and improving the effectiveness of wildlife law enforcement patrols and site-based conservation activities[136]. For example, rangers or site managers can record where they go and what they do. SMART then synthesises this information to produce easily understood and informative maps, statistics and reports for the best-informed decisions about the organisation of patrolling. It would be interesting to assess the suitability of the tool for inland fisheries.

(e) In its 2017 report, MoE presented an overview of fishery crime crackdown from 2103 to 2017 (Table 4)

(f) The Strategic Planning Framework for Fisheries: 2010-2019[137] (SPF) was fully adopted by the Royal Government of Cambodia, and subsequently integrated into the "Rectangular Strategy" for Growth, Employment, Equity and Efficiency Phase III (RS III) and the National Strategic Development Plan 2014-2018 (NSDP). Further, the Strategic Planning Framework for Fisheries is closely linked to the Agriculture Sector Strategic Development Plan (ASDP), of which the fisheries programme represents the National Fisheries Management Plan. Since the adoption of the Strategic Planning Framework for Fisheries the Royal Government of Cambodia has implemented significant reforms in the fisheries sector. Foremost among these was the "Deep Reform" in 2012, which abolished the remaining 80 fishing lots. This encompassed a transfer of rights and responsibilities to fisheries communities to co-manage the nations fisheries and closely related natural resources. The 2018 update of the Rectangular Strategy for Growth, Employment, Equity and Efficiency Phase IV, which calls for (i) the continuation of the conservation and wise management of fisheries resource through combatting fisheries crimes, improving the fishing community, and expanding aquaculture activities; and (ii) further protecting ecosystems, in particular natural areas, with emphasis on the protection of biodiversity in terrestrial, wetlands and coastal areas in order to ensure the quality of the land remains appropriate and water resources sustainable.

[136] *https://www.fauna-flora.org/news/a-smart-approach-to-marine-conservation-in-cambodia*

[137] The Strategic Planning Framework for Fisheries: 2010-2019 was updated to cover the period 2015 to 2024

Table 4: Status of fishery crime crackdown from 2013 to 2017

	2013	2014	2015	2016	2017
Provisional punishment (case)	225	408	418	385	116
Court settlement (case)	96	118	181	169	86
Destruction of evidence (case)	3 505	3 160	3 375	3 096	3 723
Total	3 826	3 686	3 974	3 650	3 925
Imprisonment (people)	133	152	85	101	56

Source: Ministries cabinet (2018). Summary report on the Achievements by the Royal Cambodia Government for 2013-2017

(g) The **Strategic Planning Framework for Fisheries: 2010 – 2019**[138], which sets out the Government's vision for the future of the fisheries sector in Cambodia and describes the goals that must be reached in order to implement it, with reference to the development goals (now in line with the Sustainable Development Goals), in line with the implementation of the National Strategic Development Plan, and in compliance with the Law on Fisheries. The framework also lays out the Royal Government's strategic priorities for sustaining and developing the fisheries sector. The Strategic Framework is very rich in the guidance toward sustainable freshwater fisheries and aquaculture. It highlights for example the strategic needs to:

- Take into consideration that (i) aquaculture, at small, medium and large-scales, and rice fisheries have the potential to very significantly increase production to maintain food security levels, increase employment opportunities and fuel an export drive; (ii) the development, management and conservation of fisheries cannot be considered in isolation from other sectors' influences and from neighbouring countries with whom Cambodia shares some waters; (iii) where appropriate and necessary, establish cross-departmental task forces to address major potential threats to the water resource, such as hydropower damming, pollution and climate change; and (iv) the development of alternative livelihoods outside of fisheries has the dual benefit of drawing people away from fisheries to enhance management and increase individual benefits from fisheries, and also to create greater rural wealth and prosperity which will feed back into rural households;
- Develop partnerships with NGOs and the private sector to jointly deliver services to communities and Commune Councils; work to harmonize plans and actions with the Development Partners through the Technical Working Group on Fisheries (TWGF); and use the Council for the Development of Cambodia (CDC) to co-ordinate the policies, plans and actions of those Ministries, Departments, Agencies and Institutes that use or affect the water resource.

(h) The Strategic Planning Framework for Fisheries 2010–2019 contains some clear enabling targets of importance for the sustainable management of fisheries: (i) by 2019, wild fish capture production is stabilized and sustained at not more than 500,000 tonnes per year; rice field fish production is increased by 15 percent annually, to reach 500,000 tonnes; aquaculture production is increased by 15 percent annually, to reach 185,000 tonnes per year; at least 1,200 communes (75% of total) have a sustainable and effective fish refuge by the end of 2019; and at least 40 of the 97 Upper Mekong deep pools are effectively protected and conserved and at least 80% of Great Lake fish sanctuaries are improved through boundary demarcation, protection and public awareness by the end of 2019; (ii) at least 85,000

[138] *http://extwprlegs1.fao.org/docs/pdf/cam143042.pdf*

trained fish farmers are actively engaged in aquaculture by the end of 2019; (iii) fish seed production is increased to 250,000,000 per year by the end of 2019; (iv) a surveillance, monitoring and control system for fish disease outbreaks is developed and implemented as soon as possible; and (v) research and development to identify commercially viable production of indigenous species. As noted in the MoE 2017 report, the freshwater and marine water resource research has been smoothly conducted in close cooperation with development partners such as EU, JICA, MRC, FAO, NACA, SEAFDEC, World Fish Center etc. with Fresh and Marine Water Research Institution being the direct implementer. The findings of the research have been printed in thousands of books and hundreds of thousand posts;

(i) 2017 Mekong Basin-Wide Fisheries Management and Development Strategy 2018-2022[139]. Its objective is to facilitate and implement sustainable fisheries management and development across the Mekong Basin.

6.3 Development of Community Fisheries[140]

Community Fisheries-based management officially commenced in late 2000 after the Royal Government of Cambodia initiated a broad reform of the fishing sector to improve the management of local fisheries and ensure local food security. With the abolishment of the fishing lots in 2012, some of the decommissioned lots were transferred to Community Fisheries and some became fishery conservation zones. In total, the Government had transferred more than 1 million hectares of private concessions to Community Fisheries (CFi). This historic landmark for freshwater resources management in Cambodia represents a shift from centralism and private ownership to decentralization and community-based management in line with Cambodia's Rectangular Strategy. Until 2017, the Ministry of Agriculture, Forest and Fisheries created 516 Community fisheries with total members of 332,168 persons (35% of women) from 475 households. Among those community fisheries, 475 are inland while 41 are marine. CFi are established to improve management and use the fishery resources in a sustainable manner. 408 out of all community fisheries were already registered at the Ministry of Agriculture, Forestry and Fisheries. With the community fisheries, 496 areas were developed to the conservation zones with boundary demarcation of 4,988 poles and 242 conservation boards. The community fisheries management is the decentralized management system of the Royal Government of Cambodia to delegate sufficient rights to the fishery people to manage their own fishery areas. Figure 12 gives an idea of the distribution of CFi in Cambodia. The success of the community fisheries reforms in Cambodia have received international attention both regionally, with an ASEAN workshop show-casing the success of the reforms, and globally.

As noted by MAFF bin its 2017 Annual Report, community Fisheries are faced with challenges such as: (i) the limited capacity of CFis members, (ii) the lack of a proper source of income for CFi committees to carry out their activities, and (iii) the lack of personal incentives for CFi members to actively participate in management activities. The government invested a lot of efforts to support Community Fisheries essentially through (i) the formulation of policies and a regulatory framework, (ii) human resource development and capacity building, as well as stock enhancement (in particular through the establishment of conservation zones and crab banks run by the Community Fisheries), and (iii) the implementation of an alternative livelihoods program. Through Partnership, the Government was able to mobilize additional funds. Cambodia is now in a lead position to experiment and ultimately achieve sustainable management of fisheries resources by small scale fishers through Community Fisheries.

Responding to a request made by the Government, Fisheries Administration officers in all the provinces created 825 community fish refuge ponds by 2016 and Kampong Speu province had the highest number

[139] http://www.mrcmekong.org/assets/Publications/BFMS-Feb20-v-Final.pdf

[140] MAFF 2017 Annual Report and Ministries cabinet (2018). Summary report on the Achievements by the Royal Cambodia Government for 2013-2017

with 173 CFRs**.** The fish refuge ponds contribute to the increase in rice field fisheries.

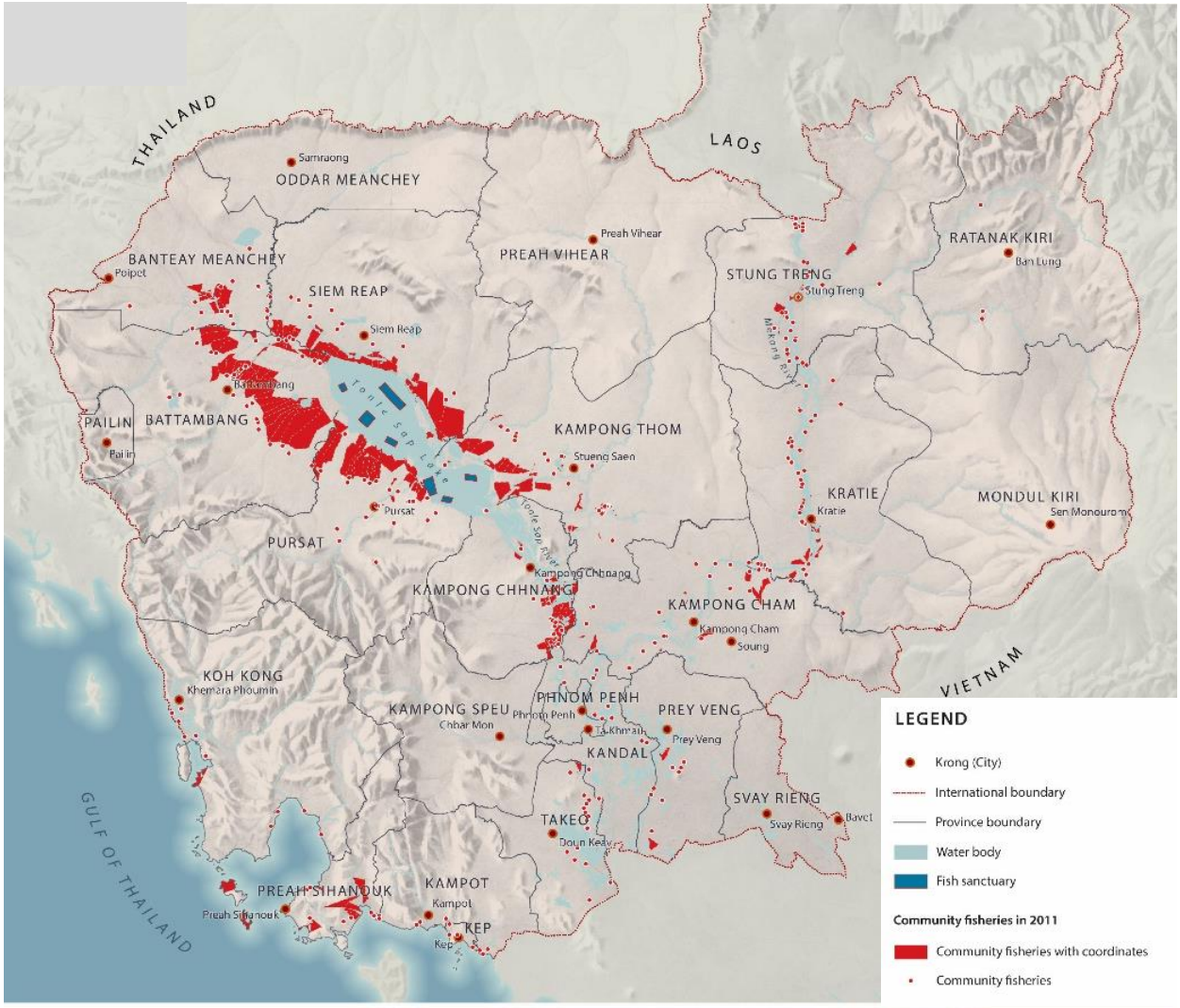


Figure 12: Distribution of community fisheries and fish sanctuaries in Cambodia (2011)

Source: Save Cambodia's Wildlife. Atlas of Cambodia: maps on socio-economic development and environment. Second ed. Phnom Penh, 2014. Print. Date created: 4 Feb 2013. Processes: Data were provided to Open Development Cambodia directly by Save Cambodia's Wildlife's 2013 Atlas Working Group in JPEG format

6.4 Fisheries conservation areas

After the cancelation of all fishing lots in 2012, 50 new fishery conservation zones (97,583 hectares) were established. In 2016/2017, there were 644 fishery conservation areas including the community fisheries. In addition, since 2013, 161 poles of 8-meter height and 72 poles of 12-meter height had been set to mark the fishery conservation areas. Twenty-five floating posts, 8 concrete offices and 4 large floating offices (ferries) were built. The fisheries conservation activities include but are not limited to: conservation of coral reefs and sea grasses within an area of 4,050 hectares; the re planting of 3,092 hectares of flooded forests and mangroves; installation of 109 hectares of mangroves; preparations of holes for fish breeders in 97 areas along the Mekong river; and conservation of threatened species such as mangrove terrapins or estuarine terrapins (*Batagur baska*), sea turtles, Asian giant soft-shell turtles (*Pelochelys cantorii*), Siamese crocodiles (*Crocodilus siamensis*), freshwater dolphins/Irrawaddy dolphins (*Orcaella brevirotris*), marine dolphins and seahorses (*Hippocampus spp*.). Their numbers increased between 10 and 15%.

As a follow-up to the adoption of the Strategic Planning Framework for Fisheries: 2010 – 2019, the FiA established additional 50 conservation areas after the cancelation of the fishing lots. Eight Tonle Sap fisheries conservation areas totalling 22,500 ha were established and approximately 726,221 ha of flooded forest around the Tonle Sap were planted to serve as breeding ground for multiple aquatic lives. FiA also encouraged community participation in replanting the flooded forest. Alongside, 27 patrolling stations were built.

Cambodia is participating in the SEAFDEC/UNEP/GEF Project: "Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand[141]." The long-term objectives of the project are to contribute to: (i) improved integration of habitat and biodiversity conservation considerations in the management of fisheries in the South China Sea and Gulf of Thailand; (ii) improved national management of the threats to fish stock and critical habitat linkages within fisheries refugia; and (iii): enhanced uptake of good practice in integrating fisheries management and biodiversity conservation in the design and implementation of regional and national fisheries management systems. Although the focus of the project is on seas, lessons learnt will be useful for inland fisheries.

6.5 Aquaculture – further development

In partnership with non-governmental organizations, the FiA organized many awareness raising and capacity-building sessions for a sustainable fish aquaculture. Aquaculture production of fish is increasing steadily (Figure 13). The aquaculture development includes shrimp and fish fattening. As a result, in 2017, aquaculture yielded 207,433 tons of fish, an increase of 34,943 tons compared to 2016. 392,000 crocodiles were fattened, an increase of 85,777 heads. Fishery breeders increased by 11 million heads compared to 2016. In addition, 309 fish breeding places were developed throughout the country with technical aspects being provided by the Fishery Administration and 864 community fish ponds were developed while rice field fisheries were on the rise.

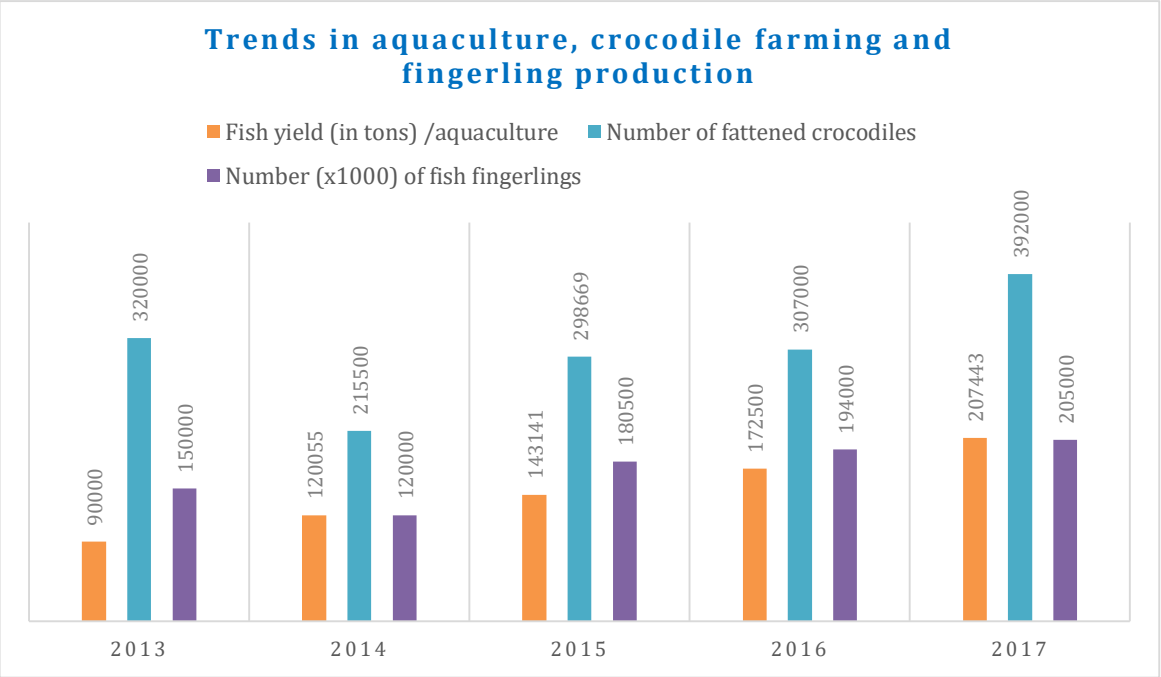


Figure 13: Trends in aquaculture, crocodile farming and fingerling production

Source: Annex to document Ministries cabinet (2018). Summary report on the Achievements by the Royal Cambodia Government for 2013-2017

[141] https://fisheries-refugia.org/documents/07-FR-Inc-Purpose-Goals-Objective-cp.pdf

The FiA and the Agence française de développenment are seeking institutions that can undertake the Cambodia Programme for Sustainable and Inclusive Growth in the Fisheries Sector: Aquaculture component (CaPFish Aquaculture)[142]. The programme will address constraints in the aquaculture sector in order to increase food security, improve nutrition and foster further economic development. This program is fully aligned to the National Aquaculture Development Strategy (NADS) and the updated Sector Planning framework for Fisheries (SPF) 2019-2025.

6.6 Selected specific measures

In order to support the management and development of fisheries in the country, the Government undertook since 2012 the following constructions: Samdech Hun Sen Research and Aquaculture Institute, Marine Aquaculture Research and Development Center, Freshwater Fishery Research Center. Preparation to build a marine fishery research and development center is under way.

Government and Conservation International

Since 2013, the Government has designated more than 20 fish sanctuaries across the Tonle Sap where people are prohibited from fishing. These no-take zones strengthened the resilience of the lake's ecosystem and helped regenerate fish stocks. In support of these FiA's actions, Conservation International is partnering with the Fisheries Administration and local authorities to patrol fish sanctuaries, also called fish conservation areas (FCAs). Together with the Cambodian government, CI trains rangers on GPS use and wildlife law, as the lake is home to otters and endangered water birds such as milky storks. Conservation International provides rangers with patrol boats and other equipment, including fuel, GPS units and binoculars. Conservation International currently supports two fish conservation areas. As a result of the patrolling, between 2010 and 2016, instances of illegal fishing decreased by half in target areas; and since January 2018, rangers in Kompong Prak have responded to more than 50 incidents of illegal fishing and have sent multiple offenders to court.

In addition, CI is helping local community members, particularly women, to improve their livelihoods by developing and managing sustainable fish-processing businesses. Also, to ensure long-term local communities' financial stability, Conservation International set up a community trust fund with an initial US$ 5,000 capital investment, which produces about 10 percent interest annually. The community uses the interest to support patrols and other conservation activities, such as creating a fishery management plan and replanting more than 160 hectares of the seasonally-flooded forest. As part of the work in this area, Conservation International is assessing the feasibility of implementing an entrance fee that community fisheries can charge non-community members to fish in their zones. These efforts are yielding results. In in Srey Choek for example, the minimum catch tripled between 2010 and 2015.

Fisheries experts from Cambodia and Lao PDR monitor fish stocks regularly in transboundary waters. They assessed last November progress in fish monitoring activities and agreed on a 10-percent increase in fish abundance in the Mekong and Sekong Rivers by 2021 and essentially by reducing illegal fishing activities in the transboundary conservation pool by 50 percent and eliminating the use of a traditional but illegal fishing gear by 80 percent.

The institution of community fisheries (CFi) organizations in Cambodia provides an interesting case for the empowerment of small-scale fisheries. According to the data from the Community Fisheries Development Department (CFDD) there were 507 CFi institutions in Cambodia in 2015. A study was carried out to understand among other things how CFi can manage fisheries domains sustainably.

Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines, FAO, 2015) were produced and endorsed by the FAO Committee on

[142] The terms of reference are accessible since 2018 at *https://afd.dgmarket.com/tender/20236506*

Fisheries in July 2014[143]. This internationally negotiated and agreed instrument complements the FAO Code of Conduct for Responsible Fisheries.

In addition, as noted in the annex to the Ministries cabinet (2018). Summary report on the Achievements by the Royal Cambodia Government for 2013-2017, the Fishery Administration undertook the following:

(a) Prepare a Prakas on quality symbol of fishery products, manual on fishery product exportation, technical principles on good sanitation practices, good product standards, AHCCP principles, practice team of shrimp, dried shrimp and crab meat and fish source processing; and

(b) Build its officials by means of provision of training on analysis methods and sample collection for quality analysis, chain of fishery values and raise the awareness of the fishery processors and other concerned individuals about good sanitation and product practices and expand the marketing system via the expansion of 21 fishery processing communities and strengthen the policy of one-window office to provide effective public services to support and facilitate the private sector.

Many governmental, intergovernmental development, aid agencies and NGOs came forward to help the Fisheries Administration (FiA) or assist the communities in their collective efforts to sustainably manage fisheries.

Conservation International

Conservation International (CI) is carrying out various projects that are contributing to the sustainability of freshwater fisheries and aquaculture:

(a) CI is working directly with communities in Tonle Sap's floating villages to promote sustainable use of resources and support sustainable fishing and fish processing practices;

(b) CI and partners continue to replant and protect flooded forests in order to increase wildlife habitat and improve fishery productivity. With government and community ranger patrols, CI contributes to the prevention of illegal fishing;

(c) CI hosts education sessions with the local communities to raise awareness about climate change impacts and possible ways to mitigate these threats and ensure sustainability of fisheries;

(d) CI is working to improve the economic well-being of women involved in fish processing in Pursat province — while also ensuring their sustainable use of the natural resources needed in their work. By June 2016, CI's women's fish processing project had trained almost 200 women;

(e) CI is informing about alternative businesses and supporting the savings groups, in which community members pool their money and provide each other with loans that enable members to invest in new business ventures.

Wetlands Alliance and Corine

Wetlands Alliance and Corine are supporting the establishment of crab banks. Crab banks, which are a tool for locally-based sustainable resource management and livelihood development. Crab catch has been steadily decreasing over the years in coastal Cambodia due to overfishing. Increasing population and number of people engaged in fishing, and the use of modern fishing tools such as ironed-frame crab trap have contributed to increased exploitation and declining resources. To address this issue, local fishers in Kampot and Kep in Cambodia established Crab Banks[144] after learning from the experiences in Thailand. The Wetlands Alliance Program and CORIN is providing support to help the local fishers who are members of local Community Fisheries Group (CFi) in the establishment of crab banks.

[143] http://www.fao.org/3/a-i7206e.pdf

[144] The idea of a crab bank is such that the gravid female could be kept in cages for a few days until they spawn. After releasing the eggs, they are fattened and sold to the market.

Global Nature and FACT

Global Nature[145] established a demonstration fish facility to train the fishers in the methods for the sustainable management of fisheries; created two environmental clubs involving 50 local fishers (33 women among them) committed to sustainable use of the lake resources. Their participation in environmental education activities and information about alternative fishing methods contribute to the promotion of sustainable behaviour among local fishers

In order to reduce the communities' dependence on fishery and take off the pressure on the fisheries ecosystems, GNF and FACT developed eco-tourism strategies and trained selected fishers' families to start new businesses. In addition, FACT[146] received financial support from the EU for implementing a three-year (January 2016 to December 2018) project titled "Strengthening Capacity of Fishers' Network and NGO coalition towards fisheries resources sustainability and ownership in Mekong and Tonle Sap regions (SFiN - NGO)." The SFiN -NGO specific objective is that "Grassroots Cambodian fishers and communities in Cambodia's Mekong and Tonle Sap are well strengthened and empowered to protect and conserve fisheries resources in sustainable manner".

Between 2016 and today, FACT successfully brought NGOs together for better coordination, cooperation and engagement with the government, NGOs are important stakeholders in the fisheries sector, bringing resources to the management of fisheries resource. Establishment of the fish conservation areas of Bak Rotes and Dei Roneath seems to effectively improve fish stocks and catch in the community fisheries area around the conservation areas. Fisheries patrolling supported by EU has been reinforced. This has helped.

The Government co-organized with FAO a forum on "Tenure and Fishing Rights 2015: A Global Forum on Rights-based Approaches for Fisheries" in Siem Reap, in March 2015[147]. The purpose of the forum was to foster mutual understanding of the challenges facing fisheries stakeholders and to find common ground and options for empowering fishers and fisheries now and in the future. Participants identified various practices and lessons learned based on their own experiences in a wide range of fisheries and rights-based management systems. Case studies presented at the forum featured both developing and developed countries and included testimonies of individually based and community-based fishing rights.

[145] *https://www.globalnature.org/35101/Themes-Projects/Sustainable-Development-Development-Cooperation/References/Fishery-Cambodia/resindex.aspx*
[146] *https://app.box.com/s/xfvio2sv7dp8cjbhnx50frr0u5ufawlb*
[147] FAO 2016 *http://www.fao.org/3/a-i5555e.pdf*

Annex T4.1: List of endangered and critically endangered fish species in Cambodia

(from a list of 46 native threatened species). **Source**: FishBase accessed on 14 January 2019 (*https://www.fishbase.de/Country/CountryChecklist.php?c_code=116&vhabitat=threatened&csub_code=*)

Species	FishBase name	Threat Category
Aaptosyax grypus	Giant salmon carp	Critically Endangered (CR)
Catlocarpio siamensis	Giant barb	Critically Endangered (CR)
Datnioides pulcher	Siamese tiger perch	Critically Endangered (CR)
Pangasianodon gigas	Mekong giant catfish	Critically Endangered (CR)
Pangasius sanitwongsei	Giant pangasius	Critically Endangered (CR)
Pristis zijsron	Longcomb sawfish	Critically Endangered (CR)
Ambastaia sidthimunki	Dwarf botia	Endangered (EN)
Balantiocheilos melanopterus	Tricolor sharkminnow	Endangered (EN)
Eusphyra blochii	Winghead shark	Endangered (EN)
Laubuka caeruleostigmata	Leaping barb	Endangered (EN)
Pangasianodon hypophthalmus	Striped catfish	Endangered (EN)
Probarbus jullieni	Isok barb	Endangered (EN)
Probarbus labeamajor	Thicklip barb	Endangered (EN)
Rhincodon typus	Whale shark	Endangered (EN)
Scleropages formosus	Asian bonytongue	Endangered (EN)
Sphyrna lewini	Scalloped hammerhead	Endangered (EN)
Sphyrna mokarran	Great hammerhead	Endangered (EN)
Stegostoma fasciatum	Zebra shark	Endangered (EN)
Urogymnus polylepis	Giant freshwater whipray	Endangered (EN)
Aetomylaeus nichofii	Banded eagle ray	Vulnerable (VU)
Bangana behri		Vulnerable (VU)
Betta splendens	Siamese fighting fish	Vulnerable (VU)
Carcharhinus longimanus	Oceanic whitetip shark	Vulnerable (VU)
Chaenogaleus macrostoma	Hooktooth shark	Vulnerable (VU)
Cirrhinus microlepis	Small scale mud carp	Vulnerable (VU)
Cromileptes altivelis	Humpback grouper	Vulnerable (VU)

NATIONAL TARGET 5 ON SUSTAINABLE MANAGEMENT OF AREAS UNDER FORESTRY

Target 5:
By 2020 the majority of areas under forestry are managed sustainably, ensuring conservation of biodiversity, sustainable development, poverty eradication and improved well-being.

1. Introduction

1.1 Scope of the subsection

As stated in the different phases of the Rectangular Strategy, the strategic goal of the Royal Government of Cambodia is to strike a balance between the socioeconomic development of the country and the conservation of its natural assets through the development of sustainable as well as highly productive agriculture and forestry, and environmentally friendly tourism, mining and industry sectors, along with the protection and development of the national cultural heritage.

Forests provide people with diverse material (e.g., timber, fuel wood and charcoal), non-material (e.g., tourism, recreation, aesthetic, non-use values) and regulating (flood and erosion control; carbon sequestration and storage) contributions. However, forests are under a lot of pressures. The National Forest Programme, the National Biodiversity Strategy and Action Plan (NBSAP), and other national strategic plans contain specific targets toward sustainably managed forests for poverty reduction and sustainable development. Targets relating to forests as well as mangroves in the NBSAP include that by 2020: (i) the majority of areas under forestry are managed sustainably, ensuring conservation of biodiversity, sustainable development, poverty eradication and improved well-being (target 5); (ii) 10 % of forest ecosystems including mangroves that have been under a lot of pressures in recent years are in an advanced state of restoration and are providing enhanced services, particularly to local communities' and indigenous ethnic minorities' women, old persons and children (target 6); (iii) pressures on forests from human activities, including in particular unsustainable production and consumption activities (target 7), habitat degradation and fragmentation, pollution, sedimentation, overharvesting, introduction of invasive alien species and their climate change (targets 12, 15, 16 and 18) are significantly reduced; (iv) currently unprotected forests of particular importance for biodiversity and ecosystem services that are under a lot of pressures from human activities are identified and integrated in the protected area system (target 8); (v) protected forests have management plans and have started effective implementation (target 8); (vi) protected forest areas and conservation forest areas have been valued, are part of a well-connected protected area system and have been integrated in national sustainable development goals and national green growth strategies, plans and programmes (targets 1, 3 and 8); (vii) Payment for Ecosystem Services (PES) is used as an incentive for the conservation and sustainable use of forest biodiversity (target 9); (viii) forest ecosystem resilience and contribution to carbon stocks have been enhanced through conservation and, if degraded, restoration, thereby contributing to climate change mitigation and adaptation and to combating desertification (target 15); (ix) the rate of loss of natural forests is at least halved (target 12); (x) forests serve for in-situ conservation of wild relatives of genetic diversity and contribute to the improvement of the status of all threatened species of fauna and flora (targets 10 and 20). In addition, in line with the National Forest Programme[148], the NBSAP calls for the protection of 3.0 million hectares of forest by 2029 (target 8)

[148] http://www.cdc-crdb.gov.kh/cdc/documents/Sector_Strategy/6_Forestry_Reform/National_Forest_Programme_2010_2029_Eng.pdf

1.2 Main findings from the 5th National Report on restoration of ecosystems under a lot of pressure

Based on the following indicators: (i) proportion of harvest from agriculture, aquaculture and forestry has been sustainable practiced and increased, (ii) area of land for agriculture, aquaculture and forestry has been sustainably managed and increased, and (iii) number of certified (qualification & environment) products, the Fifth National Report concluded that the target was implemented only partly.

2 Overview of progress towards the achievement of Cambodia Biodiversity Target 5 on sustainable management of areas under forestry

Status of progress	Comments
☐On track to exceed target ☐On track to achieve target ☒Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	**Sustainable management of areas under forestry, agriculture and animal production (Target 5)** In 2014, the country's forest cover was equivalent to 48.49% of the country's total area. Forest cover declined to 48.14% of the country's land area in 2016 i.e. 8,742,401 ha (including rubber plantation, palm oil plantation and other perennial crops). Forests ecosystems are under a lot of pressures essentially from clearance for agriculture, settlement expansion, infrastructure development, illegal logging, and unsustainable harvesting of wood fuel. The rate of decline slowed down between 2014 and 2016 (decline of 0.67% annually) as compared to the rate between 2010 and 2014 (decline of 1.90/year), which was attributed to the reforms by the government in forest management as well as the effective participation of local communities, armed forces and authorities at all levels that prevented some deforestation. Measures taken during the reporting period to promote sustainable management of forests include: (a) With regard to legislation, strategies and policies: The 2016 jurisdictional reform of the Ministry of Environment (MoE) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) strengthened sustainable natural resource management, and effectiveness and efficiency in managing forest resources. The reform included the transfer of all protected forests and fisheries to MoE for their integration in the country's protected area system. Protected areas are governed by the Protected Area Law and have recently benefitted from guidance on ways to enhance sustainable management from the 2017 National Protected Area Strategic Management Plan. The_Production Forest Strategic Plan 2018-2032 is also guiding the future development and sustainable management of production forests for their contribution to poverty alleviation, livelihoods and economic growth. Cambodia's Land Degradation Neutrality plans under the United Nations Convention to Combat Desertification[149] and Nationally Determined Contributions to Climate Change provide additional guidance on sustainable forest management. There are still challenges that must be resolved. One of

[149] https://knowledge.unccd.int/sites/default/files/ldn_targets/Cambodia.pdf

	the principal concerns is the continuing decline in the country's forest cover, which resulted essentially from recent increases in agricultural land to respond to increasing demand domestically and internationally. (b) Cambodia believes that a better knowledge of the multiple values of its forests, including mangrove forests, will enable decision-makers and all the stakeholders to manage forests in a more sustainable manner. In 2014, a study was undertaken to assess existing information on valuation of multiple benefits provided by standing forests in Cambodia. (c) In addition to the protected forests that were transferred to MoE from MAFF, Cambodia designated a large number of new protected areas and conservation areas including community-based forests, representing approximately 4.5 million ha. In 2017, Cambodia counted 610 community forests (CF), of which 464 were registered and 153 Community Protected Areas covering over 24,410 ha. Community forests give an opportunity to local communities to take care of forests, on which their livelihoods depend. However, studies indicate that more actions are needed to curb illegal selective logging of valuable timber trees. FA/MAFF reported to have completed in 2016 the permanent forest demarcation with concrete poles in Kampong Thom, Pursat, MundulKiri and Prey Veng. This work needs to be continued including zoning within protected areas; (d) Sustainable forest management (SFM), REDD+ and biomass energy: A lot of experience and lessons were gained through the UNDP/GEF funded project carried out from 2011 to 2015 across Kampong Speu, Kampong Chhnang, Pursat and Battambang on "Strengthening SFM and bioenergy markets to promote environmental sustainability and to reduce greenhouse gas emissions in Cambodia." The project strengthened community-based SFM among Community Forests (CFs) and Community Protected Areas (CPAs) and increased the production and marketing of improved wood stoves for reduced fuelwood use and reduced greenhouse gas emissions. In 2017, UNDP funded research work to identify the best conditions for the promotion of sustainable fuelwood and charcoal production and consumption in Cambodia; (e) Some forest restoration projects took place between 2014 and 2018. The total areas covered by these projects is below the 10% targeted in Cambodian National Target 6. A field-testing of methodologies to empower community organizations to implement participatory landscape planning and enhance resilience at the community level is still ongoing as part of COMDEKS[150] programme under the International Partnership for the Satoyama Initiative; (f) Awareness-raising initiatives with several partners. In brief, Cambodia has reached or is on track to reach some elements of the targets (e.g., required legislation, strategies and policies are in place, Cambodia's protected area system covers many forests). However, more effort is required to halt the decline in forest cover, restore lost and degraded forests, enforce Protected Area Law more efficiently and improve forest management.

[150] The 'Community Development and Knowledge Management for the Satoyama Initiative' is a UNDP-led programme.

3. Status, past trends and future dynamics

In 2016, the country's forest cover was about 8,742,401 ha, equivalent to 48.14 % of the country's total area. In the context of the National Forest Program and for use under Cambodia REDD+, forests are classified as evergreen forests, semi-evergreen forests, deciduous forests, flooded forests, mangrove forests, rear mangrove, pine forests and bamboo forests (see Figure 14 and

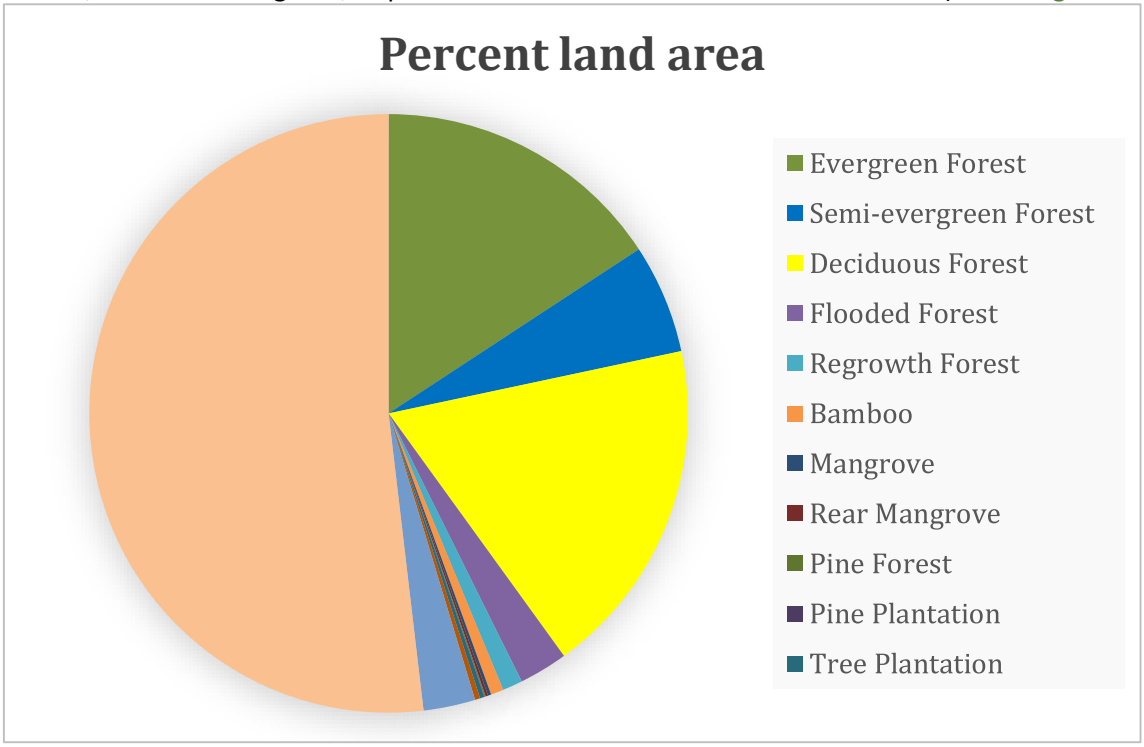


Figure **15**). Forests can be found in all the provinces and different types are distributed unevenly. Provinces with the highest forest coverage in 2016 are in hilly districts such as Preach Vihear (1,403,087 ha), Mondul Kiri (1,366,892 ha) and Kampong Thom (1,244,763 ha). Areas with the lowest forest coverage are Kep (15,173 ha) and the capital Phnom Penh with (37,374 ha)[151].

[151] *https://redd.unfccc.int/uploads/54_3_cambodia_forest_cover_resource__2016_english.pdf*

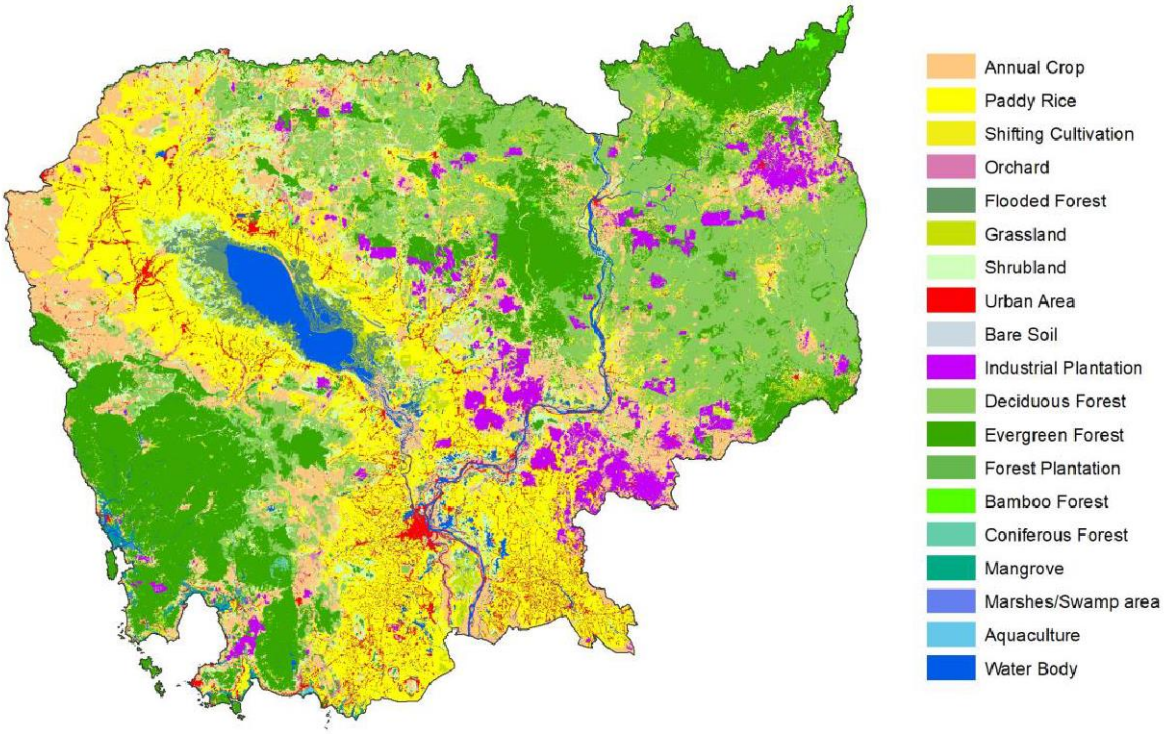


Figure 14: Land cover/land use map of Cambodia

(2015. **Source**: WCS document 2017 DSS Report for UNDP)

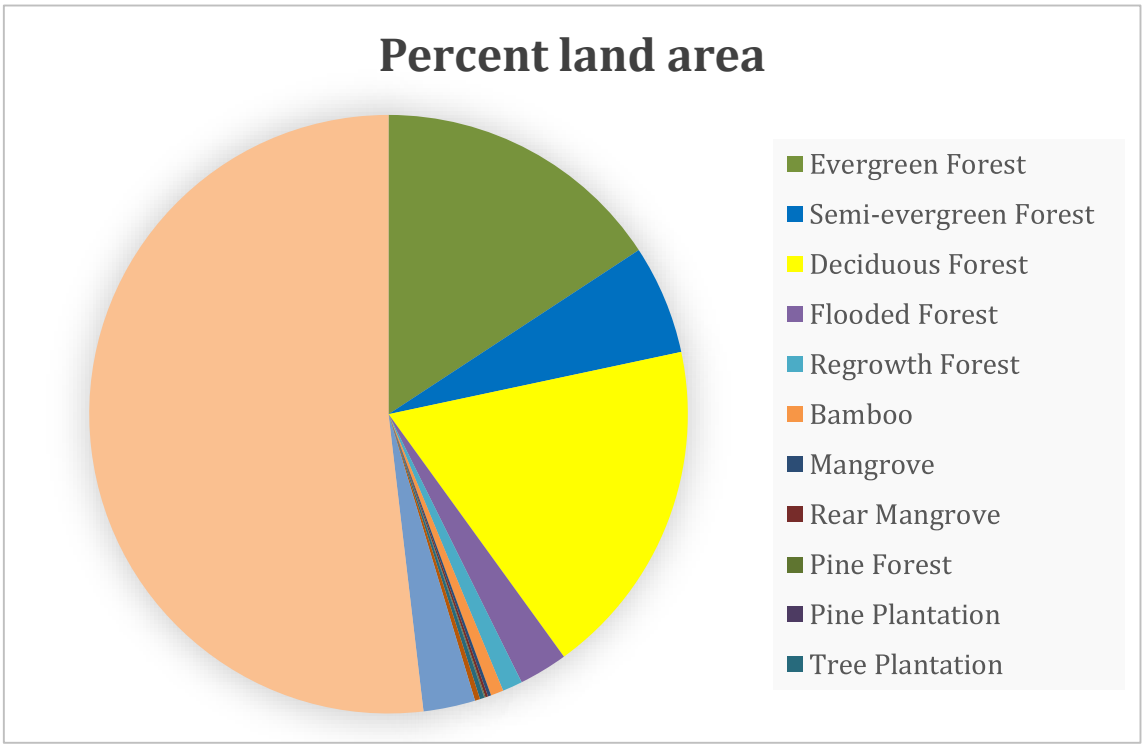


Figure 15: Area of forest types and non-forest land cover in 2016, in percent of total land area
(Source: *https://redd.unfccc.int/uploads/54_3_cambodia_forest_cover_resource__2016_english.pdf* Table 1. Statistics of National land use/cover 2016. Note: Total land area used is of 18,160,670 ha)

In 2015, FAO[152] reported 322,000ha of primary forests[153], 9,066,000 ha of other naturally regenerated forests, 69,000 ha of planted forests[154] and 50,000 ha of mangroves (Figure 16). In addition to rubber plantations considered in the FAO assessment, there are additional plantations consisting of oil palm and other unspecified tree plantations.

Forests face many threats, including logging, fragmentation and conversion to agriculture. The main drivers underlying these threats are increasing populations (with related increasing demand for natural resources and space) and diverse activities needed for economic development (e.g., expansion and establishment of garment factories, rubber plantations, tourism). The coverage of primary forests declined and stabilize from 2005 while other naturally regenerated forests and mangroves declined steadily as shown in Figure 16. Figure 17 indicates that the threats impact each type of forests differently. For example, evergreen forests and deciduous forests were more impacted than flooded forests or mangroves between 2014 and 2016. **Error! Reference source not found.**, prepared in the framework of Cambodia's rogramme on REDD+, shows that between 2014 and 2016 the most significant losses in forest cover types were deciduous forest (- 0.80%), evergreen forest (- 0.62%), semi- evergreen forest (- 0.20 %) and regrowth forest (- 0.18 %).

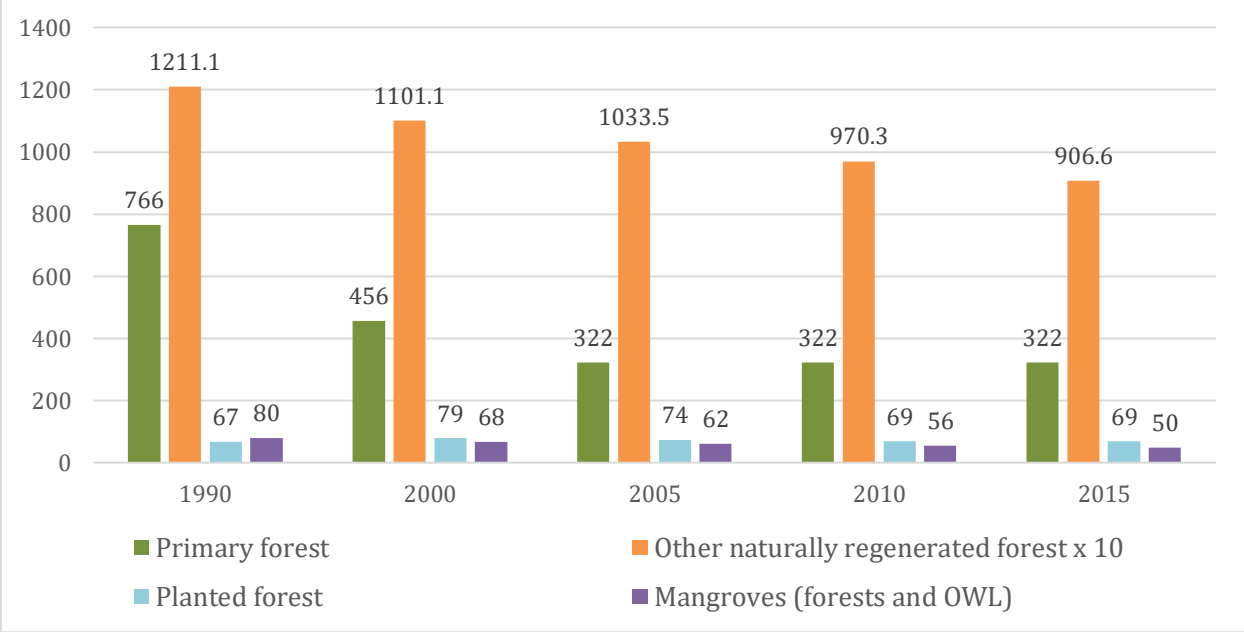


Figure 16: Trend in the coverage of primary forests, other naturally regenerated forests, planted forests and mangroves from 1990 to 2015 (x 1000 ha)

Note that values for 'other naturally regenerated forests' are to be multiplied by 10. (Source: Forest Resources Assessment, 2015: Section 2.4 Data Table 2a)

The average annual loss rate from 2014 to 2016 is estimated at about 0.67 %, equivalent to 121,328 ha of the forest land.[155] Figure 19 presents forest cover decline from 2002 to 2016. The decline increased significantly between 2010 and 2014 by about 7.59 % with average annual decline of 1 84 %. The assessment indicated a forest change rate from 2014 to 2016 of - 1.34%, with an average annual value of 0.67 % compared to the country's total land area. The lower forest cover loss between 2014 and 2016 as compared to 2010 – 2014 was due to the effective reform in forest management by government as well

[152] http://www.fao.org/3/a-i4808e.pdf
[153] Some parts of primary forest are disturbed by human activities; therefore, the primary forest area is reduced (FAO).
[154] All the planted forest areas are considered as rubber plantations (FAO)
[155] https://redd.unfccc.int/uploads/54_3_cambodia_forest_cover_resource__2016_english.pdf

as participation of local communities, armed forces and authorities at all levels to prevent deforestation. Data on annual forest cover loss shows the same trend (***Figure 21***). Loss of forest cover was expressed in terms of carbon emissions in ***Figure 20***.

Some scientists[156] projected forest cover loss for 2020 and 2030 based on continuing trends from 2006-2010 data from Forestry Administration. They found that some provinces such as Battambang and Oudor Meanchey would experience much larger changes in forest area than others with high negative impacts on their economies and human well-being. While it is acknowledged that the benefits of carbon storage are primarily global, it is expected that the benefits will accrue to land users/owners in Cambodia when an international climate agreement enables payments for avoided carbon emissions. Cambodia is among the countries actively involved in REDD+. Information on the economic value of future land use change calls for careful management of Cambodia's forest resources.

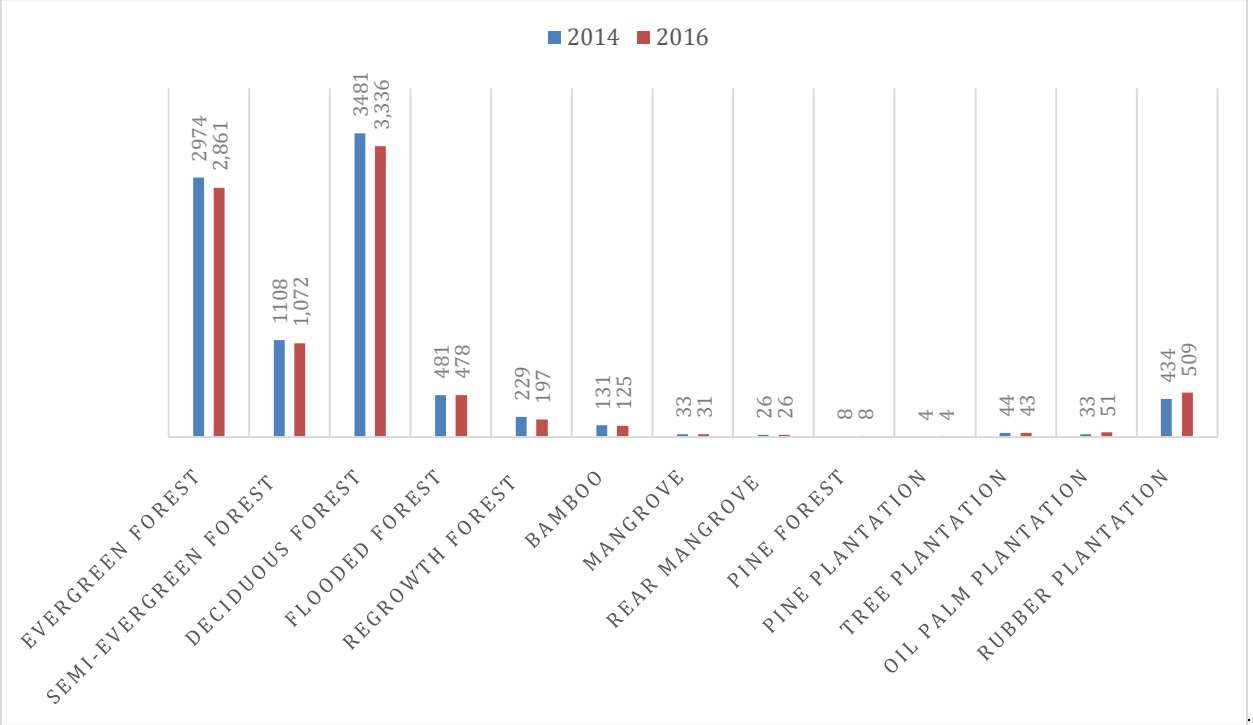


Figure 17: Forest land cover change 2014-2016 by forest type (in x 1000 ha)

(**Source**: GDANCP 2018. Cambodia Forest Cover 2016. MoE, Cambodia. Accessible at *https://redd.unfccc.int/uploads/54_3_cambodia_forest_cover_resource__2016_english.pdf)*

[156] For example, *http://lukebrander.com/wp-content/uploads/2013/07/Brander-2015-Economic-Valuation-of-the-Change-in-Forest-Ecosystem-Services-in-Cambodia.pdf*

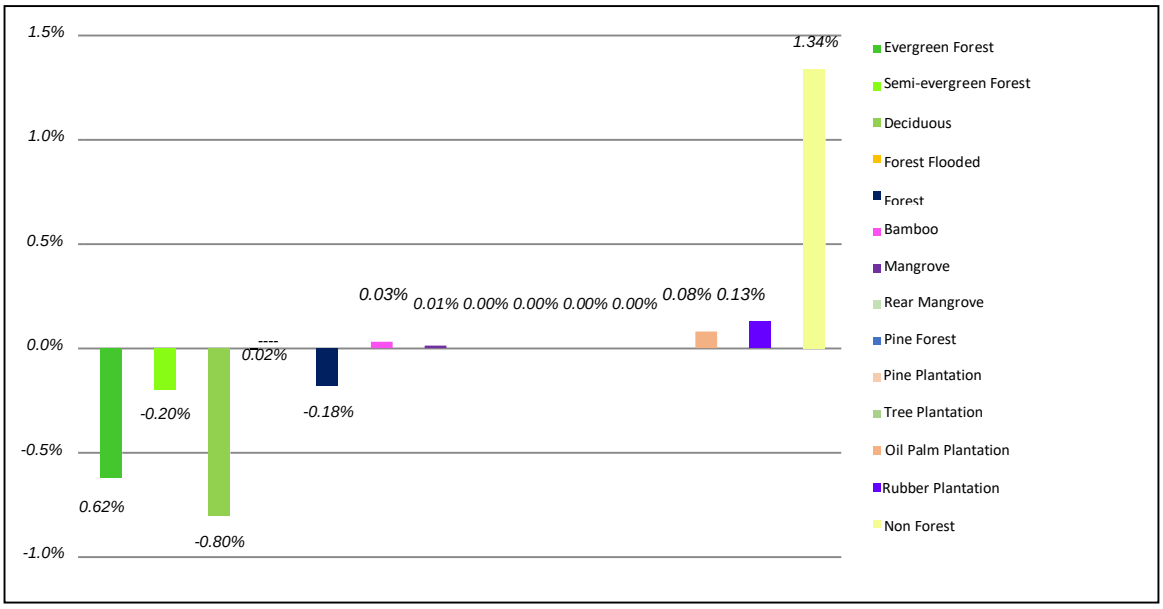


Figure 18: Graph of national land use/cover change 2014-2016
(Source: MOE 2018. Cambodia forest cover 2016**)**

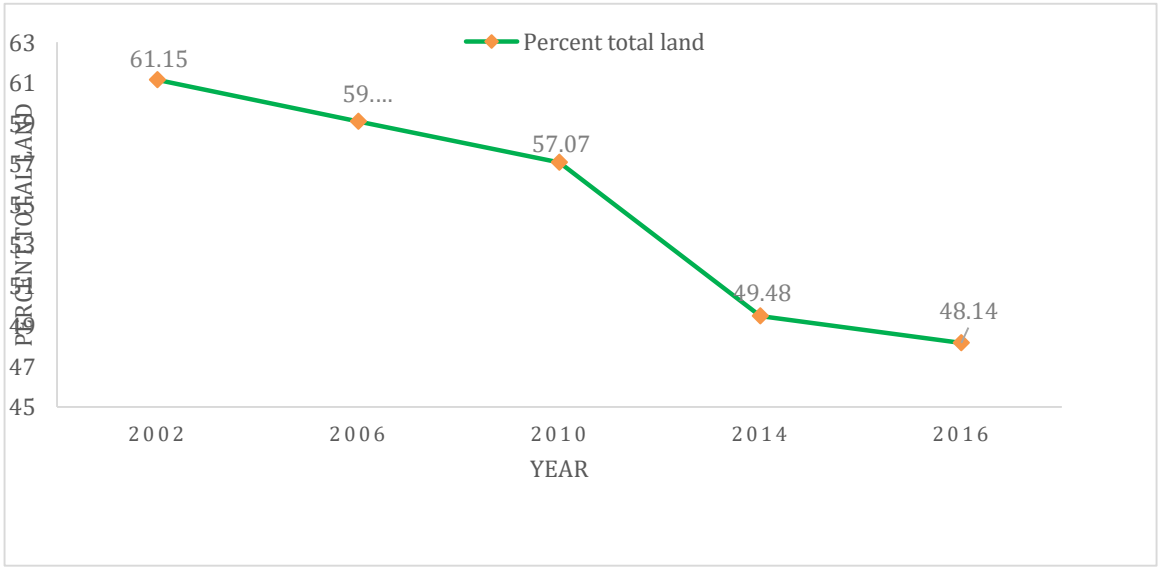


Figure 19: Forest cover change from 2002 to 2016 in percent of total land area
(Source: MOE 2018. Cambodia forest cover 2016**)**

Allowing even modest deforestation can result in substantial loss of valuable ecosystem services. Indeed, forest cover losses will lead to the destruction and degradation of biodiversity, the loss of use value of forest resources, and an increase in soil erosion and loss of land agro-ecology due to the impacts of rains and winds. According to many observations, in the first years in many deforested areas, the upper layers of fertile soil in the upstream areas are corroded and carried with the water, ending up covering the downstream areas which consist of mostly agricultural land. In the following years, water carries sand and grit to cover the agricultural land, resulting in decreased land productivity. Loss of forest cover means also loss of livelihoods and loss of habitat for many animal and plant species, which is particularly detrimental when the species are already threatened or endangered.

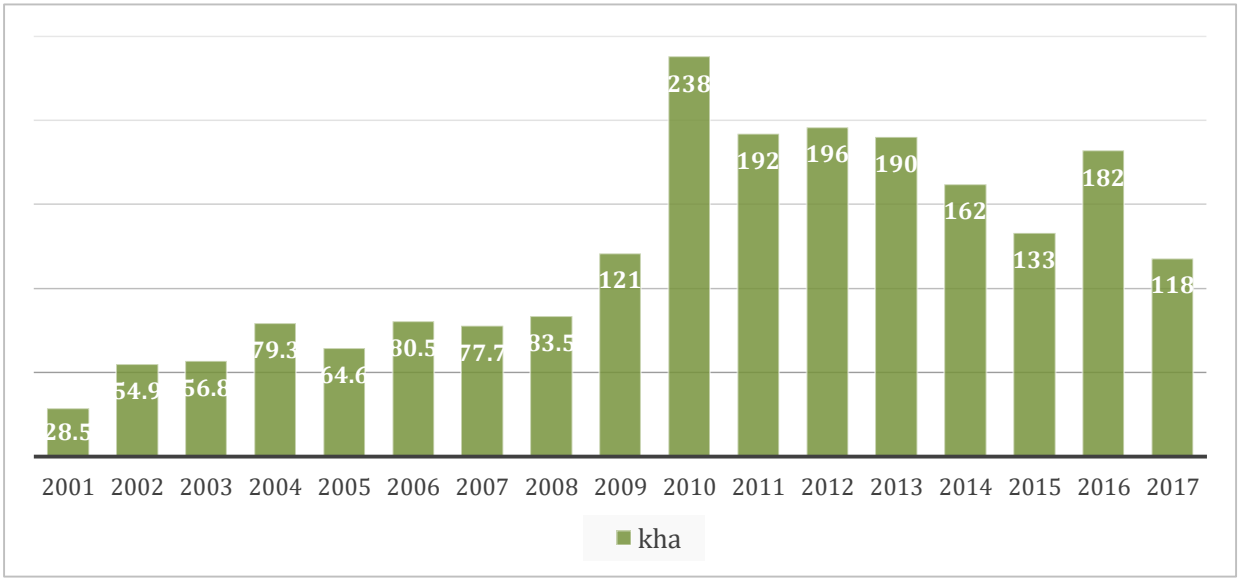


Figure 21: Annual tree cover loss (expressed as area in kilohectares/year) in Cambodia from 2001 to 2017

Source: https://www.globalforestwatch.org/dashboards/country/KHM

Many forests are part of key biodiversity areas (KBAs) (Figure 22) and many more included in Cambodia's extensive protected area system (Figure 23). Figure 23 represents the WDPA coverage of protected areas which is currently equivalent to the system before the 2016 reform[157]. The Prey Lang Wildlife Sanctuary for example include the forest across the 4 provinces of Kampong Thom, Preah Vihear, Stung Treng and Kratie. Additional examples of new protected areas that cover large portions of forests that were unprotected before the 2016 reform include Botum Sakor National Park, Southern Cardamom National Park, Tatai Wildlife Sanctuary and Keo Seima Wildlife Sanctuary.

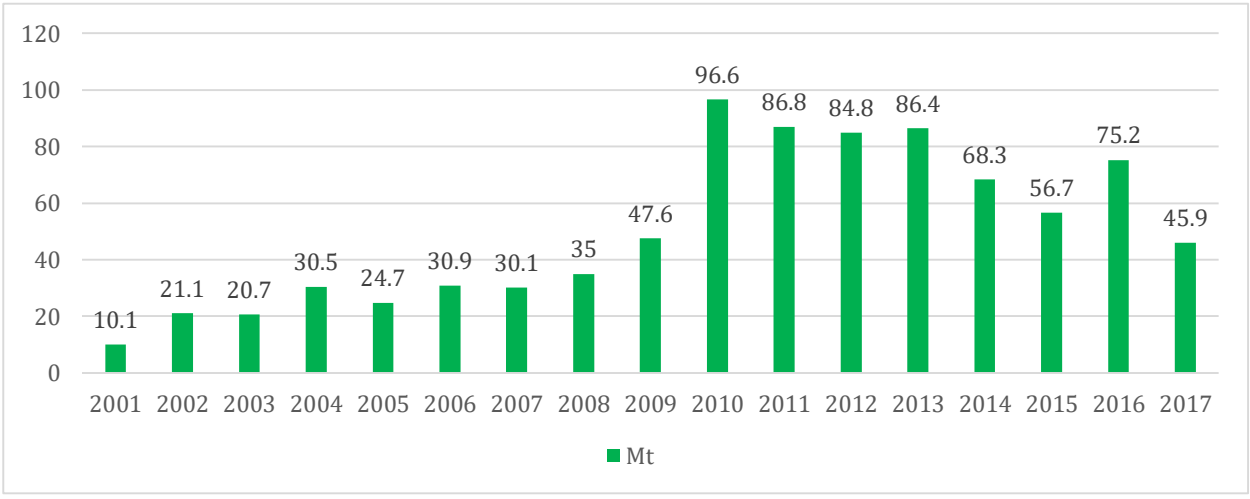
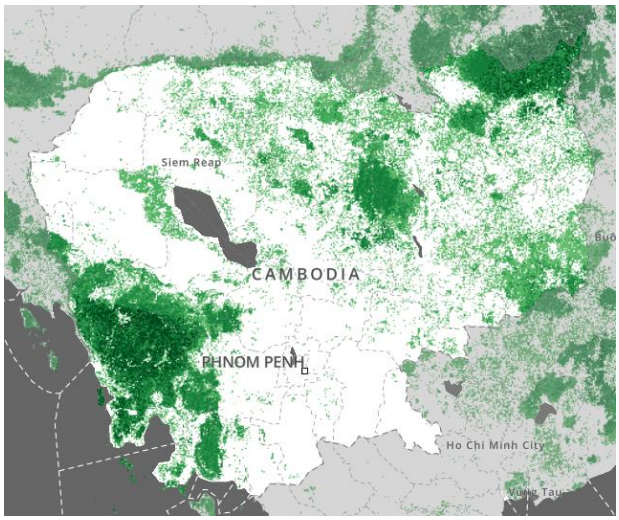


Figure 20: Calculated emissions from biomass loss in Mt in Cambodia from 2001 to 2017 (Source: https://www.globalforestwatch.org/dashboards/country/KHM)

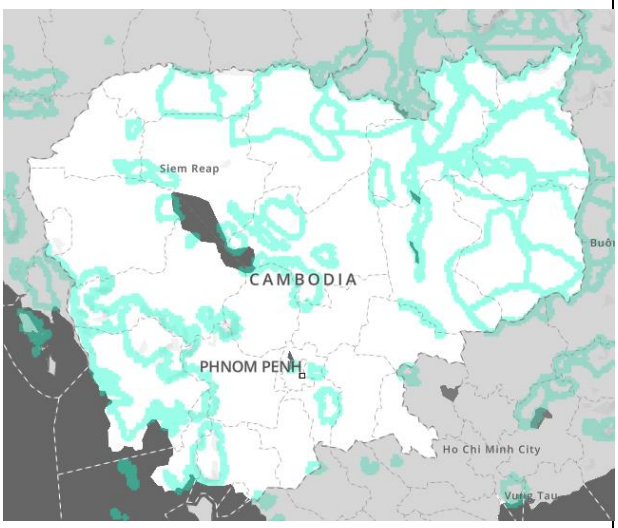
[157] The full map of protected areas in 2018 can be found in the sub-section on Target 8 on Protected Areas

4. Threats

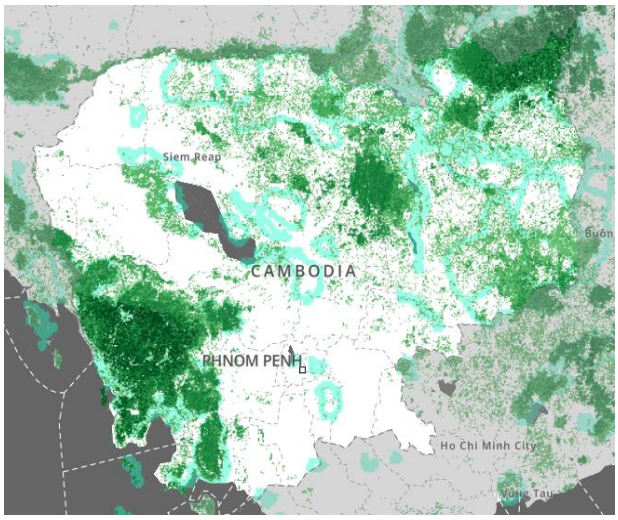
Forests in Cambodia are under a lot of threats supported by many underlying factors. Cambodia has been implementing measures to control these pressures and drivers of biodiversity loss to optimize the use and conservation of its national asset.



A. Map of forest cover in Cambodia (UN Biodiversity Lab map: Map titled 'Forest Structural Condition Index 2017 (Montana State University)')

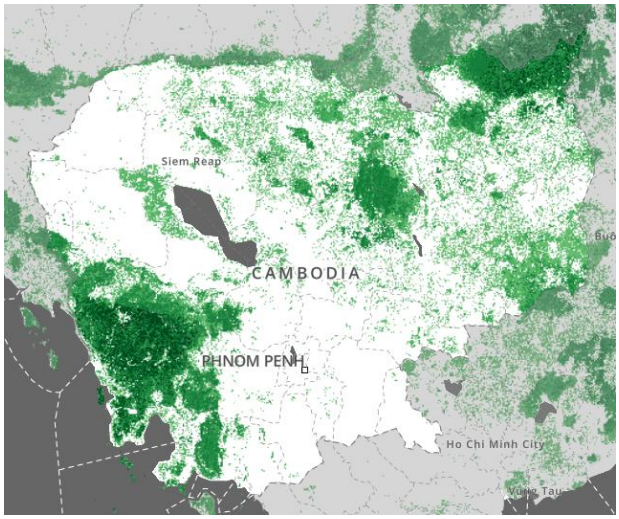


B. Map of Key Biodiversity Areas (UN Biodiversity Lab map: Map titled 'The World Database of Key Biodiversity Areas (KBA)')

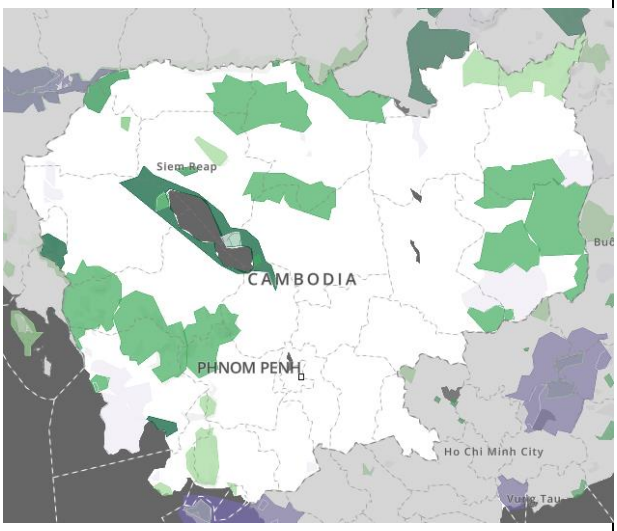


A combined map of Cambodia's forest cover **A** and Key Biodiversity Areas **B**

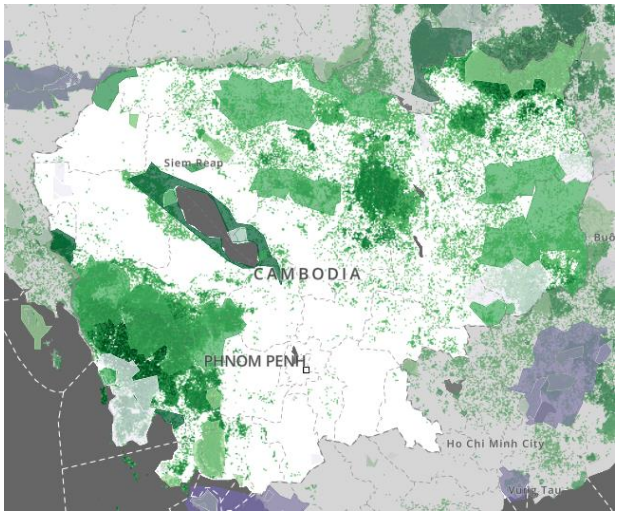
Figure 22: Maps of forest cover A, key biodiversity areas B and the combined map



A. Map of forest cover in Cambodia (UN Biodiversity Lab map: Map titled 'Forest Structural Condition Index 2017 (Montana State University)')



B. Map of WDPA protected areas in Cambodia. **Note**: WDPA protected areas are equivalent to the area that was protected before the 2016 reform. As of December 2018, WDPA does not include PAs established from 2016 to 2018.



Map of forests **A** overlaid with the map of WDPA protected areas **B**. Protected areas include large portions of the forested land in Cambodia

Figure 23: Maps of forest cover A, key biodiversity areas B and the combined map

The nature of threats to forests varies between vegetation types[158]:

(a) Deciduous and evergreen forests are threatened in particular by logging, fuel wood extraction, forest fires, conversion to rice fields, road development and human settlements;

(b) Evergreen forests are threatened by encroachment and the slash-and-burn cultivation;

(c) All types of forest, including wood scrub, bamboo, degraded and evergreen forests, even when they are classified as protected, are subject to be cleared for timber and non-timber products, and left idle with the prospect of and eventual conversion into tree plantations. Land clearing for agriculture is linked to new settlement, usually along new roads. The drivers of deforestation and forest degradation in Cambodia can operate simultaneously, in a complex set of interrelated factors related to a pattern of economic development. The REDD+ Roadmap[159] identified a series of direct drivers, including clearance for agriculture, settlement expansion, infrastructure development, illegal logging, and unsustainable harvesting of wood fuel, alongside a large set of indirect factors related to the socioeconomic environment and governance conditions both within and outside the forestry sector.

4.1 Overharvesting of forest products and illegal logging

As noted by MAFF and GDANCP/MOE in a document submitted to UNDP/GEF for a project titled "Strengthening Sustainable Forest Management and Bio-Energy Markets to Promote Environmental Sustainability and to Reduce Greenhouse Gas Emissions in Cambodia" that ended in 2015, around 85% of Cambodians depend on agricultural and/or forest production for their primary livelihood, and forest resources contribute around 40% of the total household incomes of rural people. Rural communities depend on timber for home construction, agricultural equipment manufacture and cash income. They use a lot of firewood for energy production (Figure 24). In addition, communities living near forests use non-timber forest resources such as food plants, various insects, honey, games and medicinal plants for subsistence and sale. Rattan and bamboo continue to be the most important non- timber forest products (NTFPs) for both domestic use and export markets. Wildlife and wildlife derivative products that are collected from forests and sold to markets in neighbouring countries include forest turtles, monitor lizards, snakes, eggs of the giant ibis (*Thaumatibis gigantea*) and large decorative forest bird species such as green peacocks and parrots. Forest products also constitute an important safety net, for example in the form of wild forest yams that are used as an emergency food source when rice harvests fail, and wild game that is used for protein when domestic animals are affected by diseases.

Biomass consumption increased from 1,723 ktoe in 2010 to 2,112 ktoe in 2015 at an average annual increase of 4.2 %. The residential sector is the largest consumer of biomass followed by charcoal processing, industry, and electricity generation (Figure 24). On average, the annual growth rate of biomass consumption in the industry sector was 5.1% while it was 3.9% in the residential sector. Biomass consumption for generating electricity was 3 ktoe in 2010 (i.e. about 0.2% of the total biomass consumption) and increased to 18 ktoe in 2015 (i.e. an average annual increase of 47.4%). Biomass use is expected to increase in the future in compliance with government plans to increase the use of renewables in electricity production to support rural electrification. In the residential sector, it is expected that biomass use can be reduced with the transition to convenient energy forms such as liquid petroleum gas (LPG).

[158] UNDP ProDoc 2008: Project Title: Strengthening Sustainable Forest Management and Bio-Energy Markets to Promote Environmental Sustainability and to Reduce Greenhouse Gas Emissions in Cambodia: 2010 -2015.

[159] https://redd.unfccc.int/files/cambodia_frl_rcvd17112016.pdf

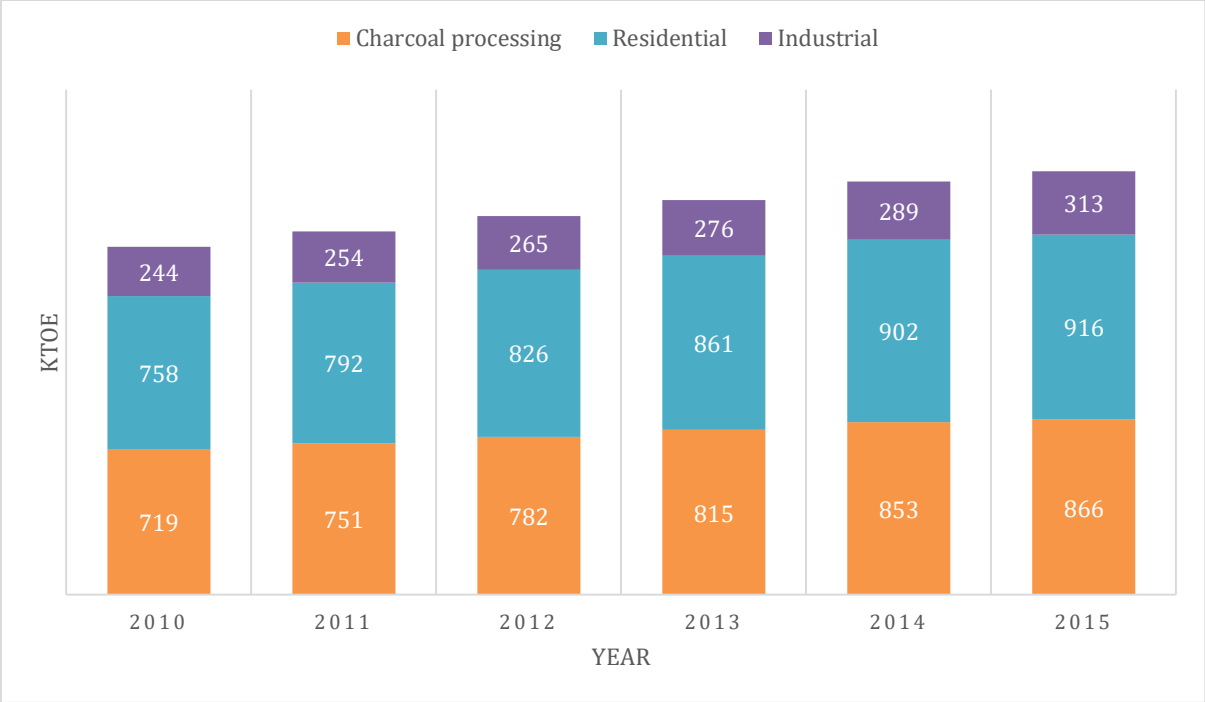


Figure 24: Biomass consumption for charcoal production and residential as well as industrial use

Note: ktoe = kiloton of oil equivalent. Source: ERIA, calculated from the Cambodia Energy Balance Table 2010–2015, cited in "Cambodia National Energy Statistics. Prepared for MME and Economic Research Institute for ASEAN and East Asia". Accessible at http://www.eria.org/RPR_FY2015_08.pdf.

Commercial logging and road construction are usually the first stages in forest degradation and deforestation. Logging is typically carried out by commercial actors, but there are also a lot of illegal logging in particular along the national borders. National demand for timber is estimated at 400,000 tons/year (around 670,000m^3) [160]. Logging involves selective extraction of the highest quality and most valuable wood for timber (e.g., *Dalbergia* and *Afzelia*), often using destructive harvesting practices. The sale of high-value timber is a lucrative billion-dollar business.

There are frequent reports of illegal logging and export of illegally logged timber involving people across all levels of the society in Cambodia. Logging has been carried out illegally even in national parks and wildlife sanctuaries. In January 2016, the Government ordered the creation of a commission to combat illegal logging, with a pilot scheme in six provinces. Reports published in 2018 still revealed illegal logging is continuing particularly in Virachey National Park in Rattanakiri, the forests surrounding the Lower Sesan dam in Stung Treng, and Phnom Prich Wildlife Sanctuary in Mondulkiri.

As shown in ***Table 5***, timber only accounts for 6% of the total national demand for wood; however, logging to supply this timber plays a key role in deforestation by opening up forests for subsequent forms of forest degradation and the eventual complete conversion of forests to other uses.

[160] UNDP ProDoc: Project Title: Strengthening Sustainable Forest Management and Bio-Energy Markets to Promote Environmental Sustainability and to Reduce Greenhouse Gas Emissions in Cambodia.

Table 5: Estimated national wood demand

	Tons	Percent of total
Timber (Source: NIS)	400,000	6
Industrial fuel wood (garment and brick industry around Phnom Penh (Source: GERES)	1,000,000	14
Rural fuel wood (Source: UNDP-MIME-GERES)	5,000,000	70
Fuel wood and charcoal in Phnom Penh (Source: UNDP-MIME-GERES)	700,000	10
Total	**7,100,000**	

Unsustainable fuel wood extraction and excessive harvesting of non-timber forest products are concentrated in areas that are accessible from urban centres. They can degrade or destroy habitats for wildlife.

The main underlying causes of unsustainable fuelwood extraction and logging are the high levels of demand for (i) land particularly by those who have influence and can 'grab' land away from not-so-wealthy local communities, or (ii) forest products in particular timber, which is in high demand for export and fuel wood for residential and industrial consumption. Demand for fuel-wood and charcoal is increasing proportional to population growth in the country side and the prevalence of inefficient cook stoves and the low availability of and access to affordable alternative energy sources. The total wood demand for domestic use and restaurant cooking in Phnom Penh (for firewood and charcoal) is estimated at around 650,000 tons per year. This would correspond to an annual clear felling of around 5,200 ha of a good or 12,000 ha of a poor deciduous forest. This figure gives some idea about the extent of forest degradation that would follow the collection of fuel wood and about the severe pressures placed on wildlife sanctuaries and national park that are targeted when wood availability outside the protected areas becomes limited.

4.2 Forest ecosystem fragmentation, degradation and conversion to other uses

Trees are being cut down and replaced with cash crops like cashew nuts, oil palm and cassava Forest conversion to other land uses (particularly agriculture) are largely carried out by actors who are not long-term members of local communities. Access to forests made possible by development projects, such as the building of roads, poor governance, as well as limited and lack of awareness of the value of all types of forests are the main factors underlying forest fragmentation or conversion to other land-uses. Decrease in forest cover contributes to erosion, flooding, and siltation of streams which compromises fisheries and water currents which directly support the livelihoods of the Cambodian people.

Mangrove forests in Cambodia are under increasing threats from several main anthropogenic and natural activities[161]: (i) coastal aquaculture development requiring clearing forests; (ii) mangrove areas have been cut down for salt pan production; (iii) sand mining and sea port are impacting on mangroves; and (iv) 5. unsustainable collection of coastal aquatic resources such as *Periglypta* sp. affects mangrove roots.

[161] *https://www.mangrovesforthefuture.org/assets/Repository/Documents/Cambodia-NSAP-2013-07-04-Webversion.pdf*

4.3 Climate change

In Cambodia, people have acknowledged the alarming trends of more frequent and intensified floods, droughts, saline intrusion and extreme weather events, especially over the last decade. Such events affect all the ecosystems and people's lives. Research and study have indicated that this trend is projected to further increase by the end of this century. Forestry: Under emission scenarios SRESB1 and SRESA2 up to 2050 most lowland forest will be exposed to a longer dry period, particularly forest areas located in the northeast and southwest[162]. More than 4 million hectares of lowland forest, which currently has a water deficit period of between 4 and 6 months, will become exposed to a greater water deficit period of between 6 to 8 months or more[163]. Therefore, climate change has become a primary issue, requiring urgent attention in designing appropriate climate change policies, strategies and actions as responses at the global, regional, national and sub-national levels.

Mangrove ecosystems in Koh Kong and Kampot provinces are also affected by climate change as sea levels are rising and inundate them with sand. Sediment shortages and sand erosion had killed swaths of mangroves in the Peam Krasop and Bang Kachang forests. Rains and storms have become more severe. Other threats to mangroves include[164]: (i) clearing for coastal aquaculture development: 1,438.8 hectares of mangroves were proposed in 2013for aquaculture production and 1,079 hectares for fish farming in Kampot Province; (ii) cutting down for salt pan production; (iii) poorly planned development project (e.g., sand mining); (iv) unsustainable collection of coastal aquatic resources such as *Periglypta* sp.; (v) urban expansion, coastal development and pollution caused by oil spills; and (vi) land reclamation for agricultural and market purposes

4.4 Invasive alien species

Information on invasive alien species in forest ecosystems in Cambodia is very limited.

4.5 Pollution

Mangroves are threatened by pollution caused by oil spills and land reclamation for agricultural and market purposes, urbanization and coastal development. Mangroves and other coastal forests and wetlands, estuaries, lagoons, sandy beaches, sand dunes, coral reefs and seagrass communities are under threats from coastal erosion, sand mining, water pollution, natural and anthropogenic natural habitat destruction and decades of ill-planned and unsustainable development activities, and these pressures continue to intensify.

4.6 Additional factors

Forest disturbance resulting from the expansion of monoculture plantations for rubber is linked to international market. Due to an increasing scarcity of available land, combined with an incomplete forest demarcation, Social Land Concessions (SLCs) often encroach on forestland and have been linked to deforestation and forest degradation, although the aggregate impact is unknown.

[162] *https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Cambodia%20First/Cambodia's%20INDC%20to%20the%20UNFCCC.pdf*

[163] Ditto and also in Cambodia's CC Priorities Action Plan for Agriculture, Forestry and Fisheries 2014

[164] *https://www.mangrovesforthefuture.org/assets/Repository/Documents/Cambodia-NSAP-2013-07-04-Webversion.pdf*

5. Measures taken to address the identified threats

5.1 Legislation, strategies and policies

The Environment and Natural Resources Code of Cambodia[165]

The Code provides the necessary guidance for environmental impact assessment and the strategic environmental assessment; Environmental Land Use Planning and Sustainable Cities; and Sustainable Management of Natural Resources. The Code contains also provisions for restoration and compensation for harm to the environment and for environment and natural resources offences and penalties. The Code defines the responsibilities of the Ministries, in particular MoE and MAFF, and that of anyone who wants to use or can have through his/her activities some impact on natural resources. The Code calls then for the Ministries in charge to develop various types of detailed guidelines, while it describes the main orientations on ways and means to (i) protect the environment to avoid and mitigate disasters and environmental harm; (ii) conserve, manage, and enhance biodiversity, natural resources, and ecosystem services, in ways to guarantee and enhance the wellbeing of the Cambodian people, and (iii) ensure that all environmental considerations are fully integrated into all relevant national and sub-national planning and decision-making concerning economic and social development.

The Code recognizes the importance of Community Forestry, Community Protected areas and Community Fisheries for adequate management of natural resources at the right scale and level. The Code specifies that Community Forests shall be managed in accordance with the principles of Collaborative Management stipulated in the Code. These Community-based natural resources management areas are expected to become recognized as components of a Collaborative Management Protection Zone. Participation of local communities, indigenous peoples, women and vulnerable people in consultations on natural resources is strongly recommended and failure to provide opportunities for their participation is a punishable offence.

The 2016 Reform of the MoE and MAFF

The 2016 Reform of the Ministries of Environment and the Ministry of Agriculture, Forestry and Fisheries is a landmark reform in the field of environment in Cambodia. Its main objective was to strengthen sustainable natural resource management. Box 3 below presents some highlights of the reform.

Box 3: Key/selected elements of the 2016 reform (Source: *https://redd.unfccc.int/uploads/54_3_cambodia_forest_cover_resource__2016_english.pdf*)
Royal Government of Cambodia (RGC) has made a reform by issuing necessary actions to strengthen sustainable natural resource management including:
1. A review of Economic Land Concessions (ELCs) with a decision to cancel the current development investment principle by some companies;
2. Establishment of a mechanism to prevent and suppression of natural resources offences;
3. To clarify the responsibilities of MoE and MAFF regarding forests, with all the conservation responsibilities under MOE and responsibilities for development under MAFF. Thus, protection and conservation of all types of forests transferred to MoE and development projects in ELCs to MAFF;
4. A National Forum on Protection and Conservation of Natural Resources held on 22nd August 2016 and 2017 formed an important mechanism to strengthen partnership between

[165] Draft 9.1 of 2017 is accessible at *https://data.opendevelopmentmekong.net/dataset/eedccd06-df86-45d2-8e96-72afe074284b/resource/adbd2e13-ffbb-43d9-8b73-00bbe837e8e5/download/enr-code-draft-9.1-in-english-25.07.2017.pdf*

	government and relevant stakeholders in natural resource protection and conservation;
5.	Circular #05 dated 22nd September 2016 on taking necessary actions on strengthening natural resource management;
6.	Strengthening capacity and expanding the number of park rangers to enhance patrol effectiveness and law enforcement in Protected Area (PAs); and
7.	Transfer of function and responsibility to sub-national levels to implement Natural Resource management, protection and conservation policy and strategy.

The National Forest Program 2010 – 2029 emphasizes, in particular, the contributions associated with strengthening good governance, expanding forest demarcation, improving forest and wildlife management and conservation practices, enhancing community forest development, establishing and expanding plantations and reforestation programs, strengthening institutional capacities and developing human resources, expanding research, and establishing secure sources of financial support for the programs planned to be implemented during the life of the program.

During the first four years of implementation of the National Forest Program from 2009 to 2013, planting activities conducted by the Forestry Administration in collaboration with private investment companies and small-scale household investments resulted in the establishment of 87,028 hectares of forest. During that same period Community forestry was promoted as well, and the number of community forests in the country increased from 402 to 457, encompassing 400,000 hectares. Efforts were also initiated in anticipation of marketing carbon credits through an assessment of carbon markets in association with development partners and national and international organizations, as well as by means of the preliminary establishment of REDD+ pilot activities in selected community forests. Cambodia's initial Forest Reference Level was assessed at 78,953,951 tCO2/year based on the historical average net emission level from 2006 to 2014[166].

However, there are still several challenges that must be resolved. One of the principal concerns is the continuing decline in the country's forest cover, which resulted essentially from recent increases in agricultural land use as the population has grown and the agricultural economy has expanded. Collaboration of appropriate authorities in resolving these challenges remains limited, especially with regard to efforts to prevent forest clearing and demarcate forest areas.

Cambodia's Land Degradation Neutrality plans under the United Nations Convention to Combat Desertification[167] and Nationally Determined Contributions to Climate Change. See Box 4 below for some highlights.

Box 4. Highlights of relevance to forests from Cambodia's Nationally Determined Contributions

Land-based mitigation plans

- Forestry and Other Land Uses (FOLU) target: 60% forest cover of total land area / 4.7 tC02eq/ha/year
- Conservation: Protected areas: 2.8 million hectares; Protected forest: 3 million hectares;
- Community forestry: 2 million hectares;

[166] Cambodia Initial Emission Reference, 2016 cited in MOE 2018. Cambodia forest cover 2016.
[167] *https://knowledge.unccd.int/sites/default/files/ldn_targets/Cambodia.pdf*

- Forest concessions reclassified to protected and production forest: 0.3 million hectares; Production forest: 2.5 million hectares Biofuels: Use of biogas Efficient Cookstoves: Promoting more efficient cookstoves

Land-based adaptation priorities

- Reforestation: Increasing forest cover to 60% of national land area, and maintaining that level from 2030 onwards
- Climate Smart Agriculture: Promoting climate resilient agriculture in coastal areas through building sea dykes and scaling-up of climate-smart farming systems;
- Developing climate-proof agriculture systems for adapting to changes in water variability to enhance crop yields
- Irrigation: Developing climate-proof tertiary-community irrigation to enhance the yields from agricultural production of paddy fields; Increasing the use of mobile pumping stations and permanent stations in responding to mini-droughts, and promoting groundwater research in response to drought and climate risk
- Agroecology: Developing crop varieties suitable to Agro-Ecological Zones (AEZ) and resilient to climate change

Disaster Risk Management:

- Strengthening early warning systems
- Mitigation and adaptation policy frameworks: Green Growth Policy and Roadmap (2009); Climate Change Strategic Plan (2014 - 2023);
- National Adaptation Plan (NAP); National Adaptation Programme of Action to Climate Change (2006); FLEGT Programme (Forest Law Enforcement, Governance and Trade)

In the National Strategic Development Plan 2014-2018 (NSDP) and Cambodia Climate Change Strategic Plan (CCCSP), besides the protection of forest ecosystems and their resources, the Royal Government is promoting tree planting, rehabilitation of degraded forests and investment in biofuel production. Cambodia adopted various other relevant laws, such as the 2002 Forestry Law, the 2006 Law on Fisheries, and the 2008 Protected Areas Law, which will ensure sustainable forest management, especially when that is done in the framework of the Rectangular Strategy Phase IV and related strategies and programmes (Green Growth Roadmap etc.). As shown in the subsection on protected areas, Cambodia's protected area system includes a vast portion of the forests.

Production Forest Strategic Plan 2018-2032 (PFSP)

The Production Forest Strategic Plan 2018-2032 (PFSP) is expected to guide the future development and sustainable management of production forests for their contribution to poverty alleviation, livelihoods and economic growth. The Plan represents the first comprehensive strategic document for production forests in Cambodia. Its development was triggered by the fact that domestic and regional demand for forest products had been rapidly increasing in Cambodia. The survival and long-term sustainability of the Cambodia's forests depends upon whether the reserves for production could continue to meet demand. It responds to the need to adjust to the recent institutional reform in the forestry sector and supports changes in the forest governance framework against the rapid socio-economic transformation and the emerging vulnerabilities of natural resources. The Plan proposes four key strategic objectives:

(i) Strengthen forest governance framework;
(ii) Ensure sustainable production of wood and non-wood forestry production through reforestation, forest rehabilitation, and planted forest management;
(iii) Promote active participation of rural communities; and
(iv) Strengthen institutional capacity and inter-institutional collaboration.

Other action plans include: Cambodia National Strategy and Action Plan 2014-2016 - Mangroves for the Future[168], Coastal Environmental Management Action Plan (2007-2011), Strategic National Action Plan for Disaster Risk Reduction (2008-2013), and National Action Plan for Coral Reef and Seagrass Management in Cambodia (2006-2015).

5.2 Value of forests including mangroves

Cambodia has one of the largest forest covers in Southeast Asia, with approximately 8.7 million hectares of forest in 2016 or 48.1% of the land area. But deforestation rate continues to be one of the highest. A better knowledge of the multiple values of forests will enable decision-makers and all the stakeholders to manage forests in a more sustainable manner. Forestry contribution to GDP continues to be significant. According to the FAO Forest Resources Assessment (2015), Cambodia's forestry sector contributed US $ 11 million to the country's economy in 2000, which is a bit less than 0.1% of Cambodia's GDP[169]. Forests provide a lot of valuable ecosystem services that contribute to human wellbeing[170]. They provide people with diverse material (e.g., timber, fuel wood and charcoal), non-material (e.g., tourism, recreation, aesthetic, non-use values) and regulating (flood and erosion control; carbon sequestration and storage) contributions. Over 80 percent of Cambodians rely on fuel wood and around 8 percent on charcoal for cooking[171]. In 2010, the Forest Administration estimated that nearly 4 million rural people- more than 30 percent of the population -- live within 5 km of the forest, with forest resources accounting for an average of 10 to 20 percent of household consumption and income sources. Many of the forest ecosystem services, which have the characteristics of 'public goods,' are generally undervalued or ignored in both private and public decision-making relating to their use, conservation and restoration (for example in cost-benefit analyses of land conversion to agriculture)[172]. According to the Second National Communication under the UNFCCC, in 2000 Cambodia emitted 47.6 million tonnes of CO_2 equivalent, but the forestry sector absorbed 48 million tonnes of CO_2 equivalent.

Mangroves store and process huge amounts of organic matter, dissolved nutrients, pesticides and other pollutants that are dumped into them by human activities[173]. They also absorb excess nitrates and phosphates, and thus prevent the contamination of coastal waters. In so doing, they play a vital role in protecting coral reefs and sea grasses from siltation and eutrophication. Mangroves also function as a sink for atmospheric carbon dioxide, a major contributor to global warming.

In 2014, a study was undertaken to assess existing information on valuation of multiple benefits provided by standing forests in Cambodia. The study compiled data and information from published literature, including scientific journals and projects' reports and documents accessible on the government's and others' websites to estimate the value of forest ecosystems in Cambodia. The compilation included (i) direct use value including values of forest products, non-timber forest products, biodiversity, ecotourism, and cultural and spiritual values; and (ii) indirect use value, including estimates for values of soil conservation, carbon, and watershed protection with mangrove storm protection functions. There was no data for estimates for values of water purification, estimates for values of nutrient cycling, estimates for

168 https://www.iucn.org/sites/dev/files/import/downloads/cambodia_nsap_2013_07_04_webversion__in_english_.pdf
169 https://www.globalforestwatch.org/dashboards/country/khm?category=land-use&economicimpact=eyj5zwfyijoymdawfq%3d%3d&treelosstsc=eyjoawdobglnahrlzci6zmfsc2v9
170 http://www.twgaw.org/wp-content/uploads/2016/08/Climate-Change-Action-Plan-2014-2018_MAFF_Kh.pdf
171 NIS 2009 'Cambodia Socio-Economic Survey 2009' accessible at www.ilo.org/surveydata/index.php/catalog/50/download/652
172 http://lukebrander.com/wp-content/uploads/2013/07/Brander-2015-Economic-Valuation-of-the-Change-in-Forest-Ecosystem-Services-in-Cambodia.pdf
173 https://www.mangrovesforthefuture.org/assets/Repository/Documents/Cambodia-NSAP-2013-07-04-Webversion.pdf

values of pollination, estimates for values of pest control, or for option value and non use value. In the year preceding 2014, Cambodia published the National Strategy and Action Plan 2014-2016. Since then, other publications have been made available (Box 5) and provide additional data and information on the value of forests in Cambodia.

5.3 Protected areas/forests, other conservation areas including community-based natural resources management areas

Protected forests

Protected forests are considered in detail in the subsection on protected areas. In 2016 all Protected Forests were transferred from FA/MAFF to MoE and integrated to the country's protected area system. Protected areas and other conservation areas that were under the jurisdiction of MoE as well as the new PAs adopted in 2016, 2017 and 2018, including the biodiversity corridors contain large forested areas. MoE has put a lot of resources to enhance the effectiveness of all the PA management, building on the NPASMP adopted in 2018. of forests. Some Community Protected Areas have already developed and adopted their management plans.

Community Forests

Many rural communities, including indigenous peoples, depend on forests for much of their livelihood. The 2002 Forestry Law provides a legal basis for rural communities to use and manage their forests through community forestry. The 2003 Sub-decree on Community Forest Management sets out the rules for the establishment, management and use of community forests in Cambodia. According to Figure 25, there were 580 community forests, of which 404 were registered, in Cambodia. They range in size from 10 ha to over 5000 ha.

Box 5: Indicative list of recent publications on valuation of forest ecosystems in Cambodia
1. Miroslav Stejskal 2017. Incorporation of Ecosystem Services Valuation in System Dynamics Models: Case Study of Mekong Flooded Forest Landscape. MSc Thesis University of Bergen
2. Abu S.M.G. Kibria, Alison Behie, Robert Costanza, Colin Groves, Tracy Farrell 2017. The value of ecosystem services obtained from the protected forest of Cambodia: The case of Veun Sai-Siem Pang National Park. Ecosystem Services 26 (2017) 27–36
3. 2017. Forest Investment Program Cambodia's Investment Plan
4. Williams, J., 2016. Environmental, anthropogenic and energetic predictors of the likelihood of Northern buff-cheeked crested gibbons (*Nomascus annamensis*) calling in Veun-Sai Siem Pang Conservation Area. Biological Anthropology. The Australian National University ACT, Australia
5. Watkins, K., C. Sovann, L. Brander, B. Neth, P. Chou, V. Spoann, S. Hoy, K. Choeun, and C. Aing. 2016. Mapping and Valuing Ecosystem Services in Mondulkiri: Outcomes and Recommendations for Sustainable and Inclusive Land Use Planning in Cambodia. WWF Cambodia. Phnom Penh
6. Davis, K.F., Yu, K., Rulli, M.C., Pichdara, L., D, 'Odorico, P., 2015. Accelerated deforestation driven by large-scale land acquisitions in Cambodia. Nat. Geosci. 8, 772–775.
7. Thoeun, H.C., 2015. Observed and projected changes in temperature and rainfall in Cambodia. Weather and Climate Extremes 7, 61–71.
8. Ministry of Planning, 2014. Cambodia Socio Economic Survey – 2013. Cambodia Socio-Economic Survey. National Institute of Statistics, Phnom Penh, p. 86.

9. Kubiszewski, I., Costanza, R., Paquet, P., Halimi, S., 2013. Hydropower development in the lower Mekong basin: alternative approaches to deal with uncertainty. Reg. Environ. Change 13, 3–15.

10. Brander L. 2018. Economic valuation of the change in forest ecosystem services in Cambodia 2010-2030

Community forests play an important role in preserving forests in Cambodia, which is experiencing a lot of deforestation. A study[174] was carried out and published in 2018 study used remote sensing data to evaluate the ability of community- protected forests to prevent deforestation and degradation within and outside six community forests in Phnom Kulen National Park. The findings suggest that while community-protected forests can improve conservation outcomes to some extent, more actions are needed to curb illegal selective logging of valuable timber trees.

The number of Community Forests is growing (Figure 25) and the NFP sets a target of two million ha of forestland allocated for Community Forestry (approximately 1,000 CF) groups fully recognized with CF agreements. Commercial timber production (plantations) barely exists, mainly because of the legal, governance-related and commercial challenges perceived by investors. As a national first, an international investor is establishing a hardwood (teak) plantation in Cambodia, wishing to adhere to sustainable forest management (SFM) and corporate social responsibility (CSR) practices. This introduces a new, important step in implementation of the NFP and may also be viewed as a practical contribution towards 'Green Growth'.

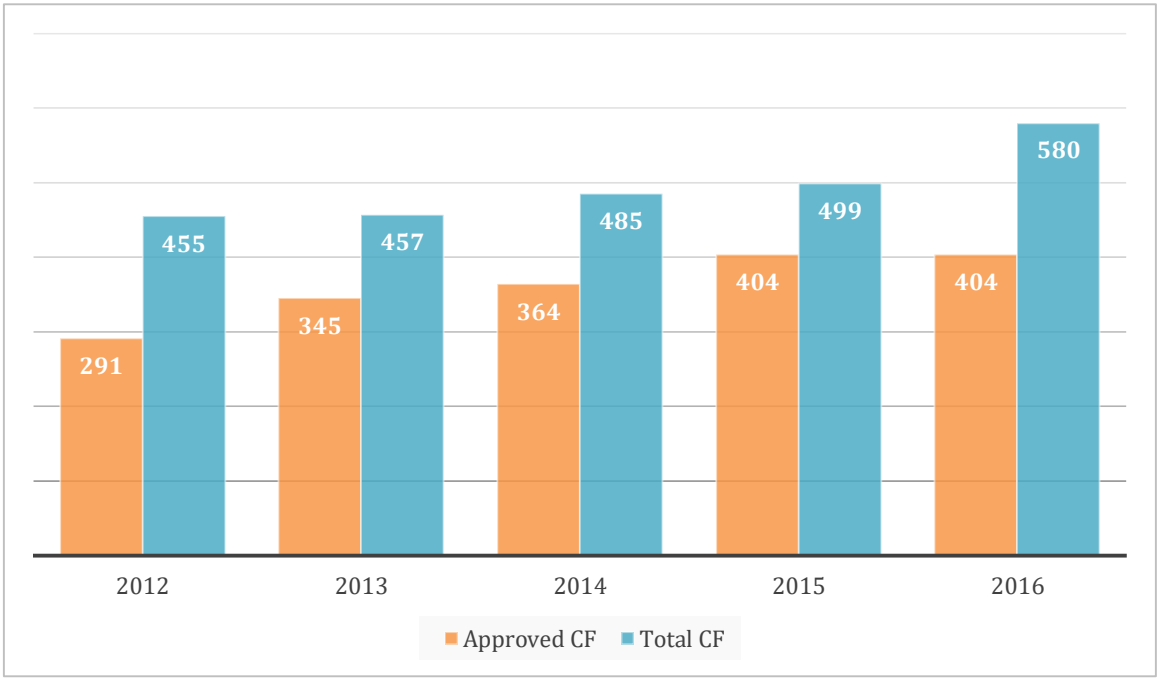


Figure 25: Number of Community Forests (CF) from 2012 to 2016
(**Source**: MAFF annual report 2016-2017)

Some projects are helping communities to protect their interest in forests. In March 2018, for example, a 5-year, $3.4 million project supported by the European Union and WWF was launched to assist Mondulkiri

[174] Singh, M., Evans, D., Chevance, J-B., Tan B.S., Wiggins, N., Kong & Sakhoeun, S. (2018) Evaluating the ability of community-protected forests in Cambodia to prevent deforestation and degradation using temporal remote sensing data. Ecology and Evolution. DOI 10.1002/ece3.4492

forest communities. The project aims to help 2,000 households in 34 villages inside two national protected areas to protect their forests from external pressures[175].

The project titled "The Partnership Programme to Support Forestry and Fishery Communities (PaFF)"coordinated by WWF[176] is a good example of partnership between the Government (MoE, MAFF and subnational authorities and institutions), NGOs (a consortium of four complementary organisations: the World Wide Fund for Nature (WWF); the Center for People and Forests (RECOFTC); the Non-Timber Forests Products Exchange Programme (NTFP-EP); and the Culture and Environment Preservation Association (CEPA)) and local communities. Its overall goal is that local and indigenous communities and households increase their incomes and improve their resilience to economic and natural shocks by engaging in sustainable community-based livelihood approaches that protect their ecosystems and reduce pressure on their communal natural resources. Phase I of the projects ran from 2014 to 2017 and focused on Kratie and Stung Treng provinces including part of the Mekong Flooded Forest. Phase II started in 2017 and will end in 2021; it has been scaled up to include Preah Vihear and Kampong Thom provinces in addition to Kratie and Stung Treng provinces. Key achievements from Phase I are:

- 15 community fisheries and 15 community forestry groups wee developed;
- 18 community-based enterprises were established to process and commercialise fish and non-timber forest products, and engage in ecotourism activities;
- Provincial level capacities were also developed for more sustainable landscape planning processes.

Phase II is proceeding well to meet the objectives of: (i) increasing the incomes of the rural and indigenous communities and households, and (ii) improving their resilience to economic and natural shocks by engaging in sustainable community-based livelihood approaches that protect their ecosystems and reduce pressure on their communal natural resource base.

5.4 Demarcation of forests and protected areas as well as zoning of protected areas.

Conflicts over forest tenure and user rights provide disincentives for stakeholders to manage forest resources sustainably. Strategies for improved governance and management of forest resources are comprehensively described in the National Forestry Programme 2010-2029 (NFP 2010). A key component for effective management of forest resources calls for the demarcation, classification and registration of Permanent Forest Estate (PFEs) as Production Forest, Protection Forests or Conversion Forests.

In accordance with the 2008 law on protected area and the Environment and Natural Resources Code of Cambodia, the process of demarcating selected forests is led by the Forestry Administration (FA). Forests of special protection value, e.g., for their unique biodiversity or ecosystem services, are considered a high priority. The process will also enable the zoning of forest classified as protected or just within protected areas. Zoning will ensure that critical areas are strictly protected, and other areas are used and managed sustainably.

MAFF reported in its 2017 annual report that the 2014 forest land cover assessment and forest land cover change in 2006, 2010 and 2014 were finalized and published. Meanwhile, in 2016, the Forestry Administration completed the collection of satellite images LANDSAT8 for assessing 2016 forest land cover assessment and cooperated with the Forestry and Forest Products Research Institute (FFPRI) in Japan to verify 120 spots on the ground in order to produce 2015-2016 forest cover map in Mundulkiri, Rattanakiri, Koh Kong, Pursat and Battambang. Also, in 2016, the permanent forest demarcation was completed with concrete poles in Kampong Thom, Pursat, MundulKiri and Prey Veng.

[175] Sen David 2018. "Project launched to conserve natural resources in Mondulkiri", *Khmer Times*, 30 March 2018. http://www.khmertimeskh.com/50269437/project-launched-to-conserve-natural-resources-in-mondulkiri/ Cited by Open Development Cambodia, accessible at https://opendevelopmentcambodia.net/topics/forests-and-forestry/#ref-80082-6 .

[176] http://cambodia.panda.org/projects/paff_program/

Working with MoE with support from UNDP, WCS compiled in 2017 a spatial planning Decision Support System used for training and defining national conservation priorities. Given the fact that our protected area system has an important role in the conservation of forest ecosystems, a planning scenario was included to explicitly consider options to identify priority areas for forest ecosystem types across the conservation landscapes.

5.5. Sustainable forest management, REDD+ and biomass energy

Valuation studies being promoted considered multiple forest ecosystem services as required by sustainable forest management (SFM). Forests benefit societies in many ways, but generally only a few such benefits, especially the provision of wood, are paid for. Cambodia is moving towards internalization of the full range of benefits provided by forests, including particularly carbon sequestration and the protection of water catchments and soils. A number of conducive policy and regulatory frameworks across sectors and institutions are being considered to support SFM in Cambodia. The REDD+ or PES scheme in general is a direction that is pursued with the regulatory and policy adjustments that may be required.

A lot of experience and lessons were gained through the UNDP/GEF funded project carried out from 2011 to 2015 across Kampong Speu, Kampong Chhnang, Pursat and Battambang on "Strengthening SFM and bioenergy markets to promote environmental sustainability and to reduce greenhouse gas emissions in Cambodia." Fully in line with the National Forest Programme goal to cover 2 million hectares in Cambodia with decentralized forest management, the project strengthened community-based SFM among Community Forests (CFs) and Community Protected Areas (CPAs) and increased the production and marketing of improved wood stoves for reduced fuelwood use and reduced greenhouse gas emissions. More specifically, the project was successful in integrating conservation approaches in land use planning. The project prepared: (i) a draft National Wood Energy Strategy still under review; and (ii) community protection management plans in 11 sites, community forest management plans in 30 sites and 4 alternative community forest modalities. The project sold 143,575 improved cook stoves[177] in total and constructed 17 efficient charcoal kilns with, as a result, respective estimated reductions in GHG emissions of 29,949 tCO2e and 945 tCO2e per year by 2015. Simultaneously, the project improved local communities' incomes (e.g., in Kampong Chhnang province, the income from forest enterprises increased from US$ 213 in 2012 to US$ 283 in 2014) as well as the protection of wildlife and globally important biodiversity areas. It also improved biological and productive functioning of forests while providing experience replicable in other forests in the country.

The work on reduced use of fuelwood for energy production in Cambodia is supported by many national and international organisations. For example,

(a) the French Agency for Development funds a 4-year project on "Support the Emergence of Sustainable Supply Chains in the Domestic Energy Sector (SEFED)[178]" coordinated by the Group for the Environment, Renewable Energy and Solidarity (GERES) and participation of UNEP and the Cambodian Institute for Research and Rural Development (CIRD). The project started in 2016. It supports producers and distributors of improved cook stoves in Cambodia; and

(b) In 2017, UNDP funded research work to identify the best conditions for the promotion of sustainable fuelwood and charcoal production and consumption in Cambodia.

Activities relating to reduced emissions from deforestation and forest degradation (REDD+) are described in the subsection on Cambodia Target 9 on payment for ecosystem services. They include for example the the ITTO project "SFM management through REDD+ mechanisms in Kampong Thom province, Cambodia"

[177] The Group for the Environment, Renewable Energy and Solidarity (GERES) announced that the 1,000,000th improved cook stove was made and marketed in March 2019

[178] https://www.geres.eu/en/actions/supporting-the-emergence-of-sustainable-supply-chains-in-the-domestic-energy-sector/

launched in 2015 mainly to strengthen the institutionalization of REDD+ activities to reduce deforestation and forest degradation in the Tomring forest in Kampong Thom Province.

5.6 Reforestation, forest restoration

With support from MAFF, the Institute of Forest and Wildlife Research and Development carried out from 2011 to 2014 the project "Multi-Functional Forest Restoration and Management of Degraded Forest Areas in Cambodia[179]" with as objectives to: (i) restore a degraded protected forest in Koh Kong; and enhance the restoration of a community forest in Siem Reap for the production of timber and non-timber forest products as a means to improve of local communities' livelihood. The project was conducted in two community forests (CF), Prey Kbal Tik CF located in Tbeng Lech village, and O Soam CF located in Kampong Thom.

Between 2016 and 2018, the Forestry Administration (FA)/MAFF and the Food and Agriculture Organization of the United Nations (FAO) implemented, with several other local partners, a work plan on forest and landscape restoration (FLR) in Cambodia. The project entitled " Promoting forest and landscape restoration in Kampong Thom, Preah Vihear and Siem Reap, capacity development on the National Forest Fund and payment for ecosystem services in Cambodia" succeeded[180] in creating an enabling environment for FLR; applied the IUCN Restoration Opportunities Assessment Methodology (ROAM) in Kampoong Thom, Preah Vihear, and Siem Reap provinces; published the ROAM study with a brief for decisions makers; implemented a stocktaking study on legal frameworks, roles and responsibilities of relevant institution involved in land use sectors; published the result of the stocktaking study with a policy brief for decision makers; considered various sustainable financing instruments; organized capacity building events for the establishment of National Forest Funds (NFF) and Payments for Ecosystem Services (PES), and made recommendations for two PES schemes in Kulen Mountains (Siem Reap province) and in Preah Sihanouk province (Khba Chhay National Park); assessed the cashew nut value chains in the buffer zone of Kulen National Park; and prepared a Concept Note for submission to Land Degradation Neutrality (LDN) Fund.

Cambodia continued its work under the International Partnership for the Satoyama Initiative. Cambodia is participating in the COMDEKS[181] programme, the field-testing of methodologies to empower community organizations to implement participatory landscape planning and enhance resilience at the community level. In this context, Cambodians and our partner, the Institute of Environmental Rehabilitation and Conservation (ERECON) from Tokyo University of Agriculture completed a 2-year study started in 2014 on "Resin trees: A vital source of the Phnong people's livelihood in transition in Cambodia". The results published in 2018 showed that the number of resin trees owned (average number of resin trees per household varied from 30 to 250 trees) was proportional to the level of income generated from resin, varying largely from USD 125 to USD 1,620 annually; and that the main threats to resin trees were the overlap of lands containing stands of resin trees with ELCs and illegal logging.

Another REDD forest restoration project reported on during the reporting period is the afforestation/reforestation project in Kratie Province, established in 2010, between the Forest Administration and the Think Biotech Cambodia, co. ltd. Phnom Penh, Cambodia (TB), a subsidiary of Korea's Hanwha Corporation. This forest restoration project is expected to promote sustainable resource use by reducing local slash-and-burn activities.

[179] http://www.apfnet.cn/en/show-model6-957.html
[180] http://www.fao.org/in-action/forest-landscape-restoration-mechanism/activities/national/cambodia/en/
[181] The 'Community Development and Knowledge Management for the Satoyama Initiative' is a UNDP-led programme.

5.7 A network of partners[182] and awareness-raising

Both national and international non-governmental organisations joined hand with MAFF and MOE to carry out projects in Cambodian forests during the period covered by this report i.e. 2014 to 2018. NGOs are important actors in implementing national plans of action to strengthen forest protection. Some are in the field while others are in research institutions (e.g., RUPP, RUA, University of Battambang). The following is an example of 2018 study for a better understanding of the effectiveness of community forests: Biophysical factors affecting forest cover changes in community forestry in Cambodia.

Regarding REDD+, the biggest international program is supported by the UN through the REDD+ programme. Partners include : (i) WCS (promotion of conservation, education and capacity building, in Seima Forest, Northern Plains (in Preah Vihear province) and the Tonle Sap); (ii) Center for People and Forests in Cambodia (RECOFTC) (help establishing Community Forestry sites. Contributed to half of the community forest sites in Cambodia, around 245 over 14 provinces); (iii) the USAID – funded Cambodia Supporting Forests and Biodiversity (SFB) project (November 2012–February 2018), (managed by Winrock International (Cambodia). to protect forests and, apply sustainable forest management practices, in Eastern plains and Prey Lang landscapes as well as Seima Protected Forest through the Action Learning for Community Carbon Accounting program); (iv) Fauna & Flora International (FFI) (support threatened species and ecosystems while improving the livelihoods of the poor and the vulnerable. Four major programs: food security, biodiversity conservation, equality and equity and disaster preparedness). A few additional partners are listed in Table 6.

The network of NGOs consists of:

(i) Consortium de 60 (international) NGOs forming the Non-Timber Forest Products Extension Programme (NTFP-EP) to advocate for forest protection. The Non-Timber Forest Products Extension Programme (NTFP-EP), Community-based organizations throughout Asia, that works to strengthen capacity and natural resource management

(ii) The (national) NGO Forum on Cambodia, for national NGOs for information sharing, dialogue and advocacy. Three programs dedicated to forest protection: Development Issues, Environment Programme, Land and Livelihoods

Table 6: Indicative list of national and international non-governmental organizations carrying out some forest projects between 2014 and 2018

Organisation	Project/programme title	Project location	Duration	Cooperating Ministry
BirdLife International (BLI)	Western Siem Pang, towards a vision for biodiversity conservation in dry forests of Cambodia	Siem Pang district, Stung Treng province	2011 – 2015	Ministry of Agriculture, Fisheries and Forestry
BirdLife International (BLI)	Siem Pang Protected Forest, towards a vision for biodiversity conservation in dry forest of Cambodia (PhaseII)	Siem Pang district, Stung Treng province	2016 – 2019	N/A
Groupe Energies Renouvelables,	Supporting Forests and Biodiversity (SFB)	Sandan and Santuk districts, Kampong Thom province	2016	N/A

[182] https://opendevelopmentcambodia.net/topics/forest-protection-ngos/

Organisation	Project/programme title	Project location	Duration	Cooperating Ministry
Environnement et Solidarité (GERES)				
Winrock Cambodia	Supporting Forests and Biodiversity Project	Kampong Thom, Kratie, Mondulkiri, Preah Vihear, and Stung Treng provinces.	2012 - 2017	N/A
Wildlife Conservation Society (WCS)	Conservation and Landscape Management in the Northern Plains	Svay Leu district, Siem Reap province, and Preah Vihear province	2012 - 2017	Ministry of Agriculture, Fisheries and Forestry
Wildlife Conservation Society (WCS)	Southern Mondulkiri Biodiversity Conservation Project	Snoul district, Kartie province; Keo Seima and Ou Reang districts, Mondulkiri province	2003 - 2017	Ministry of Agriculture, Fisheries and Forestry
Wildlife Alliance (WA)	Southern Cardamom Forest Protection Program	Kampong Speu, Koh Kong, Pursat, and Preah Sihanouk provinces	2016 – 2018	Ministry of Agriculture, Fisheries and Forestry
World Wide Fund for Nature Cambodia (WWF)	Eastern Plains Landscape (EPL)	Koah Nheak, Pech Chenda, and Saen Monorom District, Mondulkiri province.	2016 – 2016	N/A

NATIONAL TARGET 6 ON RESTORATION OF 10 PERCENT OF PRESSURED PAS, CONSERVATION AREAS, AGRO-ECOSYSTEMS AND FOREST ECOSYSTEMS INCLUDING MANGROVES

Target 6:
By 2020, 10 % of those protected areas, conservation areas, agro-ecosystems and forest ecosystems including mangroves that have been under a lot of pressures in recent years are in an advanced state of restoration and are providing enhanced services, particularly to local communities' and indigenous ethnic minorities' women, old persons and children

1. Introduction

1.1 Scope of the subsection

This subsection presents an overview of restoration projects under way or that started between 2014 and 2018, with some attempts to see what they represent in terms of percentage of degraded protected areas, conservation areas, agro-ecosystems and forest ecosystems including mangrove forests.

1.2 Main findings from the 5th National Report on restoration of ecosystems under a lot of pressure

The Fifth National Report listed 'planting and restoration of flooded and mangrove forests' among other activities undertaken by MoE and MAFF in collaboration with NGOs for the protection and management of the natural resources in Cambodia. However, the specific restoration programmes/projects were not listed. The Fifth National Report also noted the current tendency to use native tree species in place of introduced species when referring to forest restoration activities, especially those associated with the planting of trees by the Government (Forestry Administration) on Royal Arbor Day.

The following indicators were assessed: (i) budget for livelihood development of local communities established by 2015; (ii) number of special areas established as part of community protected areas (CPA, CF, CFi), recognized and managed well; (iii) number of restored areas in the community protected areas (CPA, CF, CFi); and (iv) 30% of ecosystems protected. It was concluded that implementation of restoration and preservation of ecosystems and their functioning for the benefit of local communities particularly women, old persons, children and indigenous people[183] (Target 6) had not been started in 2014 at the time when the 5th national report was submitted to the Secretariat of the Convention on Biological Diversity. However, it was estimated that target 12 (the rate of natural habitat loss will have reduced, and restoration of natural habitat and wildlife corridors will have improved by 2020) was considered partially implemented on the basis of the following indicators: (i) plan of habitat loss prevention, habitat and important ecology restoration, (ii) areas and size of habitat restored and protected, (iii) number of rangers and operational equipment and facilities, and (iv) assessment report on current rate of habitat loss and important ecosystem degradation. In addition, target 11 ('By 2020, ecosystems and their services have been better assessed, protected and improved'), for which one indicator was "number of restoration and rehabilitation programs and area (ha)" was considered partially implemented, while target 10 ('By 2020, all known threatened species (fauna & flora) at national level have been protected and conserved'), for which one indicator was "number of restoration programs and action plans to manage and conserve threatened species", was considered on track to full implementation. Finally, based on indicators including the level

[183] Using the language and indicators of the draft target 6 at the time of the 5th National Report

of maintenance and restoration of fish stocks and ecosystems, it was considered that target 4 ('By 2020, aquatic biodiversity and ecosystems have been improved and managed sustainably') was also on track for full implementation by 2020.

2 Overview of progress towards the achievement of Target 6

Status of progress	Comments
☐On track to exceed target ☐On track to achieve target ☒Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Several restoration projects were under way or initiated between 2014 and 2018 covering protected areas and other conservation areas, forest ecosystems including mangroves, and agricultural lands. Many of these projects were conducted to provide basic information on ways and means to carry out restoration projects. They are generally of small size (below 100 ha) and will have to be upscaled to cover significant portions of the degraded ecosystems and reach the 10% target. The GEF-funded project "Collaborative Management for Watershed and Ecosystem Service Protection and Rehabilitation in the Cardamom Mountains, Upper Prek Thnot River Basin" is an example of relatively large-scale restoration project with 1,000 ha of forestland under assisted natural regeneration. The project was started in 2017 to restore and maintain forest cover and watershed stability functions while providing for sustainable livelihoods and ecosystem services in the Upper Prek Thnot Watershed.

3. Pressures on protected areas, conservation areas, agro-ecosystems and forest ecosystems including mangroves

Figure 26 shows that all the protected areas[184] (listed in WDPA as of 15 March 2019) in Cambodia are under some kind of human pressures. Some protected areas such as Beng Per Wildlife Sanctuary (249694 ha), as well as Samlaut (60,000ha) and Tonle Sap (316,250 ha) Multiple Use Areas, all established in 1993, are under very intense human pressure while human pressure in Central Cardamom (401,313 ha established in 2016), Virachey (334,173 ha, established in 1993) and Vensai Siempang (57,469 ha, 2016) National Parks as well as Phnom Prich Wildlife Sanctuary (222,500 ha, 1993) is relatively low. There was no clear correlation between protected area size and intensity of human pressure confirming some of the observations reported in a recent report published in 2018 that studied human pressure intensity in protected areas at the global level[185]. In this study that used 2016 WDPA data (i.e. before the reform that increased the size of Cambodia's protected area system to a bit more than 40%), protected areas that are under low human pressure represented 14.69% of total land, and protected areas under intense human pressure represent 11.34 %[186].

[184] The map shows only protected areas listed in the WDPA as of 15 March 2019, which does not yet include protected areas designated from 2016 to date.
[185] Jones, K. R., O. Venter, R. A. Fuller, J. R. Allan, S. L. Maxwell, P. J. Negret, J. E. M. Watson 2018. One-third of global protected land is under intense human pressure. Science 360, 788–791
[186] http://science.sciencemag.org/content/sci/suppl/2018/05/16/360.6390.788.DC1/aap9565_Jones_SM.pdf

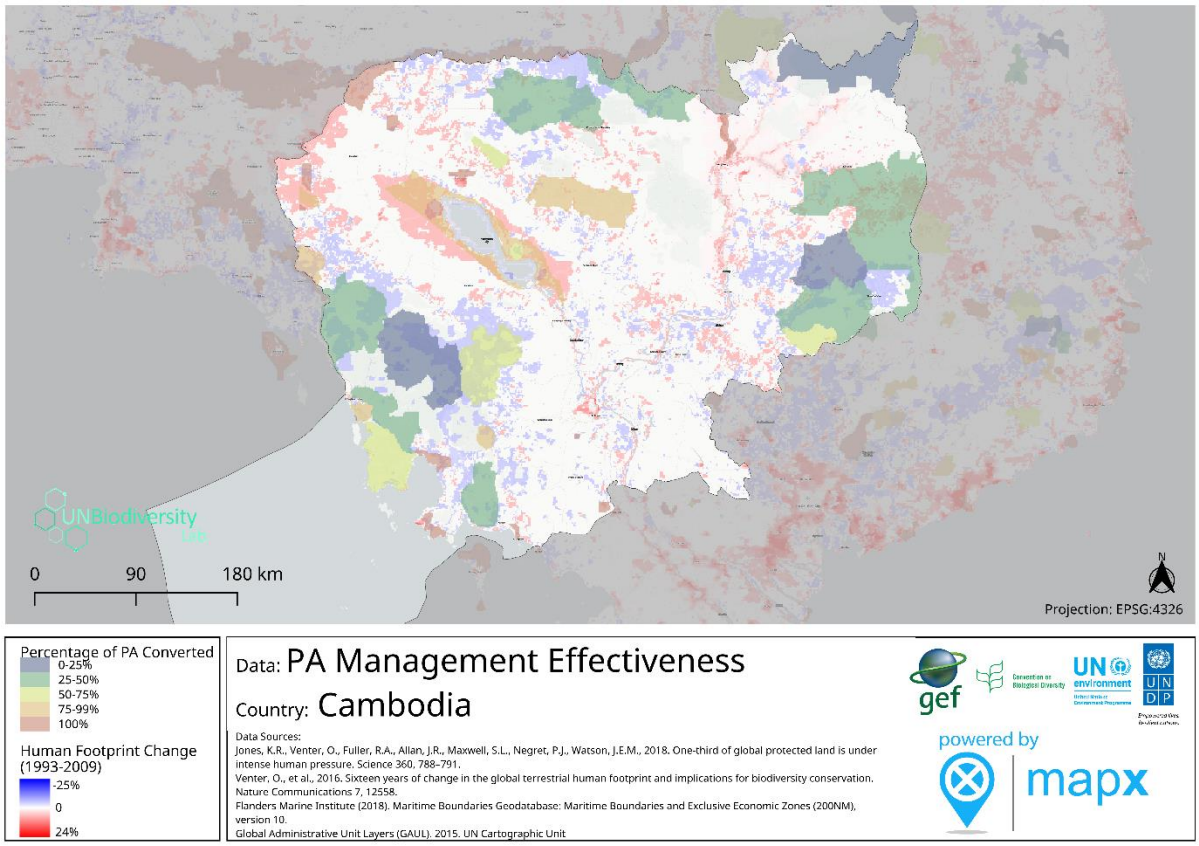


Figure 26: Importance of human pressure within protected areas

Cambodia's forest cover declined from 49.48% in 2014 to 48.14% in 2016 due to clearance for agriculture, settlement expansion, infrastructure development, illegal logging, and unsustainable harvesting of wood fuel. This deforestation is closely linked to other key environmental issues such as land degradation, soil erosion, extinction of wildlife and general loss of biodiversity and ecosystem services, which results in reduced resilience to disasters and climate change.

Coastal development, marine-based pollution, sedimentation, overfishing and destructive fishing are the major pressures impacting coral reefs in Cambodia, including in the Koh Rong Marine National Park, with a threat index considered high for 90% of the reefs and very high for 10%[187]. The Economics of Ecosystems and Biodiversity (TEEB) estimated the value of healthy coral reef between $130,000 and $1.2 million/hectare/year. They noted that coral reefs promote fisheries and eco-tourism practices. They provide a variety of services including food, raw materials, ornamental resources, climate regulation, moderation of extreme events, waste treatment, biological control, cultural services, maintenance of genetic diversity and coastal protection.

Loss of fertility in agroecosystem and decline in food crop productivity are increasing in areas where swidden/shifting cultivation is practiced with more and more reduced regenerative fallow periods and in areas where certain monocultures are practiced[188]. MAFF 2016- 2017 Annual report indicated that production and productivity of rice and other subsidiary and industrial crops increased steadily in the past

[187] van Bochove, J-W., M. McVee, N. Ioannou, P. Raines. 2011 Cambodia Reef Conservation Project 2011 Annual Report. Coral Cay Conservation and MAFF Fisheries Department. Cambodia

[188] For example http://www.fao.org/3/a-i4580e.pdf

5 years, but that soil erosion occurred in 2016-2017 under cassava cropping[189]. In the country profile[190] published in 2018 by the Global Mechanism of the United Nations Convention to Combat Desertification (UNCCD), it was noted that 6.3 million people were living on degrading agricultural land in 2010 - an increase of 38% in a decade, bringing the share of rural residents who inhabit degraded agricultural land up to 55% of the total rural population. Land degradation can severely influence populations' livelihood by restricting people from vital ecosystem services (including food and water), increasing the risk of poverty. Populations in remote areas have restricted options for managing land and accessing other benefits of economic development. The annual cost of land degradation in Cambodia is estimated at 677 million US dollars. This is equal to approximately 8% of the country's Gross Domestic Product[191]. Land degradation leads to reduction in the provision of ecosystem services that takes different forms - deterioration in food availability, soil fertility, carbon sequestration capacity, wood production, groundwater recharge, etc.- with significant social and economic costs to the country.

4. Restoration of degraded ecosystems – Recent examples of projects

During 2014 and 2018, MoE and MAFF initiated some ecosystem restoration activities and strengthened ongoing ones, in partnership with many non-governmental organizations. Projects that have a small restoration component are included in the list below.

4.1 Protected areas and other conservation areas

MoE: **Enhancing Climate Resilience of Rural Communities Living in Protected Areas of Cambodia** (2013 - 2018)[192]: to increase food supply and reduce soil erosion in Chiork Beungprey, Chom Thlork, Skor Mreach (all in Beung Per Wildlife Sanctuary), Ronouk Khgeng (Phnom Prech Wildlife Sanctuary) and Chop Tasok (Phnom Kulen National Park) by restoring a variety of plant species to at least 1,875 hectares of degraded forests; enrichment planting of rice paddy boundaries and other cultivated areas with multi-use tree species that will enhance crop productivity; trial plots of several drought-tolerant hybrid rice cultivars in order to assess their potential yield and suitability for cultivation; and intensifying and diversifying the productivity of at least 1,907 family agriculture areas (including home gardens ranging in size from 0.2 hectares to 1 hectares) in communities living around the forest sites.

4.2 Forests and mangroves

In 2011, it was estimated that approximately 2,600,000 hectares of forest land required restoration[193]. Recent forest restoration projects include:

(a) Afforestation/reforestation (A/R) project in Kratie Province, established in December 2010, by the Forest Administration and the Think Biotech Cambodia, co. ltd. Phnom Penh, Cambodia (TB), a subsidiary of Korea's Hanwha Corporation[194];

[189] MAFF 2016-2017 Report: Preliminary results from two years' study on Kampong Siem soil group at three cassava fields showed average surface soil lost from the field with 4-7% slope were 60-80 t/ha or 4.3-8.5 cm surface depth

[190] Global Mechanism of the UNCCD, 2018. Country Profile of Cambodia. Investing in Land Degradation Neutrality: Making the Case. An Overview of Indicators and Assessments. Bonn, Germany. Accessible at https://knowledge.unccd.int/sites/default/files/ldn_targets/Cambodia.pdf

[191] https://knowledge.unccd.int/sites/default/files/ldn_targets/Cambodia.pdf

[192] https://www.adaptation-fund.org/project/enhancing-climate-resilience-of-rural-communities-living-in-protected-areas-of-cambodia/

[193] http://www.kh.undp.org/content/cambodia/en/home/operations/projects/environment_and_energy/sustainable-forest-management.html

[194] https://pdfs.semanticscholar.org/c49e/d97c57d8014599e94d046c596fbee3667700.pdf Courtney Work 2017 Forest Islands and Castaway Communities: REDD+ and Forest Restoration in Prey Lang Forest. Forests 2017, 8, 47; doi:10.3390/f8020047

(b) The Forest and Landscape Restoration Mechanism (FLRM) Work Plan for Cambodia 2016–2018[195] developed by the Forestry Administration (FA) of the Ministry of Agriculture, Forestry and Fisheries (MAFF) in partnership with FAO.

Objectives: prepare the FLRM with the identification of two possible pilot sites: (i) Steung Sen Watershed and Ecological and Livelihoods Landscape in Kampong Thom and Preah Vihear provinces, (ii) Steung Siem Reap Watershed, Ecological, Cultural and Ecotourism Landscape; methodologies (in particular, the Restoration Opportunities Assessment Methodology (ROAM)) and sources of funding (including two payment for ecosystem services schemes in Kulen Mountains (Siem Reap province) and in Preah Sihanouk province (Khba Chhay National Park) and Land Degradation Neutrality (LDN) Fund)[196];

(c) Multi-Functional Forest Restoration and Management of Degraded Forest Areas in Cambodia[197], in partnership between MAFF and the Institute of Forest and Wildlife Research and Development. 2011-2014.

Objectives: (i) rehabilitate degraded forests in two community forests (20 ha of Prey Kbal Tik community forest located in Tbeng Lech village and 30 ha of O Soam community forest located in Kampong Thom) and transform them into multi-functional healthy forests well stocked with high-value timber (HVT) species and non-timber forest products (NTFPs). Restoration techniques used included silviculture, enrichment planting, assisted natural regeneration and agroforestry; (ii) become a recognized national model on forest rehabilitation and rural livelihood improvement. It should be noted that in 2011, it was considered that about 400,000 ha of natural forests had been placed under the management of local communities, through the Community Forestry system. Community forests are degraded, and communities lack the means to restore them. The Asia-Pacific Network for Sustainable Forest Management and Rehabilitation provided financial support to this 3-year project (project ended in 2015).[198].

Outputs included: (i) two community nurseries built in the Tbeng Lech and O Soam community forests; (ii) over 20 000 seedlings produced (to sustain sales and boost self-reliance); (iii) 52 ha of restored forestland using high-value timber species (e.g. *Dipterocarpus alatus* and *Dalbergia cochinenisis*) and priority species (e.g. rattan, bamboo and fruit trees); (iv) increased capacity in restoration techniques and awareness; (v) pilot study on assisted natural regeneration; and (vi) policy study and technical report on forest restoration in Cambodia.

Additional expected output: (i) for Tbeng Lech CF: recovery of the community forest; availability forest products for home consumption; and support to the ecotourism industry; (ii) for O Soam CF: big trees that could support the housing construction needs, with abundant NTFPs and fish in the creek.

(d) Improving Capacity on Forest Restoration in Cambodia (Phase II) 2012-2013 extended for 5 to 10 more years. Three experiments on forest restoration in Siem Reap to initiate a research study on the reforestation of degraded forests by direct seeding[199] (total area of 1.5 ha). Partnership between the MAFF Forestry Administration (FA) and the ASEAN-ROK Forest Cooperation (AFoCo) with financial support from the Korea Forest Service;

(e) Mangrove rehabilitation in Asia – Local Action and cross-border Transfer of Knowledge for the Conservation of Climate, Forests and Biodiversity[200]. Cambodia participated in this 2012 – 2015 project run

[195] http://www.fao.org/in-action/forest-landscape-restoration-mechanism/resources/detail/en/c/456686/
[196] http://www.fao.org/in-action/forest-landscape-restoration-mechanism/activities/national/cambodia/en/
[197] http://www.apfnet.cn/en/show-model6-957.html
[198] http://www.apfnet.cn/en/uploads/file/20171114/1510642195640915.pdf
[199] http://www.irdfa.org/wp-content/uploads/2017/11/Improving-Capacity-on-Forest-Restoration-in-Cambodia.pdf
[200] https://www.globalnature.org/Mangroves

in 4 countries through Fisheries Action Coalition Team (FACT)[201]. The mangrove forest protection and reforestation will reduce the impact of climate change and improve biodiversity.

(f) Ten hectares of degraded mangrove forests were restored in Koh Kong province[202];

(g) Tould Korki CPAs planted over 25000 mangrove seedlings over 4 ha in May 2016 in collaboration with the Dept of Environment, Peam Krasop WS and local authorities in Toul Korki Commune and financial, support from MFF[203];

(h) In a publication titled "Restoration may Increase Carbon Stock of Degraded Mangrove Forests across Cambodia"[204], scientists estimated ecosystem carbon stock of mangrove forests across Cambodia under different land-use types (intact, disturbed, deforested and restored). Data were collected using the Sustainable Wetland Adaptation and Mitigation Program (SWAMP) protocol. Some of the results are highlighted in Figure 27.

Conversion of intact mangroves to 'disturbed' mangroves resulted in a loss of 253 Mg C ha^{-1}(~30%) and deforestation for shrimp ponds and/or salt pans resulted in a loss of 517 Mg C ha^{-1}(~60%). Rehabilitation of mangroves in Cambodia appears to restore the carbon stocks of degraded mangroves. However, conservation of intact mangroves should still be prioritized as an effective tool to maintain mangrove carbon stocks and their ability to sequester and bury the carbon[205].

4.3 Agroecosystems

Land degradation poses serious direct threats to food and water security in Cambodia. It affects agricultural productivity and water retention capacity of watersheds[206]. The Royal Government of Cambodia's (RGC) primary response to land degradation is detailed in the 2018 National Action Plan to Combat Land Degradation (NAP).

The Global Mechanism of the United Nations Convention to Combat Desertification (UNCCD) published in 2018 that the returns on taking action against land degradation through restoration and sustainable land management practices were estimated at 3 USD for every dollar invested in restoring degraded land in Cambodia[207]. This highlights the strong economic incentive for bold actions against land degradation versus inaction. Economic evaluations of various climate change mitigation alternatives show that capturing carbon through restoring degraded lands is a cost-effective option that offers multiple co-benefits. Given the significant economic burden of land degradation, research has also focused on the study of the costs of action against land degradation through restoration and sustainable land management practices. In the framework of Cambodia's National Voluntary LDN Targets and Measures, Cambodia targets to maintain and enhance ecosystems and their services by *inter alia* restoring at least 8% of degraded and depressed protected areas, conservation areas, agroecosystems and forest ecosystems including mangroves, particularly in 3 provinces (Kampong Thom, Preah Vihear and Siem Reap) where Forest Landscape

[201] The Fisheries Action Coalition Team (FACT) is a group of NGOs that came together to address coastal issues, especially problems related to local fisheries. FACT was formed in the year 2000 and mainly works around Tonle Sap Lake. Apart from biodiversity restoration programs, FACT is involved in mangrove restoration efforts in the coastal zone and has a strong advocacy on fishing rights and coastal resource usage. www.fact.org.kh

[202] https://www.iucn.org/asia/countries/cambodia/mangroves-future-mff-cambodia

[203] https://www.iucn.org/sites/dev/files/content/documents/mff-cambodia_factsheet.pdf

[204] Sharma,S., R. A. MacKenzie, P. Foulk, G. Blate, A. Resanond, N. Tulyasuwan, T. Tieng, R. Wachirapunyanont 2016. Restoration may Increase Carbon Stock of Degraded Mangrove Forests across Cambodia. Powerpoint presentation made at The Mangrove & Macrobenthos Meeting (MMM4) held in the USA in 2016. Accessible at https://conference.ifas.ufl.edu/mmm4/presentations/9-1615_Sharma.pdf

[205] https://conference.ifas.ufl.edu/mmm4/presentations/9-1615_Sharma.pdf

[206] http://www.kh.undp.org/content/cambodia/en/home/operations/projects/build-resilience/COWES.html

[207] https://knowledge.unccd.int/sites/default/files/ldn_targets/Cambodia.pdf

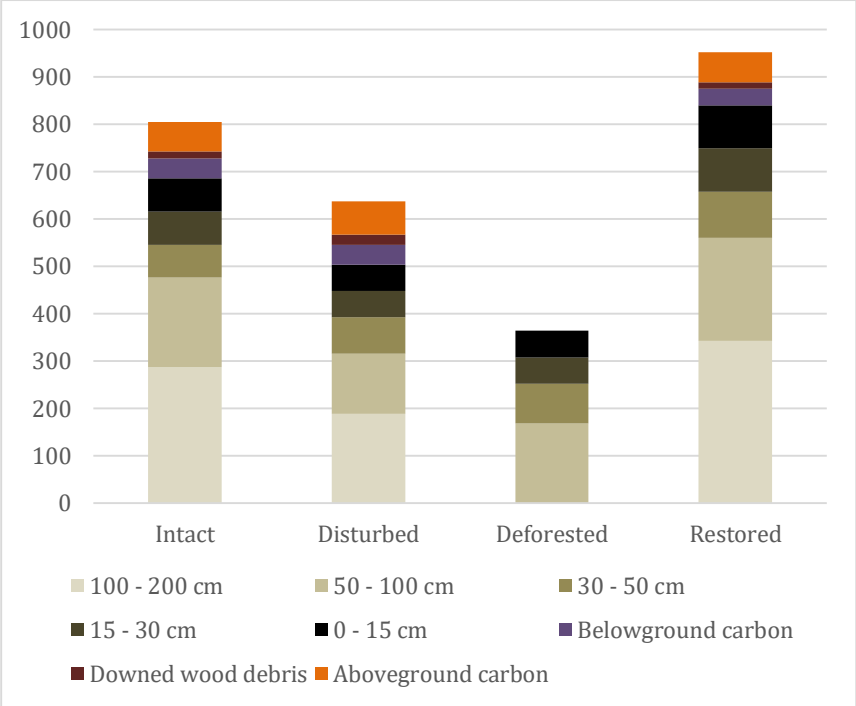


Figure 27: Carbon stocks in different pools and different land use types (intact, disturbed, deforested and restored mangroves of 24-yr Rhizophora sp. dominant) in Mg C ha^{-1}

(**Source**: Redrawn from Sharma *et al*., 2016. Accessible at https://conference.ifas.ufl.edu/mmm4/presentations/9-1615_Sharma.pdf).

Restoration (FLR) and Restoration Opportunities Assessment Methodology (ROAM) approach are being implemented[208].

Cambodia is one of the focal Asian countries where CIAT is conducting in-depth research to document and learn from international, national, and subnational experiences in land restoration policies and projects to identify challenges and opportunities in designing and implementing programs. CIAT's ongoing work supports countries in the achievement of SDG 15. The focus work in Cambodia is on halting desertification and loss of arable land. CIAT 's objectives of the research program on restoration of degraded lands are to support national and sub-national restoration efforts by (i) improving effectiveness: restoration efforts bring significant and sustainable rehabilitation of ecosystems and ecosystem services; (ii) increasing efficiency: restoration is achieved at the minimum cost; (iii) ensuring equity: appropriate institutions (rules) are supported so that restoration benefits and costs are distributed fairly and with appropriate levels of consent among people, among and within countries; (iv) generating development benefits: actions support sustainable development locally, nationally, and internationally; and (v) ensuring sustainability: restoration actions promote lasting benefits and synergies with limited trade-offs across spatial scales[209].

Ongoing removals of landmines constitute another important endeavour that is restoring land for agriculture and many activities contributing to the socioeconomic development of populations in Cambodia.

[208] *https://knowledge.unccd.int/sites/default/files/ldn_targets/Cambodia.pdf*
[209] *https://cgspace.cgiar.org/bitstream/handle/10568/89188/CIAT_RESTORATION_OF_DEGRADED_LANDS_FRAMEWORK.pdf?sequence=3*

4.4 Freshwater and marine ecosystems

Fisheries is essential in strengthening the national economy in in daily lives of people living in Cambodia. However, the use of destructive fishing practices, water pollution from agricultural run-off and industries, and clearance of flooded forests are threatening the services from freshwater and marine ecosystems. Cambodia's policies and actions to address these threats are under way in various projects such as the following:

(a) Collaborative Management for Watershed and Ecosystem Service Protection and Rehabilitation in the Cardamom Mountains, Upper Prek Thnot River Basin. The objective of this GEF-funded project carried out from 2017[210] was to restore and maintain forest cover and watershed stability functions while providing for sustainable livelihoods and ecosystem services in the Upper Prek Thnot Watershed. The project outputs included 1,000 ha of forestland under assisted natural regeneration, the establishment of mechanisms for increased stakeholder participation in watershed rehabilitation and management (e.g. involving local stakeholder groups including community watershed committees, farmer groups, and businesses), and integrated agro-forest and forest ecosystem restoration that is stabilizing prioritized steep slopes areas and reducing sedimentation in downstream areas;

(b) Conservation International (CI) continued to replant and protect flooded forests in key areas with partners in order to increase wildlife habitat and improve fishery productivity[211], e.g. in the floating villages of Tonle Sap Lake where reportedly more than 90 % of the flooded forest, which stretches over 300,000 ha, has already been affected by overexploitation for firewood, overfishing and deforestation to make way for agriculture plots[212]. Three communities— Kompog Prak, O'taprok and Kompong Lor — in floating villages received support from CI to protect, maintain and replant flooded forest, and by 2014 they had replanted more than 120 hectares with 75,000 seedlings.

4.5 General consideration

Interesting outputs from the work carried out during the reporting period include:

(a) A handbook on mangrove restoration[213] was published in 2015. It compiles experiences on Community-based Ecological Mangrove Restoration (CBEMR), a holistic approach, which views the plant and animal communities to be restored as part of a larger ecosystem, connected with other ecological communities and their functions. The Fisheries Action Coalition Team (FACT), a group of Cambodian NGOs, participated in testing the concept.

(b) Several awareness-raising events were organized such as

- In collaboration with the Forestry Administration and the Food and Agriculture Organization (FAO), APFNet organized a Workshop on Mainstreaming Degraded Forest Restoration into Forestry Strategic Plans in Phnom Penh, in December 2014[214];
- the Arbor Day Tree-planting Event in July 2016 when more than 170 people from Phnom Penh, local forest communities, and various provinces worked together to plant 2,600 saplings in the Prey Lang forest near Kbal Klaa community, Kampong Thom province[215].

(c) As part of an IUCN project to identify priority areas for forest landscape restoration in Kampong Thom, Preah Vihear and Siem Reap Provinces, which used the IUCN/WRI Restoration Opportunities Assessment Methodology (ROAM), it was clear that long-term success of landscape restoration projects required some level of land security[216]. There was good evidence that local communities were willing and able to manage their natural resources sustainably when land tenure was secured, and policy incentives were in place. Farmers could then commit themselves to forest restorations at scales that can improve the ecological functions of wide landscape.

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[210] http://www.kh.undp.org/content/cambodia/en/home/operations/projects/build-resilience/COWES.html. Component 2 of the project is "Community forest areas restored and sustainably managed"

[211] https://www.conservation.org/projects/Pages/tonle-sap-lake-conserving-cambodia-fish-factory-mekong.aspx

[212] https://blog.conservation.org/2014/09/cambodias-giving-tree-makes-life-possible-in-floating-villages/

[213] https://www.globalnature.org/bausteine.net/f/8281/GNF_Mangrove_Handbook_2015.pdf?fd=0

[214] http://www.apfnet.cn/en/show-list-313.html

[215] https://www.globalgiving.org/pfil/27912/projdoc.pdf

[216] Observation made in 2017 accessible at https://www.iucn.org/news/asia/201704/long-term-success-landscape-restoration-projects-cambodia-will-require-greater-land-security-and-fewer-land-disputes.

NATIONAL TARGET 7 ON REDUCTION OF NEGATIVE IMPACT OF UNSUSTAINABLE PRODUCTION AND CONSUMPTION

Target 7:

By 2020, Government, private sector and other stakeholders have taken steps to reduce the negative impacts on ecosystems and their services caused by unsustainable production and consumption activities.

1. Introduction

1.1 Scope of the subsection

This subsection presents progress made towards Cambodia's initiatives to reduce the negative impacts of unsustainable production and consumption activities on ecosystems and their services. Protection, conservation, sustainable use and management and restoration of natural and cultural resources are central to Cambodia's roadmap to sustainable development and poverty alleviation. Cambodia's economy is rapidly growing through strong performances in key sectors such as garments, agriculture, and tourism. Being in the challenging process of economic transition, Cambodia has been seeking to enhance production in other sectors and making sustainable its consumption patterns. Natural resources being at the center of its development, Cambodia is paying particular attention to the impact of production and consumption on its natural assets along the value chains.

1.2 Main findings from the 5th National Report on unsustainable production and consumption impacting biodiversity

During the reporting period of the 5th National Report, Cambodia was implementing the Agricultural Sector Strategic Development Plan 2009-2013 and the Strategy for Agriculture and Water; both are aligned with the Rectangular Strategy and efforts to achieve biodiversity indicator targets and Millennium Development Goals. The overarching intent of the Agricultural Sector Strategic Development Plan is to enhance agricultural productivity, diversification and commercialization in order to reduce poverty and promote economic growth consistent with sustainable natural resource management.

Rural Cambodians did not always produce enough rice for their consumption. Observed declines in fisheries resources (decline in larger fish and increase in smaller fish in the catch) and NTFP's meant that rural people were facing intense food insecurity. Through training and awareness raising by the Government, new crop varieties, rotating crops and the System Rice Improvement (SRI) have been promoted to increase rice production for local consumption and export. The use of several different early, medium and late-season rice seed varieties helped to advantage of diverse ecological requirements. The recognition of the importance of promoting diversity into agriculture has also extended into Government initiatives to expand crop diversity, which has led to increases in cultivated areas, as well as production, of other agricultural crops (including corn, cassava, soybean, and mung-bean), livestock, poultry, fish and aquaculture.

Regarding forests, there have been efforts to reduce deforestation (protection, community forestry, community-based production forestry) and the Government had targets for increased forest cover. However, the country's forest cover declined from 61.15% in 2002 to 57.07% in 2010. The lack of protected areas management plans with formal conservation core zones has allowed for Economic Land Concessions to be placed within protected areas, sometimes with significant biodiversity impacts. Suspending some forest concessions reduced formal timber harvesting, charcoal production and deforestation. The

mangrove forests experienced threats from charcoal production, the expansion of salt farms and widespread shrimp aquaculture. Through collaborative efforts by government, NGOs and local communities, the Provincial Environment Department addressed these threats with some success.

A study undertaken in 2010 indicates that wood is now a more and more favoured source of energy given the rising cost of (fossil fuel dependant) electricity and fuel oil. The Government identified Solar Energy and Wind Energy (particularly in the southern part of Tonle Sap, the mountainous districts in the southwest and the coastal regions) as possible alternatives. A report submitted to MoE indicated that until April 2019, Cambodia used 210 MW of electricity (i.e. 12 % of total electricity used in the country) from solar energy. In addition, the Ministry of Rural Development had a national Biodigester Program, with technical training on biogas production and the Ministry of Mines & Energy had a Wood Energy Strategy to increase the efficiency of transformation processes, improve cook stoves for households.

The government set directions and roadmap for short, medium and long-term with respect to water consumption (household, industries) industry and preserve those of urban and rural populations. MOWRAM undertook initiatives to minimize the impacts of its developments and operations on the environment and surrounding communities.

The fifth national report concluded that Government, the private sector and other stakeholders have not yet started taking steps for reducing negative impacts on ecosystems caused by development (consumption and production) activities. The conclusion was reached on the basis of the assessment of the following indicators: (i) number of market-based incentives has been developed and implemented for sustainable production and consumption; (ii) legislations and other programs (green growth development, Satoyama Initiative...) supporting sustainable development has been established and implemented; and (iii) number of certified (qualification and environment) products.

2. Overview of progress towards the achievement of Cambodia Biodiversity Target 7 on unsustainable production and consumption

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Cambodia has in place the necessary legislation, policies and guidelines for sustainable production and consumption. Many ongoing initiatives have already integrated the provisions from the guidelines and legislation compiled and harmonized in the Environment and Natural Resources Code of Cambodia. Sustainable consumption and production are key to the country's sustainable development and poverty alleviation. The report contains some activities started between 2014 and 2018. They are selected examples of many ongoing initiatives in the field of energy for industries, recycling, waste treatment, crop improvement and efficient technologies, and capacity-building.

3. Overview of recent activities to address unsustainable production and consumption impacting biodiversity and ecosystem services in Cambodia

3.1 Production and consumption[217] activities and their possible impacts on biodiversity and its contribution to people in Cambodia

Any production or consumption sector has direct or indirect impact on biodiversity and its contribution to people. Cambodia is going through a period of rapid economic growth. To sustain its strong economic performance, Cambodia is strengthening several growth-supporting factors e.g., by moving into higher-value-added production and sustained improvements in infrastructure, human capital, governance, and other economic factors. Cambodia's production structure is balanced between agriculture, industry, and services. Agriculture's share of national output has declined, falling from almost half of national output in 1995 to 34% in 2013. During the same period, industry's share rose from 15% to 26% and that of services from 36% to 41%. In order to maintain its productions in agriculture, industry and services, the country is paying particular attention to ensure sustainability and, in other words, avoid production and consumption activities that can jeopardize its natural assets.

Table 7 presents examples of consumption and production activities in the three sectors (garments, agriculture, and tourism) driving economic growth in Cambodia and their potential negative impact on biodiversity and ecosystem services

3.2 Optional steps to reduce the negative impacts of unsustainable production and consumption

3.2.1 Measures already taken by the Government

Laws, strategies and plans

The Government has already adopted laws, strategies and plans that, if applied or implemented effectively, can prevent the use of unsustainable production and consumption methods and/or mitigate their impacts on biodiversity and its contribution to people:

(a) Adoption of biodiversity-related conventions including: the Convention on Biological Diversity (CBD); the United Nations Convention to Combat Desertification (UNCCD); the United Nations Framework Convention on Climate Change (UNFCCC); and the other biodiversity-related conventions such as CITES, the Ramsar Convention on Wetlands of International Importance, and the World Heritage Convention. In this framework, Cambodia adopted national strategies and action plans: (i) 2016 National Biodiversity Strategy and Action Plan (NBSAP) under the CBD; (ii) 2018 National Action Program to Combat Land Degradation; and Cambodia's National Voluntary Land Degradation Neutrality Targets and Measures; and (iii) Second National Communication to UNFCCC as well as the Nationally Determined Contribution to UNFCCC. It is also important to note the ecosystem approach, the Addis Ababa Guidelines on Sustainable Development and the Voluntary Biodiversity Inclusive Guidelines on Environmental Impact Assessment and the Voluntary Biodiversity Inclusive Guidelines on the Strategic

[217] From the National Sustainable Development Strategy (NSDS): Increasing consumption of natural resources and environmental pollution including water, soil and the atmosphere are causing high potential risks and hazards to the public health and the environment, and are jeopardizing the long-term economic development of the country.

Table 7: Indicative list of production and consumption activities and their potential impact on biodiversity in the context of Cambodia

Production or consumption activities	Elements of the value chain	Potential impact on biodiversity and ecosystem services
Raw materials[218] from animal and plant origin	**Production and processing of raw material** The main sources of *materials used in the apparel* industry in Cambodia are: (i) natural fibres, including cultivated cotton, flax, hemp and rubber; forestry pulp; and farmed and wild animal skins, wools and silk; (ii) synthetic fibres (imported) based on petrochemicals (e.g. polyester, synthetic rubber) or on recycled chemical materials (e.g. plastic bottles). Cambodia relies heavily on cotton fabric in its garment sector. 66% of garment raw materials were imported in 2008[219], and the trend has been increasing to respond to the global demand of garments.	Cambodia import of cotton is on the increase (Figure 28). It was estimated at US$445.51 Million in 2016[220]. Savings on imports can be used for better management and sustainable use of biodiversity and ecosystem services. Increase in cotton production will need some expansion of the area for the cultivation of cotton, which may require the conversion of natural ecosystems or replace food crops. In addition, as a crop, cotton requires a lot of chemical inputs that can pollute air as well as ground water.
	Rubber: Currently, Cambodia produces enough rubber for its domestic needs and export part of its production	In case Cambodia decide to increase its production of rubber, there will be a need to expand the area for rubber plantation, which can lead to deforestation and thus contribute to greenhouse gas emission. Pulp mills can discharge in surrounding water bodies many pollutants, some of which are persistent and toxic.

[218] Based mainly on the IUCN publication on "Biodiversity Risks and Opportunities in the Apparel Sector" *https://portals.iucn.org/library/sites/library/files/documents/Rep-2016-001.pdf*

[219] *http://www.yarnsandfibers.com/preferredsupplier/reports_fullstory.php?id=546*

[220] United Nations COMTRADE database on international trade

Production or consumption activities	Elements of the value chain	Potential impact on biodiversity and ecosystem services
	Farmed and wild animal skins. There are more than 50 factories in Cambodia that produce shoes and bags from leather. Most of these raw materials are either provided by buyers or imported from outside Cambodia. In 2015, Mong Reththy Group built Cambodia's first pig skin processing factory.	Extraordinary level of pollution caused by unregulated tanneries and processors
	The Siamese crocodile is currently banned from export. It is classified as threatened by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Fauna and Flora International and the Forest Administration are protecting the species in the wild while as many as 20,000 Siamese crocodiles are now raised on over 350 crocodile farms in the Tonle Sap area. Cambodia has started to export crocodile skins and meat to neighbouring countries.	Methods used in crocodile farms are not endorsed by all conservationists The major sources of pollution from the livestock sector are from animal wastes, antibiotics and hormones, fertilizers and pesticides used for feed crops, and sediments from eroded pastures
	Cambodia has a long and rich history in silk production and weaving dating back more than a thousand years[221]. The country uses both farmed and wild animal silk. Cambodia Golden Cocoon Silk production has been in rapid decline in recent years to circa one 1 metric tonne and imported silk yarns have increased to circa four hundred metric tonnes each year. There are many reasons	The cleaning process of silk involves chemicals and the polluted waste water can be discharged to local waterways as pollutants

[221] *https://www.tripadvisor.co.za/ShowTopic-g293939-i9162-k10102164-Silk_Cambodian_Silk_Silk_in_Cambodia-Cambodia.html*

Production or consumption activities	Elements of the value chain	Potential impact on biodiversity and ecosystem services
	for this decline but disease[222] and the increasing use of pesticides for crops in Cambodia is certainly a contributory cause. As such, Cambodia was developing a National Silk Strategy 2016	
Manufacturing/Processing	The processing of raw materials into intermediate and final products comprises many steps. If an apparel factory is taken as an example, the manufacturing chain would include dyeing and wet processes; spinning, weaving and knitting; cutting and trimming; and, sowing, finishing and packaging. Need for energy is very high	Manufacturing/processing can have large environmental impacts. In the case of garments, high-volume textile dyeing and finishing mills in particular are high-impact producers of water pollution and greenhouse gas (GHG) emissions. Some companies lack the capacity to adequately monitor the environmental impacts of manufacturing processes or to enforce compliance with environmental regulations and standards.
Mining and oil sectors	Extractions can require quantities of water and toxic chemicals	Ecosystem (land, water and air) degradation and pollution
Transportation of Goods	The distribution of finished or partially finished goods is made by ship, rail, road, and/or air from manufacturers to retailers and buyers within the country and around the world.	Transportation results in significant GHG emissions, and other forms of air and water pollution. Materials used for packaging (food, beverage e.g., for tourists), if not recyclable, becomes a challenge for agriculture, animals and human health
Consumer care and end-of-life disposal	Generally, the use, maintenance and disposal of goods by consumers is not yet done following standards, with the separation into organic and inorganic components, degradable and recyclable.	Consumer care and end-of-life disposal are important points for consideration. They can also have a large environmental impact, for example through water and energy use.

[222] http://www.dawn.com/news/789057

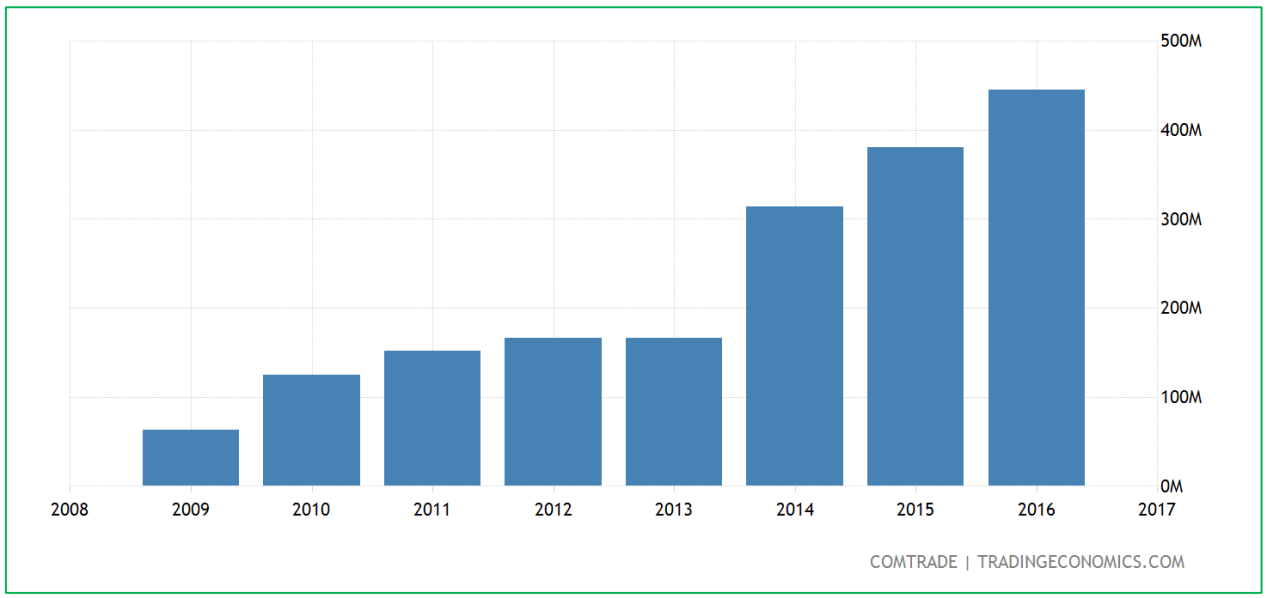


Figure 28: Value of cotton importation from 2008 to 2016

Source: https://tradingeconomics.com/cambodia/imports/cotton

Environmental Assessment under the Convention on Biological Diversity. They all contain guidelines for sustainable production and consumption;

(b) Rectangular Strategy Phase IV and National Green Growth Roadmap to promote and develop a green economy through environmental sustainability, green jobs, green technologies, green finance, green credit and green investment;

(c) Cambodia Industrial Development Policy 2015 – 2025, in which the Government draws attention to environmental protection in order to avoid environmental pollution caused by industrial and chemical wastes, and calls for managing environmental resources in a way to ensure sustainability of ecosystems;

(d) Environmental Guidelines on Solid Waste Management in Kingdom of Cambodia.[223] Supported by the European Union, the Ministry of Environment and COMPED cooperatively created the environmental guidelines on solid waste management in 2006. These guidelines offer detailed directions and instructions including preparing, operating, maintaining and closing landfills, composting methods, medical waste management, environmental education, etc.;

(e) 1996 Law on the Environmental Protection and Natural Resources Management that created the basis of standard setting for air pollution. The management of pollution and waste is governed by the Sub-Decree on the Environmental Impacts Assessment (1999), Sub-Decree on Solid Waste Management (1999), Sub-Decree on the Control on Air and Noise Pollution (2000) and Sub-Decree on Water Pollution Control (1999).

The *Environment and Natural Resources Code of Cambodia* (under review for finalization) compiles and harmonizes the guidance from enacted laws, sub-decrees and policies. The Code contains a section on sustainable consumption and production (Title 3) in guidance is given to the National Council for Sustainable Development / MoE on the development of a number of policy documents (e.g., on sustainable consumption in Article 198 covering areas of water and energy consumption, hazardous waste generation, waste management, tourism, and infrastructure development; sustainable production in Article 199; environmental technology in Articles 200 and 201; environmental labelling in Section 3 etc.) engaging the private sector, civil society organizations, the relevant ministries or institutions, and citizens. The Code goes to specifics like consideration of standards for resource efficiency assessment, demarcation of management zones in protected areas, sustainable charcoal and firewood production; activities affecting threatened plant species habitat, hazardous substances. The Code lists prohibitions, offences and penalties as well as research and awareness raising needs.

3.2.2 Some recent initiatives

[223] *https://comped-cam.org/Documents/developmentguideline/06_03_25_Environmental%20gl%20on%20swm_END.pdf*

Annex 1 contains a list of options for sustainable production and consumption put forward by IUCN. Cambodia has already integrated most of them in its plans of action and implementation is ongoing. The following are a few examples of recent initiatives:

(a) The GIZ-Project "Biodiversity-based products[224] (BBP)" is, implemented in Cambodia, Lao PDR and Vietnam with a 4-year-duration from March 2015 to February 2019. It is one of three modules of the German – ASEAN Centre for Biodiversity (ACB) Cooperation Program "Protection of Biological Diversity in the ASEAN Member States". For Cambodia, the project was implemented in Phnom Kulen National Park (PKNP) in collaboration with the General Secretariat of National Council for Sustainable Development, Ministry of Environment (GSSD/MOE). The Phnom Kulen National Park (PKNP) in Cambodia was chosen because the area was to receive more development support than other national parks. Furthermore, the Royal Government of Cambodia applied for UNESCO World Heritage Status for PKNP. In PKNP, the BBP-project intends to support the value chain development of the ginger species Zingiberaceae spp. (Khmer name: "Prateal Thleum Chhke"), Bamboo Handicraft and Wild Honey, and other potential BBP resources to give households in the community protected areas an alternative to improve their livelihood and at the same time protect the biodiversity in the PKNP area.

(b) Two other initiatives have been launched to promote the 3Rs strategy (re-use, recycle, reduce waste):

- Waste to energy: funded by EU, SWITCH-Asia, SNV Cambodia implemented the Waste to Energy (WtE) project for the rice milling sector in Cambodia – a technology to generate electricity from rice husks – from 2012 to 2015. It targeted nine provinces across Cambodia: Battambang, Pursat, Kompong Speu, Banteay Meanchey, Kompong Thom, Siem Reap, Kandal, Kompong Cham and Prey Veng. This project aimed to make the industry greener, cleaner and more competitive.
- Anti-plastic bags campaign: UNESCO Cambodia, Ministry of Environment, Ministry of Tourism and Union of Youth Federations in Cambodia jointly organized the Cambodian Anti-Plastic Bag Campaign to raise awareness on reducing plastic and recycling. It also aimed to influence behavioral change in Cambodian people.

(c) A regional five-year project aiming to improve waste management was launched in 2015. This project includes Cambodia, Philippines, Vietnam, Laos and Mongolia. The Global Environment Fund has earmarked US$7.5 million for the project. In Cambodia, this project is under the Ministry of Environment, the United Nations Industrial Development Organization (UNIDO) and Phnom Penh Municipal Hall, focuses primarily on Phnom Penh's largest dumpsite Choeung Ek.

(d) Sustainable production and consumption of wood-fuel:

- In Cambodia, 780,000 tonnes /year of fuelwood are consumed by the industrial sector Since June 2016, the Group for the Environment, Renewable Energy and Solidarity (GERES)[225] is implementing a research and development project called: "*Fuelling the Low Carbon Development of Cambodian Manufacturing Industries*". The project aims at supporting the Cambodian industry's low-carbon development by tackling the barriers towards a switch to sustainable biomass energy supply for thermal energy generation, with a focus on the garment and brick manufacturing industries. The project studied how to process agricultural residues such as rice straw or corn stalks (scattered in the field) or factory residues (result of the processing and concentration of the harvest) such as rice husk or corn cobs to make briquettes as a promising, technically and economically viable alternative to fuelwood.
- **Supporting Sustainable Supply Chains in the Domestic Energy Sector in Cambodia**[226]**:** The project led by Group for the Environment, Renewable Energy and Solidarity (GERES) aims to create the conditions for the emergence of a sustainable cooking sector in Cambodia, based on the large-scale adoption of locally produced standardized improved cookstoves. In 2017, the project focused on the institutional empowerment of a professional network engaged in the production and distribution of ICS. In partnership with the Cambodian Institute for Research and Rural Development (CIRD), GERES is

[224] http://www.chm.gdancp-moe.org/attachments/article/22/Call_for_%20Proposal_BBP_Project.pdf
[225] Additional relevant projects by GERES in Cambodia can be found at https://www.geres.eu/en/wp-content/uploads/2018/09/GERES_GSA_Capability_Statement_2017.pdf
[226] https://www.geres.eu/en/wp-content/uploads/2018/09/ra-geres-2017-en.pdf

working with the women and men of this value chain to build their capacities and let them become fully self-sufficient by mid-2019.

Annex 1: An indicative list of options for sustainable production and consumption

(based on IUCN recommendations[227])

The following types of commitments are likely to match some of the risks and opportunities:

Define clearly the commitments in relation to nature conservation:

- Move to deforestation-free supply chains: Ensure that major product lines using raw materials that are based on terrestrial ecosystems (such as cotton or plantation agroecosystems, or natural forest ecosystems), will only source from existing managed landscapes for agriculture or forestry activities.
- Promote land restoration: For raw materials or commodities that have a potential impact on land use (for example cotton), join or develop land restoration initiatives at the landscape level (i.e. help bring back productivity to adjacent areas, thereby reducing the risk of natural habitat conversion for other land uses, including food production).
- Substitute more hazardous chemicals with less hazardous ones: As evidence improves on impacts of industrial chemicals on human and environmental health, best practices, laws and international norms related to such chemical use, substitute more toxic substances with less toxic ones, and improve the targeting and precision of chemical use to minimize non-target impacts.
- Sustainable water management: Across the value chain, commit to using and managing water resources sustainably. Advanced corporate strategies should aim to recognise, map and reduce water risks for wider multi-stakeholder benefits at river basin scale. This approach should underpin work on mitigating biodiversity risks (for example water quality) and encourage business to support better public sector policy development, regulatory mechanisms and monitoring.
- Contribute to sustainable livelihoods: Benefit local communities in your supply chains (particularly in developing countries) that are dependent on natural resources for their livelihoods by creating opportunities for sustainable natural resource management (for e.g. good agricultural practices, water stewardship) with the aim of transforming these supply chains for both community and conservation benefit.

I**ntegrate credible certification schemes in the supply chains.** Identify what would be the most suitable standard and certification systems, based on company's areas of sourcing and operation and the company's values. Eventually define ways to support relevant certification systems and/or national or sub-national governments to improve their capacity to respond to sustainability, quality and market requirements.

Distinguish between animal welfare and biodiversity conservation issues. Both issues are critical, but clearly distinct. The strategies and actions shall be clearly separate in order to ensure that the impacts are correctly addressed as well as the opportunities. Furthermore, partners on the ground and globally will very likely be different for these two issues.

Adopt the mitigation hierarchy. In developing a sustainability strategy for biodiversity, it is advisable to use the mitigation hierarchy as a framework for action. This calls for three main steps:

- Define what impacts can be avoided and address them first (for e.g. avoiding sourcing of wild species that are globally threatened)
- Define options for minimizing environmental impacts and maximizing conservation opportunities (e.g. purchasing organic or sustainably-certified cotton minimises the impact of intensive agrochemicals on local biodiversity in production regions; identifying areas near cotton plantation for restoration).

[227] Based mainly on the IUCN publication on "Biodiversity Risks and Opportunities in the Apparel Sector" *https://portals.iucn.org/library/sites/library/files/documents/Rep-2016-001.pdf*

NATIONAL TARGET 8 ON PROTECTED AREAS: EXPANSION, VALUATION, IMPROVED EFFECTIVENESS AND ENHANCED CONNECTIVITY

Target 8:

In 2020, at the latest, existing protected areas and conservation areas, including community-based natural resource management areas, have management plans and have started effective implementation.

By 2020,

(i) the coverage of marine and coastal protected areas and freshwater protected areas has at least doubled as compared to the 2010 levels;

(ii) Currently unprotected areas of particular importance for biodiversity and ecosystem services that are under a lot of pressures from human activities are identified and integrated in the protected area system; and

(iii) Protected areas and conservation areas have been valued, are part of a well-connected protected area system and have been integrated in national sustainable development goals and national green growth strategies, plans and programmes;

By 2029, protected forest covers 3.0 million hectares, in line with the objectives of the National Forest Programme 2010-2029

1. Introduction

1.1 Scope of the subsection

Cambodia had already exceeded the terrestrial coverage aspect of Aichi Biodiversity Target 11 at the time the target was being adopted. This subsection addresses the national targets that address areas of Aichi Biodiversity target 11 that required additional action i.e. achieving 10 per cent of coastal and marine areas; ensuring effectiveness and equity of protected area management; connectivity of protected areas; and integration within wider landscape and seascape.

1.2 Main findings from the 5th National Report on protected areas

The fifth national report indicated that at the time of the report (2014):

1. The protected areas system in Cambodia included 7 national parks (of which 4 were coastal and marine protected areas) (IUCN management categories II and IV), 10 wildlife sanctuaries (IUCN management categories II and IV), 3 protected landscapes (IUCN management category V), 3 multiple use areas (one of which is a coastal and marine area) (IUCN management category VI), 31 fishery conservation areas and 2 protected forests. Most of these protected areas had been designated in 1993. In addition, the Royal Government of Cambodia made a series of designation of 10 additional Protected Forest areas administered by the Forestry Administration of the Ministry of Agriculture, Forestry and Fisheries covering 1.63 million hectares and 8 fish sanctuaries supported by its Fisheries Administration.

2. In 2013, forest protected areas were: 20 Protected forests and Biodiversity Conservation Areas (IUCN management categories II and IV), and 453 Community Forestry areas (IUCN management categories IV, V and VI); and aquatic conservation areas were: 58 Fish Conservation Areas (consisting of 120,003 ha of inland wetlands and flooded forests under IUCN management categories II and IV) and 469 Community Fisheries (consisting of 126,490 ha of wetlands, flooded forests, mangrove, corals reef and sea grass under IUCN management category VI).
3. The conservation priority of protected areas had been blurred with development needs (e.g., rubber plantation) being prioritized over conservation.
4. The lack of protected areas management plans with formal conservation core zones has allowed for Economic Land Concessions to be placed within protected areas, sometimes with significant biodiversity impacts.
5. Importance of ensuring PAs are resilient was acknowledged in the Cambodia Climate Change Strategic Plan: "Ensure climate resilience of critical ecosystems (Tonle Sap Lake, Mekong River, coastal ecosystems, highlands etc.), biodiversity, protected areas and cultural heritage sites" is one of the 8 strategic objectives.
6. Low ability to enforce laws and regulations concerning management of protected areas was pointed out as a threat to biodiversity, particularly in the context of tourism;
7. Some remarkable progress had been made regarding the creation of more community protected areas (CPAs).
8. No national marine protected areas had been officially established during the reporting period, but there had been significant progress on the designation and protection of important habitats including mangrove, coral reef and seagrass and some other important aquatic habitats through the community-based approach. MAFF has been actively engaged in identifying potential marine protected areas with IUCN and also promoting Community Fisheries and Community Forestry in wetland, marine and coastal habitats. The Ministry of Agriculture, Forestry and Fisheries was preparing two areas for marine fishery management: one in Rong islands and Kampong Smach estuaries for protection of coral reefs, sea grasses, mangroves and other marine fishery resources. MoE had identified three areas as Ramsar Site and one Biosphere reserve and 40 Important Bird Areas, and was supporting community-protected areas within wetland marine and coastal habitats.
9. The number of CPAs created by and under MoE was increasing every year from 3 CPAs communities in year 1999 to 122 CPAs in 2014. The nationwide number of local people participating in CPAs was 28,782 families from 224 villages and also covering 169,104 ha of forests. The number of CFs under management of FA/ MAFF was 453 and covering 399,880 ha, while CFis is 469 covering on the total areas of 126,490 ha in 2010.
10. Restoration of CPA, CF and CFi had not yet taken place in 2014 to benefit local communities particularly women, old persons, children and indigenous people.

The 5th National Report concluded that activities undertaken to reach the national target 8 on protected areas were been implemented only partially. This conclusion was reached by assessing the following indicators: (i) number of existing protected areas and protected forest that have been demarcated with defined zones; (ii) number of management plans for existing protected areas, protected forests and freshwater and marine protected areas; (iii) number of new protected forests, and freshwater and marine protected areas; (iv) and number of coordination mechanisms established for PAs.

2 Overview of progress towards the achievement of Cambodia Biodiversity Target 8 on protected areas

Sub-target	Status of progress	Comments
Coverage	☒Target already exceeded	As of December 2018, Cambodia's protected area system counts 56 PAs covering 7,412,392.67 ha i.e. 40.9% of the territory in the following categories: National Parks (12), Wildlife Sanctuaries (20[228]), Protected Landscapes (10), Multiple Use Areas (8), Ramsar Site (1[229]), Natural Heritage Sites (2), and Marine National Park (1), Genetic Conservation Area (1) and Biodiversity Corridors (counted as 1, but also considered as three sets as North-East Corridor, North-West Corridor and Cardamom Corridor)
Development of management plans	☐On track to exceed target ☒On track to achieve the adjusted target (management plans for 25 PAs by 2021) ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	The importance of management plans is well understood and experience in developing them has been gained. Only two of the 56 protected areas have active management plans. Four other protected areas (of which 2 are Ramsar sites) have management plans that are obsolete. Some management plans have already been developed but need approval. With the adoption of the National Protected Area Strategic Management Plan in 2017, Cambodia took the necessary measures to have management plans for at least 25 protected areas by 2021. This is the adjusted target. In addition, a review of management plans of community protected areas is also planned. Demarcation and zoning, already started in a few protected areas, are priority tasks in the implementation of management plans.
At least doubling of marine and coastal as well as freshwater protected area coverage	☒On track to exceed target limited to marine area ☐On track to achieve target ☐Progress but at an insufficient rate	The establishment of the Marine National Park (1.08% of the EEZ) is more than the double of the 0.2 % marine protected area before 2016.

[228] This number takes into account that Snoul Wildlife Sanctuary and Roniem Daun Sam Wildlife Sanctuary were both declassified in February 2018

[229] This site is Stung Treng. There are 4 other Ramsar Sites that are part of Tonle Sap Multiple Use Area (Boeng Chhmar Core Area, Prek Toal Core Area and Stung Sen Core Area) and part of Peam Krasaop Wildlife Sanctuary (Koh Kapik).

	☐No significant change ☐Moving away from target ☐Unknown	
Designation of important biodiversity areas under pressure	☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Many KBA have now been included in the PA system (including the corridors). However, a few KBAs will need additional protection. Cambodia is very conscious that designation alone is not sufficient but there is a need to continue strengthening law enforcement. Cambodia uses various tools such as SMART with encouraging successes.
Valuation, connectivity and mainstreaming of protected areas	☒On track to exceed target ☐On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Progress in valuating biodiversity in PAS and elsewhere, and in working on ecosystem mapping is progressing significantly (Universities, NGOs, MoE and MAFF): on track. Benefitting from the IPBES experience, Cambodia is considering ways and means to launch a national biodiversity valuation initiative. In terms of connectivity, the establishment of biodiversity conservation corridors in 2017 is outstanding. The 1427939.76 ha designated as corridors represent 7.9 % of the total national land: "Target exceeded" Integration of PAs in national development goals and strategies is clear in Rectangular Strategy Phase IV and in the Environment and Natural Resources Code of Cambodia. The Rectangular Strategy defines the framework for all strategies, plans and programmes that Cambodia is taking. PAs are also well integrated in strategies and other key documents on climate change and land degradation: "Target exceeded".
Expansion of protected forests	☒On track to exceed target ☐On track to achieve target	Most of the new PAs established from 2016 contain a lot of forested areas. Together with the Protected forests transferred to MOE in 2016, protected forests have exceeded the 3 million ha targeted for 2029

	☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	

2. Protected area management plans

3.1 Protected area coverage

As of December 2018, Cambodia's protected area system counts 56 PAs (Figure 29) covering 7,412,392.67 ha representing 40.9%[230] of the territory, one of the highest percentages of national territory within protected areas in the world. Figure 30 presents the evolution of the protected area system from 1993 to



Figure 29: Map of Cambodia's protected area system
(MoE, 2018)

2018. The first protected area, Angkor Archaeological Park, was declared in 1925. The year 1993 represents the time when the country emerged from years of conflicts and created by royal decree a

[230] Cambodia's total territory area is 18.103,500 ha

number of protected areas to address the growing pressures on natural resources and save important ecologically and culturally important sites. In 2016, Cambodia conducted an in-depth reform in the management of its natural resource and environment sector with the exchange of protected forests and production forests / economic land concessions between the Ministry of Environment (MoE) and the Ministry of Agriculture, Forestry and Fisheries (MAFF). Cambodia adopted the National Protected Areas Strategic Management Plan (NPASMP) and completed its project on biodiversity corridor in 2017. While new PAs were designated in 2018, Cambodia declassified Snoul Wildlife Sanctuary and Roniem Daun Sam Wildlife Sanctuary that same year.

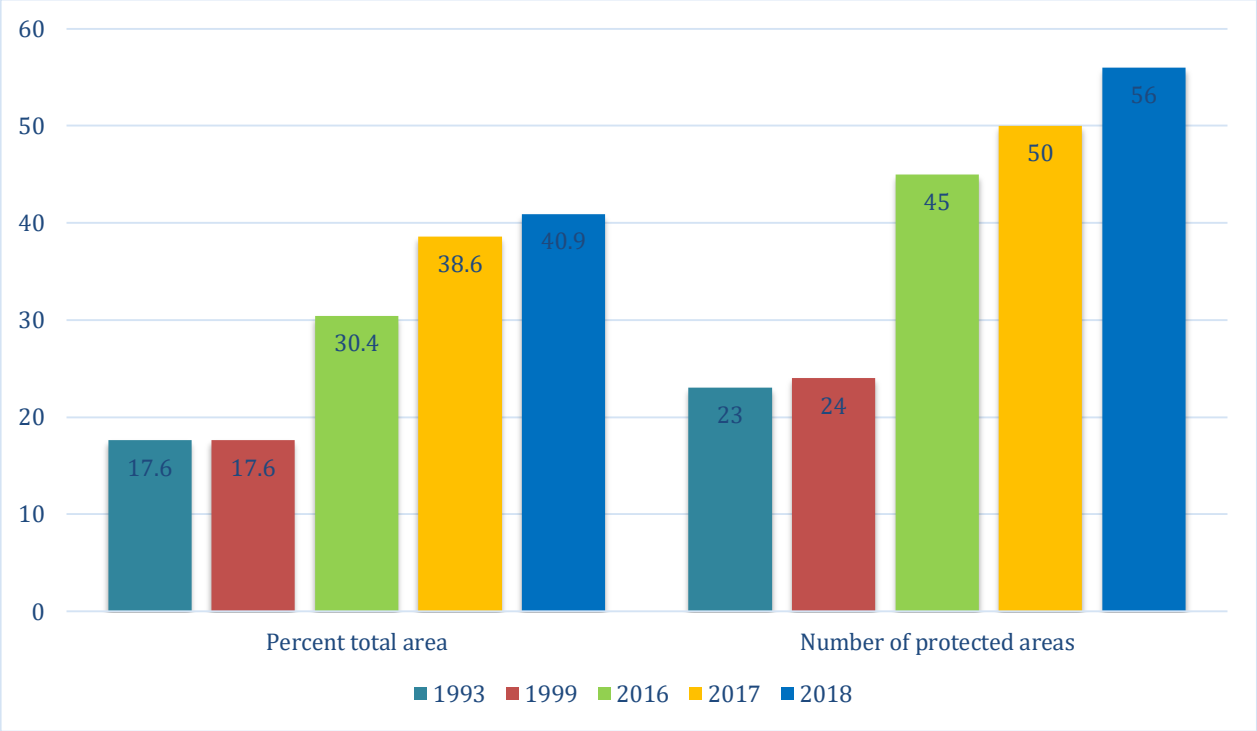


Figure 30: Total area and number of protected areas in Cambodia since 1993

Note: Only years when there were changes are indicated. For example, numbers were the same from 1993 to 1998. A new PA was added in 1999.

At the end of 2018 Cambodia's protected area system consisted of: 12 National Parks, 20 Wildlife Sanctuaries[231], 10 Protected Landscapes, 8 Multiple Use Areas, 1 distinct Ramsar Site (Stung Treng) and 4 other Ramsar Sites that are part of the Tonle Sap Multiple Use Area (Boeng Chhmar Core Area, Prek Toal Core Area and Stung Sen Core Area) and Peam Krasaop Wildlife Sanctuary (Koh Kapik), 2 Natural Heritage Sites, 1 Marine National Park, 1 Genetic Conservation Area and Biodiversity Corridors (North-East Corridors, North-West Corridors and Cardamom Corridors).

3.2 Management Plans of Protected Areas and other conservation areas, including community-based natural resource management areas

Cambodia recognizes the critical importance of management plans to ensure that its protected area system functions in the most efficient and effective way. However, to date only 6 protected areas developed management plans and only 2 of them are still being implemented. The two PAs having active management plans are: (i) Phnom Kulen Preah Cheyvarama National Park, and Phnom Prich Wildlife

[231] This number takes into account that Snoul Wildlife Sanctuary and Roniem Daun Sam Wildlife Sanctuary were both declassified in February 2018

Sanctuary. Management plans of the Virachey National Park, Lomphat Wildlife Sanctuary, Prek Toal Core Area Ramsar Site and Stung Sen Core Area Ramsar Site are no longer valid. Here are some characteristics of the management plan of each of these PAs:

Phnom Kulen Preah Cheyvarama was established in 1993. Kulen Mountain is sacred and considered as the birthplace of the Cambodian Kingdom. It is known not only for its more than 50 ancient temples, but as home to some of the world's endangered species and the source of the Siem Reap River. The Phnom Kulen Preah Cheyvarama National Park, or in short Phnom Kulen National Park (PKNP), was established to protect all these assets. It has several Community Protected Areas (CPA) and one private tourist concession.

People living within the boundary of the Phnom Kulen National Park are engaged in a rainfed agricultural system involving both rice and non-rice (*chamcar*) production. Timber and non-timber forest resource collection are central to their livelihoods.

A survey of the Park was carried out between 2009 and 2013 to ascertain the biodiversity conservation priorities and values within the park, identify threats, and produce recommendations for the mitigation of these threats. Conservation zones were drawn up to assist with future management plans[232]. In April 2017, a consultation was organized to consider a draft of the Phnom Kulen National Park Management Plan.

(a) Located in the Eastern Plains Landscape (EPL), Phnom Prich Wildlife Sanctuary (PPWS) (222,500.00 ha) is home to numerous endangered species and is also important for social and cultural aspects with regard to the local communities. The Wildlife Sanctuary is under serious threat from illegal loggers and poachers as well as the increasing number of domestic dogs threatening wildlife. The Phnom Prich Wildlife Sanctuary (PPWS) management plan for 2016-2021 was developed with support from the Department of Terrestrial Protected Area Conservation, the General Department of Administration for Nature Conservation and Protection (GDANCP)/MoE and Winrock International[233]. The plan has 4 goals, three targets for 2021, as well as provisions for awareness raising, law enforcement, s**cientific research priorities, zoning and objectives to** contribute to the rural economy, poverty reduction, and climate change mitigation.

(b) The Virachey National Park (334,173.00 ha) was established in 1993. Its 2003-2007 management plan[234] was developed through a participatory process, approved by MoE in 2003 and implemented. A management plan update was planned toward the end of 2007 but was not completed. The plan addressed both the biological and the human dimensions of conservation including the definition and partial demarcation of the park boundaries. However, the Plan focused on activities rather than problem solving. Its content was generic in nature and not based on thorough spatial analysis of the conservation values and significance. A Manual for Participatory Development of Management Plans for PAs was prepared and disseminated.

(c) Lomphat Wildlife Sanctuary (LWS) represents relatively unaltered dry deciduous and semi-evergreen forests (250,000 ha) hosting many globally rare and endangered animals (such as the Sarus crane, the Great ibis, Eld's deer, herds of Gaur, Banteng, tiger, leopard, and the red-headed, slender-billed as well as white-rumped vultures) of significance at the national, regional and global levels[235]. In January 2017, the zoning of the Phnom Prich Wildlife Sanctuary[236] and the Lomphat Wildlife Sanctuary[237] was

[232] *https://www.rufford.org/files/11488-1%20Detailed%20Final%20Report_0.pdf*
[233] *http://wwf.panda.org/?284872/Phnom-Prich-Wildlife-Sanctuary-Management-Plan-Developed-in-Protecting-Wildlife-and-Sustaining-Community-Livelihoods*
[234] *http://documents.worldbank.org/curated/en/431561468227947014/pdf/ICR5690ICR0P0610Box334086B01PUBLIC1.pdf*
[235] *https://www.nfwf.org/finalreports1/14407_initiatives_grants_2002-0301-029.pdf*
[236] *https://www.cambodiadaily.com/news/wildlife-sanctuaries-issued-first-zoning-plans-123189/*
[237] *https://www.cambodiadaily.com/news/wildlife-sanctuaries-issued-first-zoning-plans-123189/*

approved for benefits targeted to the indigenous ethnic minorities and the conservation of threatened wildlife;

(d) Prek Toal Core Area and Stung Sen Core Area are part of Tonle Sap multiple use area;

(e) With assistance from Mangroves for the Future (MFF) and IUCN, the Department of Coastal and Marine Conservation of the Ministry of Environment as well as Koh Kong Provincial authorities completed in 2017 the development of a management plan for Peam Krasop Wildlife Sanctuary[238]. The plan was developed with inputs from local communities. It lays out specific actions to address illegal fishing and causes of mangrove degradation including improved law enforcement, sustainable harvesting methods, and communities' livelihoods diversification to reduce pressure on the mangrove. In addition, draft management plans have been developed for two national parks[239]: for the Ream Pheah Sihanouk National Park under an IUCN programme, and for Bokor National Park under the EC-funded Support Programme to the Environmental Sector in Cambodia (SPEC);

(f) Twenty-two Community Protected Areas have approved management plans[240].

Table 8 extracted from the National Protected Areas Strategic Management Plan 2017 – 2013 highlights the roadmap detailed in the strategic document on ways and means to ensure that protected areas and other conservation areas have adequate management plans and that the plans are effectively implemented from now on as well as post 2020.

Table 8: Status of Cambodia's protected area system in 2017 with specific targets for 2017 in the framework of the respective strategic objectives

Indicators and lead MOE Directorate		Baseline (2017)	2021 Target
NPASMP Strategic Objective (SO) 1.1 Secure PA boundaries, zoning and management plans			
(a)	Number of protected areas (PAs) with outer boundaries clearly demarcated at access points (roads, trails, etc.,) and officially registered (GDANCP/GDLC)	7	37
(b)	Number of *Protected Area Profiles* (simplified management plans) completed (GDANCP)	0	25
(c)	Number of PAs with approved management zones (GDANCP with support from GDEKI (GIS unit))	3	25
(d)	Number of Biodiversity Corridors with outer boundaries clearly demarcated and officially registered (GDANCP/GDLC)	0	50%
(e)	Monitoring and assessment of natural resources (GDANCP)	0	2 times
NPASMP Strategic Objective 1.2 Invest in law enforcement and threat reduction			
(a)	Number of PAs with upgraded equipment for effective patrolling and biodiversity monitoring (GDANCP)	4	30
(b)	Number of Rangers that have received specialized law enforcement training (GDANCP)	300	1,000
(c)	Number of PAs with active community awareness programmes that include gender considerations (GDANCP/GDLC with support from GDEKI)	4	30
NPASMP Strategic Objective 1.3 Promote biodiversity conservation and restoration			
(a)	Number of PAs with species-specific conservation action plans (GDANCP)	0	15

[238] https://www.iucn.org/news/cambodia/201711/planning-future-peam-krasop-wildlife-sanctuary
[239] http://www.mekonginfo.org/assets/midocs/0003675-environment-biodiversity-and-protected-areas-cambodia.pdf
[240] See National Protected Areas Strategic Management Plan 2017 – 2013 accessible at https://redd.unfccc.int/uploads/54_2_cambodia_nat_protected_area_strategic_plan_eng_27_jul_2017.pdf

Indicators and lead MOE Directorate		Baseline (2017)	2021 Target
(b)	Number of PAs with forest restoration plans under implementation (GDANCP)	0	15
NPASMP Strategic Objective 1.4 Expand international cooperation			
(a)	GDANCP/GDLC staff participate in key regional and international workshops, trainings and study tours (All departments)	-	Done
NPASMP Strategic Objective 2.1 Harmonize development activities with PA management objectives			
(a)	Proportion of existing Economic Land Concessions (ELCs) with completed EIAs (GDANCP with support from GDES and MAFF)	10% of all ELCs	60% of all ELCs
(b)	The National Committee for Conflict Resolution on PA Management is functioning and making significant progress in addressing land use conflicts (MOE)	-	Done
NPASMP Strategic Objective 2.2 Connect the PA system			
(a)	Ecosystem mapping and spatial gap analyses to identify and establish new biodiversity corridors and review (rationalize) existing PA boundaries (GDANCP with support from GDEKI (GIS unit))	-	Done
(b)	Number of new Marine/Coastal PAs proposed and approved (GDANCP)	1	4
(c)	Number of new Wetland PAs proposed or approved as Ramsar sites (GDANCP)	4	8
NPASMP Strategic Objective 3.1 Enhance local involvement in management planning processes			
(a)	Staff from GDLC, Provincial Environment Departments and PA Directors trained on using participatory and gender sensitive tools for engaging local stakeholders (Training of Trainers) (GDLC/GDANCP)	0	-
(b)	Development and delivery of awareness raising campaigns on PA laws, regulations and management aimed at local authorities (GDLC with support from GDANCP and GDEKI)	0	-
(c)	Number of PAs that have initiated forest and ecosystem restoration actions with local participation (see also SO1.3 and SO3.3) (GDANCP/GDLC)	6 PAs	30 PAs
NPASMP Strategic Objective 3.2 Support collaborative management mechanisms			
(a)	Number of CPAs with approved management plans (GDLC/GDANCP)	22 CPAs	60 CPAs
(b)	Number of CPAs with active community networks to share CPA experiences and receiving operational support (GDLC)	5	40
(c)	Number of new CPAs approved with clear boundary demarcation (GDLC/GDANCP)	0	25
NPASMP Strategic Objective 3.3 Expand livelihood opportunities for local communities			
(a)	Number of CPAs targeted for livelihood enhancements (GDLC)	15	50
(b)	Number of CPAs that have facilitated access to microcredit opportunities (including women entrepreneurs) (GDLC)	5	30
(c)	Development of Ecotourism Strategy for PAs and establishment of ecotourism network (GDANCP/GDLC)	0	Done
(d)	Number of PAs with business plans for ecotourism development (GDLC)	3 PAs	15 PAs
(e)	Number of PAs that generate revenue used for conservation and management activities (GDLC/GDANCP)	3	10
NPASMP Strategic Objective 4.1 Ensure adequate staff with appropriate capacity and resources			
(a)	Develop three Regional Training Centers aimed at PA staff and local authorities (one for each GDANCP region) (GDANCP/GDLC)	0	3
(b)	Establish a new Research and Development Unit in GDANCP that will provide technical advice and training to central and provincial staff on conservation biology (MOE and GDANCP)	-	Done

Indicators and lead MOE Directorate		Baseline (2017)	2021 Target
(c)	Number of integrated technical training modules developed and delivered for central and provincial staff (GDANCP/GDLC)	0	10
NPASMP Strategic Objective 4.2 Enhance collaboration for research, planning and policy development			
(a)	Mechanisms for collaboration at policy and technical levels established (MOE and NCSD)	-	Done
(b)	Baseline conservation data catalogued, stored and shared in central MOE database (GDANCP and Biodiversity Department (GSSD))	-	Done
(c)	Number of PAs using standardized biodiversity monitoring protocols (GDANCP and Biodiversity Department (GSSD))	4	20
(d)	Number of PAs that have completed valuation of ecosystem services (PES pilots) (GDANCP and Biodiversity Department (GSSD))	0	5
Management Effectiveness Evaluations			
(a)	Number of PAs that have completed rapid management effectiveness evaluations (GDANCP/GDLC NCSD)	0	5

Source: Annex 3 of the National Protected Areas Strategic Management Plan (NPASMP) 2017-2031

3.3 National Protected Area Strategic Management Plan 2017-2031

Cambodia has a very rich biodiversity, in particular the largest contiguous block of natural forest remaining on the Asian continent's mainland. Biodiversity and its ecosystem services are under a lot of pressure and the country is exploring ways and means to find and maintain a sustainable balance between the conservation of its natural assets and socioeconomic development. Establishment of protected areas is among the options that the country is using. With its 40.9 % of the territory under protection (from strict conservation to sustainable use of protected assets), Cambodia has one of the highest percentages of national territory within protected areas in the world. It has already surpassed the 17% of the Aichi Biodiversity Target for terrestrial and inland water areas.

Some of the most commercially productive areas of Cambodia include protected areas, such as Tonle Sap Lake and Angkor Protected Landscape. At the same time, the country's protected areas provide sanctuaries to almost 2% of globally threatened species on IUCN's Red List, including 34 mammals, 39 birds, and 20 reptiles[241]. Cambodia's protected area system is under heavy pressure (e.g., illegal logging, poaching, encroachment for land use change). Cambodia has taken important steps to make sure the PA system is effectively protected for future generations. In 2016, the responsibility for safeguarding all protected areas and biodiversity corridors was given to the Ministry of Environment to optimize efficiency. In the absence of management plans for most of the protected areas and other conservation areas, the Royal Government of Cambodia developed the National Protected Area Strategic Management Plan (NPASMP), which reflects the government political will and firm commitment to safeguard the network of protected areas for their contributions to the country's economy and sustainable development, including poverty reduction, through the conservation and sustainable use of its biological, natural and cultural resources and other ecosystem services. The NPASMP was adopted to guide the Ministry of Environment, the Ministry of Agriculture, Forestry and Fisheries as well as other line ministries and assist non-governmental organizations and development partners in developing concrete and appropriate measures and actions to strengthen the effectiveness of protected areas in contributing to the NBSAP and other strategic objectives enshrined in documents such as the National Strategic Development Plan, the National

[241] Ministry of Environment 2017. National Protected Area Strategic Management Plan 2017-2031. The Royal Government of Cambodia.

Strategic Plan on Green Growth, the Cambodia Climate Change Strategic Plan, the National Adaptation Programme to Combat Desertification, and the National REDD+ Strategy.

The NPASMP, which is strategic and generic in its formulation of the objectives (1. Prioritize and strengthen conservation; 2. Enhance sustainable management; 3. Expand community participation and benefits; and 4. Strengthen institutional capacity and collaboration) and enabling activities (gender mainstreaming, resource mobilization, monitoring and evaluation) is being operationalized within the different protected areas and other conservation areas, particularly in the context of the implementation of the payment for ecosystem services schemes including REDD+ (see Cambodia Biodiversity Target 9 in this report).

4. Increase in the coverage of marine protected areas and the protection of freshwater ecosystems

Freshwater within protected areas

Many protected areas and the corridors established from 2016 to date include aquatic systems. For example, North-East corridors protect a large part of the Mekong River in Stung Treng and Kratie provinces. The Cardamom corridors include many streams from the mountains. Several Wildlife Sanctuaries and the new Protected Landscapes have riverine habitats and small wetlands.

Marine protected areas

At the time Parties to the Convention on Biological Diversity adopted the Aichi Biodiversity Targets, in particular Aichi Target 11 that called for the conservation of at least 10 per cent of coastal and marine areas, Cambodia did not have any marine protected area. In a report submitted[242] to the Secretariat of the Convention on Biological Diversity in December 2011, it was noted that the coastal and marine protected areas of Cambodia included Botum Sakor National Park, Ream Pheah Sihanouk National Park; Kep National Park, Preah Monivong; Peam Krasop Wildlife Sanctuary, Phnom Samkos Wildlife Sanctuary and Dong Peng Multiple Use Area, all established in 1993. New protected areas in the coastal areas include Koh Rong National Park, Boeng Prektub Protected Landscape and Kbal Chay Multiple Use Area, established in 2016.

After more than five years of baseline social and biophysical research alongside intensive consultations and collaborative work with government agencies, NGOs, local authorities, tourism operators and community fisheries (CFis), Cambodia designated in 2016 the country's first large-scale marine protected area (MPA) (52498 ha), Marine Fisheries Management Area (MFMA), located in Preah Sihanouk province. MFMA was subsequently designated as the Koh Rong Marine National Park. This represents 1.08 % of the EEZ[243]. As noted by IUCN[244], this Marine National Park is critical to safeguarding coastal habitats such as coral reefs, seagrass beds and mangrove forests. The park is also home to flagship species such as Irawaddy dolphins, dugongs and sea turtles.

In recent years, the Koh Rong area has been under development, leading to certain level of pressures: terrestrial forest degradation, road expansion, unregulated fishing, pollution from improper sewage disposal, disturbance of coral reefs and seagrass beds and more population settlement. A number of organisations supported the government to address these challenges. Fauna and Flora International (FFI) began work in the Koh Rong area in 2010 and supported the idea of establishing an MPA.

[242] Report "Action Plan for Implementing the Convention on Biological Diversity's Programme of Work on Protected Areas" was submitted by S. Chan, GDANCP, MOE on 10 Dec 2011. Link (cambodia_action_plan.doc) is accessible at *https://www.cbd.int/protected/implementation/actionplans/country/?country=kh*

[243] EEZ area is 4869700 ha.

[244] *https://www.iucn.org/news/cambodia/201805/koh-rong-national-marine-park-first-cambodia*

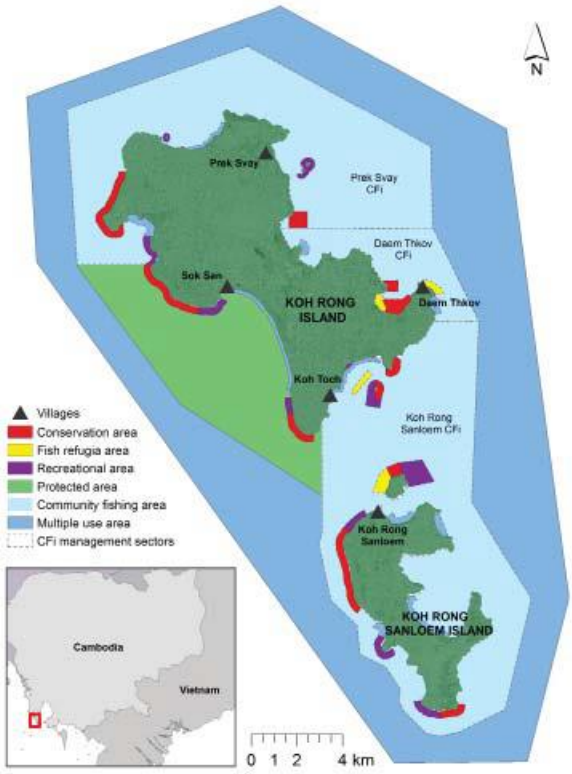


Figure 31: Koh Rong National Marine Park and the proposed management zones.

(**Source** : Roig-Boixeda *et al.*, 2018)

MoE and Mangroves for the Future (MFF) applied a participatory and bottom-up approach for the establishment of the marine protected area. They organize consultations and considered concerns and suggestions from relevant local, provincial and national stakeholders[245]. In line with the reef-to-ridge approach, they recognized the connectivity between marine and coastal ecosystems and terrestrial forest, watershed and other upland ecosystems. Thus, marine areas and terrestrial forests of the surrounding islands were included in the design of the National Marine Park system.

As part of their support to the Department of Marine and Coastal Conservation, IUCN, MFF, Fauna and Flora International and other conservation partners worked on the preparation of the management plan and zoning scheme for the park, while MoE was establishing community-protected areas within the park to ensure the involvement of local communities in the management and protection process. The proposed zones include: 13 conservation area, 1 strict protected area, 3 community fishing areas, 4 fisheries refugia areas, 13 recreational areas and 13 multiple use areas (Figure 31[246] and see Box 6).

Following the introduction of SMART[247] patrolling in 2014 with the support of FFI, illegal fishing activities have decreased significantly (in the range of 70 % after one year). A study[20] conducted to understand non-compliance with conservation rules and published in 2018 indicated that compliance with the rules of the protected area appeared to be driven by awareness and perceived legitimacy of the rules, whereas the main motivations for illegal fishing included economical or livelihood incentives and lack of awareness.

[245] *https://www.iucn.org/news/cambodia/201805/koh-rong-national-marine-park-first-cambodia*
[246] https://www.icriforum.org/sites/default/files/4.4.1%20Case%20study%20Cambodia_MPA%20Koh%20Rong.pdf
[247] Spatial Monitoring and Reporting Tool (SMART) facilitates and standardizes data collection, analysis and reporting of patrol records to encourage their use within adaptive management frameworks (www.ecostats.com, *http://smartconservationtools.org*). The tool is now more and more used in Cambodia.

Experiences gained in Cambodia with spatial planning for land use, with focus on the zoning of protected areas and other conservation areas mandated in the 2008 Protected Area Law with guidance from 'the

Box 6: Zoning of Koh Rong National Marine Park[248]

Marine ecosystems provide a variety of services and can thus become sources of conflicts among beneficiaries and users of the services. Cambodia's coast and islands hold a rich diversity of coral reefs, seagrass beds and mangroves that are under increasing pressure from unsustainable fishing practices, sedimentation, coastal development and marine-based pollution.

At the time of the zoning work, the waters of the Koh Rong Archipelago were in part managed by Community Fisheries (CFi) (about 39 recognized CFis at the time) and showed a decline in catches by small-scale fishers. Increased tourism activities were also observed in the area. The establishment of the Marine Fisheries Management Area was welcomed with the hope to better conserve the ecosystem, support sustainable fishing and tourism, and contribute to poverty alleviation. It is thus necessary to zone marine spaces to designate areas for specific conservation and use purposes with provisions allowing for the determination of trade-offs when conflicts between human resource uses arise. Levels of protection would thus range from strictly no-take areas to areas that allow selective and sustainable extraction of resources.

A range of methods and tools are used to support decision-making processes during the design of marine protected areas including its conservation zones:

Multicriteria decision analysis frameworks were the most commonly used previously. In this type of analysis, information from different criteria is combined to form a single index for evaluating and scoring each site. Scoring methods are quick and easy, but they are mostly ineffective at providing comprehensive solutions in cases where the full range of biodiversity should be included, and they value sites individually rather than collectively i.e. they fail to consider the ecosystem approach principles.
The spatial conservation prioritisation, which is more comprehensive, involves: (i) setting overall conservation objectives (e.g. biodiversity conservation, threat management); (ii) determining conservation features, which are the habitat types and/or species to be conserved; (iii) setting targets for each of these conservation features by, for example, following national or international targets; (iv) dividing the planning region into a series of planning units; (v) calculating the amount of each feature found in each planning unit; (vi) assigning a cost value to each planning unit; and (vii) identifying sets of priority areas for conserving biodiversity that meet the targets, with the constraints of reducing fragmentation of these areas and minimizing planning unit costs.

The Royal Government of Cambodia and conservation partners, including in particular Coral Cay Conservation (CCC) and Fauna & Flora International (FFI), used the spatial prioritisation with the Marxan and Zonation tool to guide decision-making on the design and choices of conservation and use zones in the Marine Fisheries Management Area established in 2016. The process included:

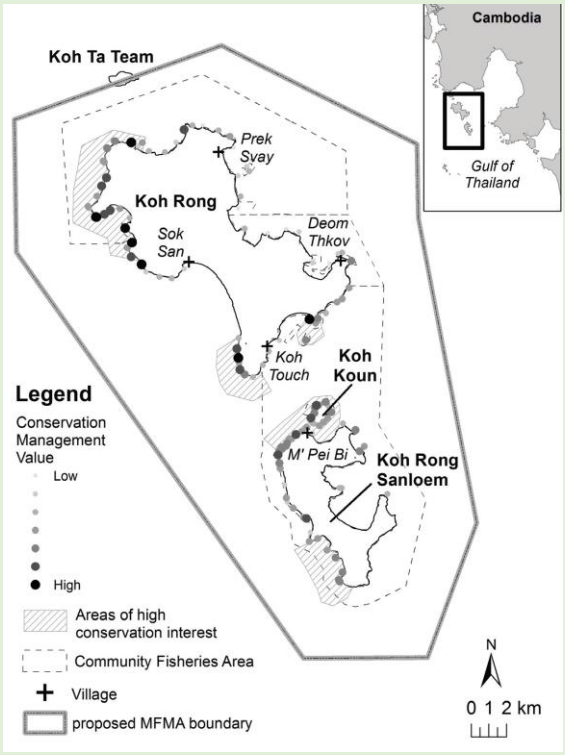
(a) First, a scoring analysis using only ecological data to give an overview of potential areas of conservation interest for reef and reef-associated species. The analysis used coral reef data collected by Coral Cay Conservation in 2010 –2012 and completed with other ecological data such as target fish species abundance, fish species diversity, food fish abundance, target invertebrate species abundance, and invertebrate species diversity. Each site was ranked on the basis of the ecological data. Conservation management value of the sites are presented in this Box Figure 1.

(b) The scoring method based solely on biological data could not be sufficient without taking the range of competing and sometimes reinforcing interests in the region. A supplementary analysis was conducted using Marxan with Zones, which used data on coral reefs, mangroves and seagrasses as well as cost layers derived for sedimentation and fishing impacts. This analysis tried to take into account a wider range of biodiversity around the islands and considered threats to marine habitats. A zoning scheme that took into account both the conservation goals and the socioeconomic cost of fisheries was considered central to the

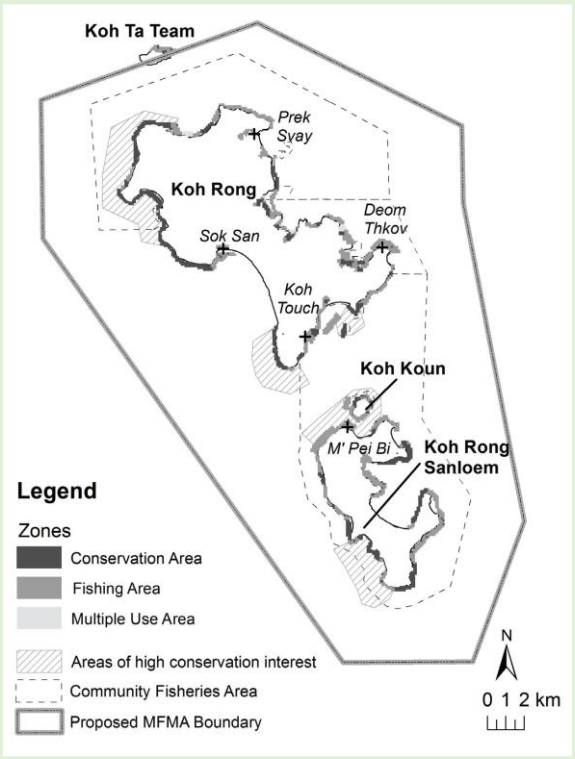
[248] Based on Boon P.Y., Mulligan, B., Benbow, S.L.P., Thorne, B.V., Leng P. & Longhurst, K. (2014) Zoning Cambodia's first Marine Fisheries Management Area. Cambodian Journal of Natural History, 2014, 55–65

success of the MFMA. It was agreed that the zones to be identified needed to include conservation areas (in which any activity that has a negative effect on fishery resources is strictly prohibited except for permitted scientific research), protected/community fishing areas (where subsistence fishing is allowed), and multiple use areas (where environmentally friendly coastal development and tourism are allowed).

Areas of high conservation interest derived from the Marxan with Zones analysis are shown in Box Figure 1. The conservation areas derived from the Marxan with Zones analysis corresponded quite well with the areas of high conservation management value identified through the scoring method, with a few exceptions. An initial zonation plan produced from Marxan with Zones in relation to areas of high conservation interest taking into account the threats from sedimentation and fishing pressure is presented in Box Figure 2. Results from this study will be completed when more quantitative data become available.



Box Figure 1: Conservation management values and areas of high reef conservation interest from the scoring method



Box Figure 2: Initial zonation plan produced from Marxan with Zones in relation to areas of high reef conservation interest.

Environment and Natural Resources Code of Cambodia' (still under review for finalisation) were compiled in 2017 by WCS with support from UNDP in the form of a decision support system. The publication is useful for raising awareness and the training of decision-makers at all levels in the society and as a starting point for discussions and engagement of representatives of all stakeholders including local communities and local authorities for a transparent and robust process leading to land use planning across conservation landscapes and particularly the selection and prioritization of conservation areas and sustainable use areas. Cambodia has increased investment in management zoning arrangements across conservation landscapes in the framework of its REDD+ programme. Identified data gaps (particularly on ecosystem mapping and the status, trends and future dynamics of species and ecosystems of national, regional and global significance, and on related threats taking into account measures taken) are already guiding some research in universities, relevant departments at MoE and MAFF and among conservation non-governmental organizations.

5. Integration in Cambodia's protected area system of unprotected areas of particular importance for biodiversity and ecosystem services

Cambodia has 4 ecoregions: the Cardamom Mountains Moist Forests, the Central Indochina Dry Forests, the Annamite Range Moist Forests ecoregion, which covers parts of Laos, Vietnam and the northeastern edges of Cambodia, and the Mekong River. In 2016, Cambodia noted that all terrestrial ecoregions were under some protection, ranging from 20 to 62% coverage of the respective ecoregions (Figure 32A and B). However, only a small portion (<1 percent) of the Tonle Sap-Mekong peat swamp forests was protected[249]; the remaining part was under human pressure and has been converted to scrub or degraded forests due to intensive agriculture and the alteration of the hydrodynamics of the river systems in the region.

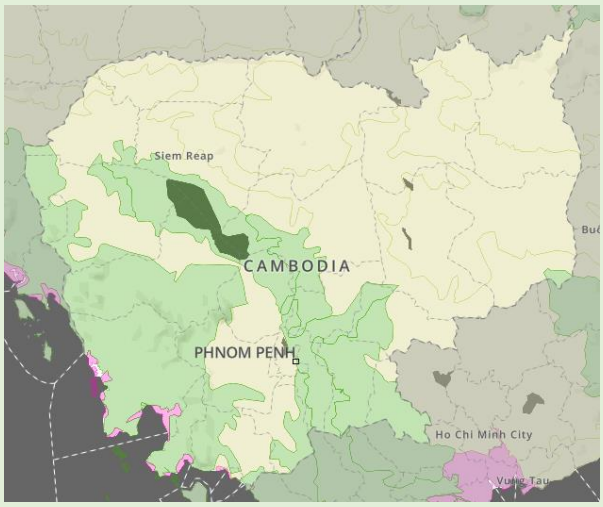


Figure 32 A: Ecoregions of Cambodia

(Source: UN Biodiversity Lab – Ecoregions2017 by biomes)

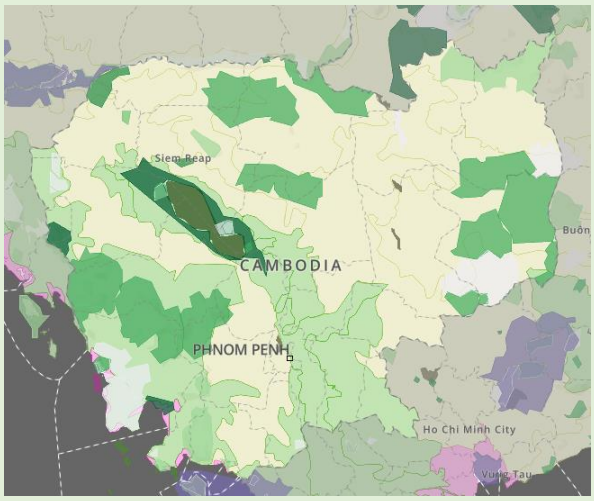


Figure 32 B: Ecoregion map overlaid with the map of protected areas before the 2016 reform
(Source: UN Biodiversity Lab – Ecoregions 2017 by biomes and World Database of Protected Areas (WDPA))

Figure 32: Ecoregion map A overlaid with the WDPA protected areas map

Note: WDPA current map corresponds to the status of Cambodia's protected areas before 2016 because none of the protected areas recently approved is captured in the WDPA.

Cambodia has 45 Key Biodiversity Areas (KBAs)[250] and 40 Important Bird and Biodiversity Area (4,416,991 ha)[251] of which 6 are considered in danger (Boeung Prek Lapouv, Kampong Trach, Lomphat, Sesan River, Stung / Chi Kreng / Kampong Svay, and Western Siem Pang) as a result of agricultural expansion and intensification, human intrusions and disturbances, energy production and mining, overexploitation of some species, in particular wood harvesting and collection of non-timber products. As shown in Figure 33A and B, in 2016 (before the reform undertaken by Cambodia in the forest sector and regarding protected areas) some of these KBAs and IBAs were partly included in the country's protected area system and many other were unprotected.

[249] https://www.worldwildlife.org/ecoregions/im0165
[250] http://www.keybiodiversityareas.org/site/mapsearch The World Database of Key Biodiversity Areas (KBAs)
[251] BirdLife International (2019) Country profile: Cambodia. Available from http://www.birdlife.org/datazone/country/cambodia. Checked: 2019-02-08

The recent expansion of the protected area system is a part of an initiative of the Royal Government of Cambodia (RGC) to enact environmental governance reforms. In February 2016, as part of the actions recommended in the Rectangular Strategy Phase III[252], the Prime Minister undertook a jurisdictional reform of the natural resource management (NRM) sector by extending the role of the Ministry of Environment (MoE) regarding the protection and conservation of natural resources. All the community forestry and all proposed and existing protected forests were transferred from the Forestry Administration (FA) of the Ministry of Agriculture, Forestry and Fisheries (MAFF) to MoE[253]. That year, Cambodia's protected area system was expanded by 12.8 % from its 1999 coverage (Figure 2). Many of the protected areas were rather isolated and could not serve fully their role of protecting wildlife in their full range and in light of current and future pressures (e.g., climate change impacts). Protected areas are intended to maintain species populations and ecological functions. If isolated, protected areas may fail to provide for species migration and dispersal or ecological flows of goods and services required to sustain genetic and species diversity, population recovery, ecosystem processes and contribution to human well-being. Isolated protected areas will become vulnerable to environmental change and at greater risk of experiencing local species extirpations.

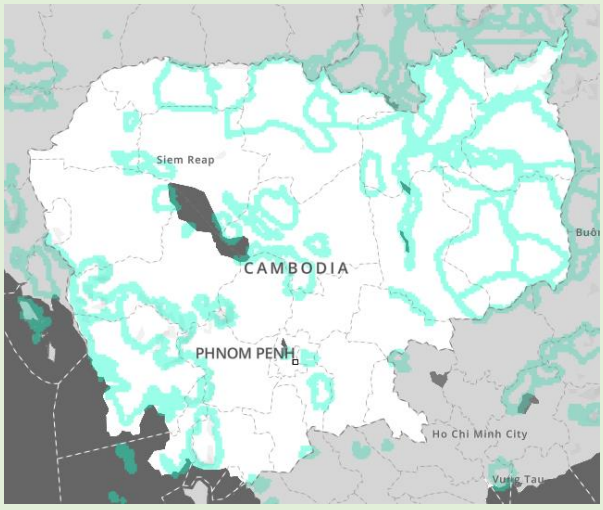


Figure 33A: Key Biodiversity Areas (KBA)
(Source: UN Biodiversity Lab)

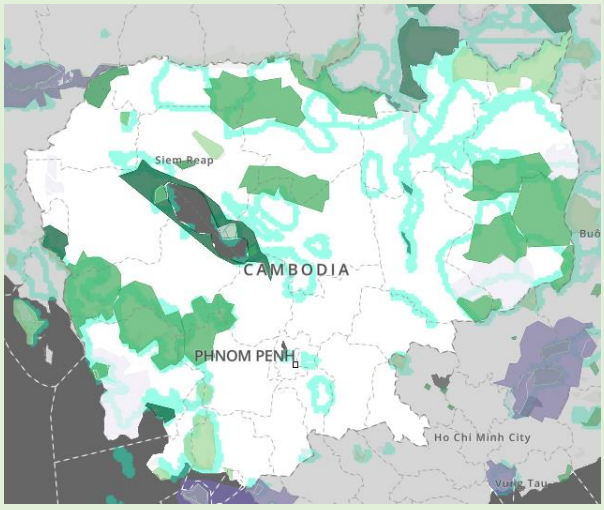


Figure 33B: Overlay of KBA and WDPA maps
(Source: UN Biodiversity Lab)

Figure 33: Maps of Key Biodiversity Areas, WDPA protected areas and their overlay
See Note regarding WDPA protected areas under Figure 32

Building on the experience gained through the Biodiversity Conservation Corridors Project (BCC) administered by the Asian Development Bank[254], and using the resources developed as part of that Project (e.g., the 2010 Project Administration Manual - Kingdom of Cambodia: Greater Mekong Subregion Biodiversity Conservation Corridors Project), Cambodia developed its roadmap for the creation of additional corridors (North-East corridors, North-West corridors and Cardamom corridors). In January 2017, a sub-decree established the conservation corridor network (CC) covering 1427939.76 ha, representing about 7.9 % of the total national land previously unprotected (Figure 34). In addition, in the 2016 NBSAP, Cambodia identified among KBAs and IBAs areas that were then insufficiently protected.

[252] The Rectangular Strategy – Phase III states that "the Royal Government of the Fifth Legislature will reinforce and broaden the management of natural resources to strike a balance between development and conservation".
[253] WCS 2017. Towards a decision support system to inform landscape planning in Cambodia. Report submitted to UNDP
[254] That project focused on biodiversity rich forest landscapes of the Cardamom Mountains and Eastern Plains Dry Forest in Cambodia, Tri-border Forest areas located in southern Lao PDR, and the Central Annamites in Viet Nam.

Many of them and others were included in the PAs established in 2017 and 2018 (**Error! Reference source ot found.** or Figure 34).

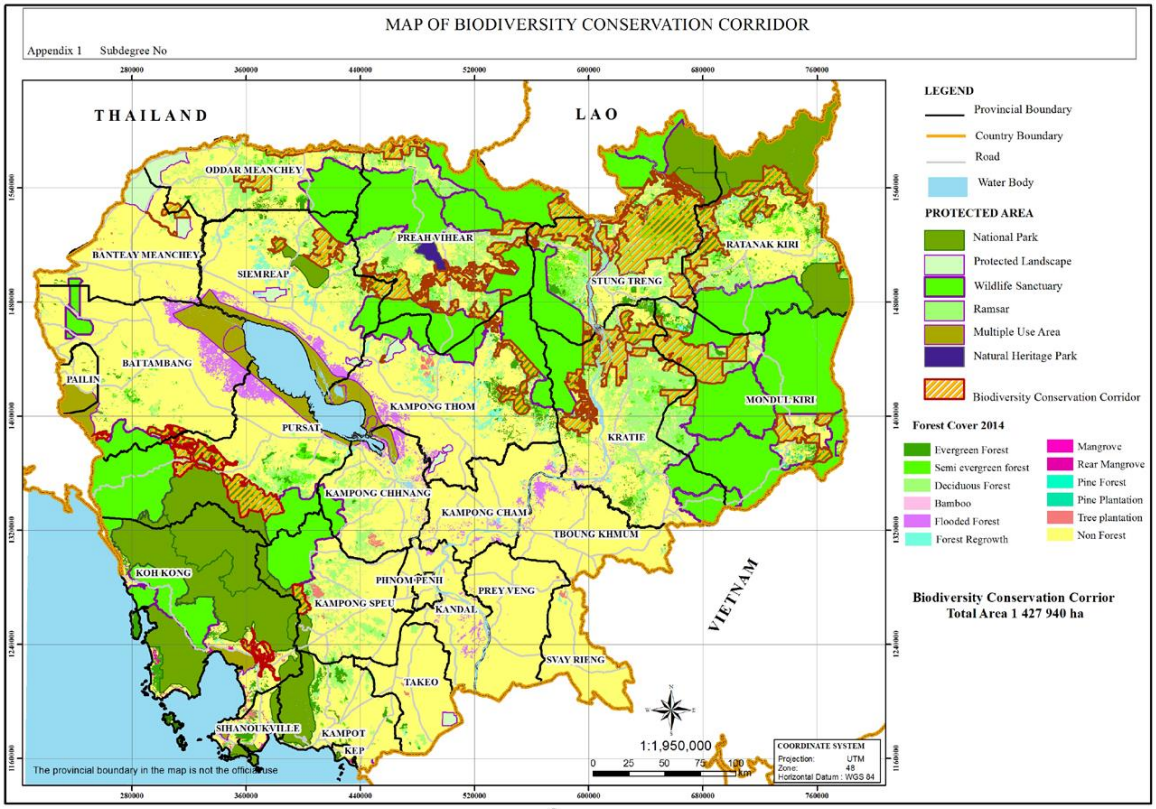


Figure 34: Map of Biodiversity Conservation Corridors

(**Source**: MoE 2017. The National Protected Area Strategic Management Plan 2017-2031. The Royal Government of Cambodia)

6. Protected areas and other conservation areas: their values, connectedness and integration

6.1 Value and scenario analysis

Cambodia is rich in natural resources that contribute to the wellbeing of its population and the country's economy. Millions of people, particularly in rural areas, depend directly on the natural environment for their daily food, water and energy needs and their livelihoods. Some of the country's biodiversity components have global importance. These services are threatened essentially by ecosystem fragmentation, degradation and pollution, and illegal and over-harvesting of natural resources due to industrial and other development activities. Economic growth is essential for the country to develop. However, economic growth at the expense of natural resources and ecosystem services is unsustainable, weakening the functioning of the country's ecosystems and increasing vulnerability among the poorest communities[255].

[255] Watkins, K., C. Sovann, L. Brander, B. Neth, P. Chou, V. Spoann, S. Hoy, K. Choeun, and C. Aing. 2016. Mapping and Valuing Ecosystem Services in Mondulkiri: Outcomes and Recommendations for Sustainable and Inclusive Land Use Planning in Cambodia. WWF Cambodia. Phnom Penh.

Valuation of biodiversity/ecosystems and associated services can guide conservation decisions. There have been many valuation studies in recent years in Cambodia (see an indicative list of recent publications in Table 9). Such valuation studies have considerably increased our knowledge of the value of ecosystems.

Protected areas values covered in these publications include essentially local use of non-timber forest products, sustainable timber, watershed and wildlife protection, carbon sequestration, local use of aquatic products, water quality and flow services, coastal protection, tourism and recreation, support to offshore fisheries, tourism, on-site fisheries, and coastal protection.

In 2014, WWF introduced InVEST (Integrated Valuation of Ecosystem Services and Trade-offs) tool in Mondulkiri to spatially map and economically value different ecosystem services in that province as part of a 2-year initiative funded by USAID and the EU [256]. Box 7 is an example of such valuation. After training people on the use of the tool, the team (WWF-Cambodia, together with the Royal University of Phnom Penh (RUPP) and the Provincial Government of Mondulkiri) produced maps of carbon storage and sequestration, non-timber forest products (NTFPs), annual water yield, sediment retention, nutrient retention and wildlife habitat quality (which used biodiversity as a proxy). Baseline maps of ecosystem services were produced using 2010 data on forest cover and land use published in 2011 by the Forestry Administration/MAFF. The project included a capacity building of provincial level stakeholders to understand, interpret and apply the results of this ecosystem services assessment and valuation; and, where possible, mainstream these outcomes into decision making concerning natural resource management, socio-economic development and land use planning.

[256] Watkins, K., C. Sovann, L. Brander, B. Neth, P. Chou, V. Spoann, S. Hoy, K. Choeun, and C. Aing. 2016. Mapping and Valuing Ecosystem Services in Mondulkiri: Outcomes and Recommendations for Sustainable and Inclusive Land Use Planning in Cambodia. WWF Cambodia. Phnom Penh. Accessible at *http://cambodia.panda.org/?277850/httpwwwcambodiapandaorgprojectsandreportssustainingbiodiversityintheepl*

Table 9: Examples of recent publications on biodiversity/ecosystem valuation

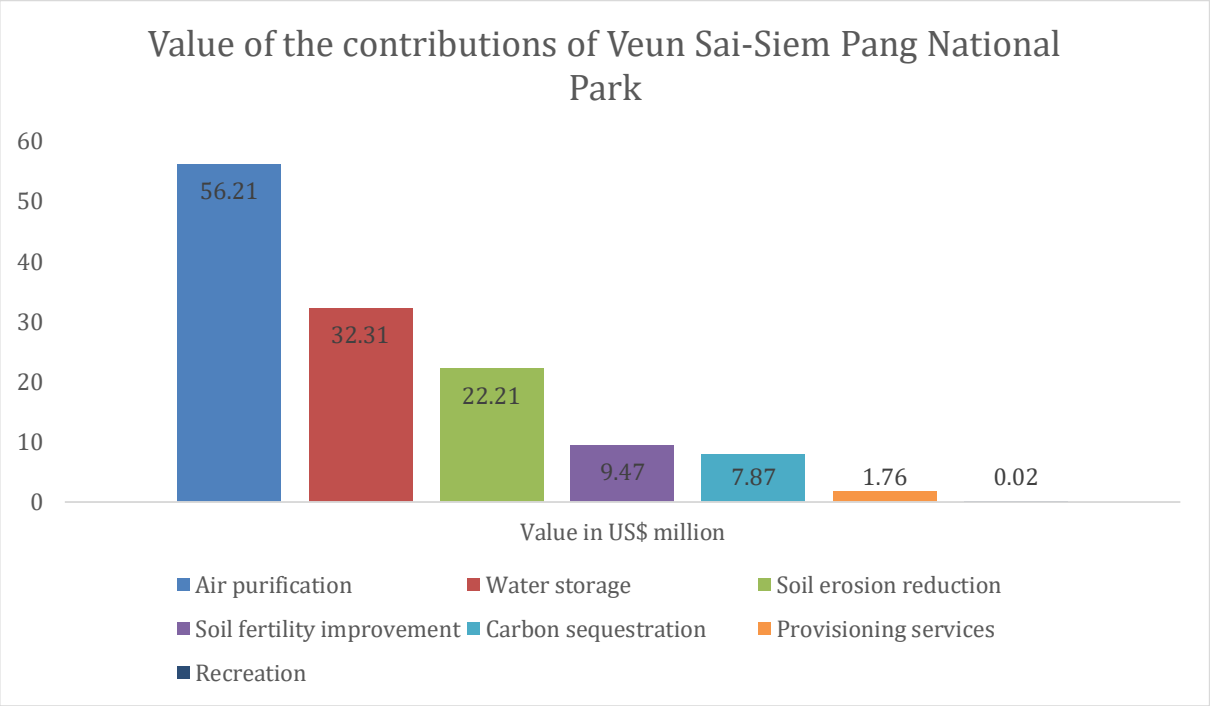
1. Brander, Luke. (2018). Economic valuation of the change in forest ecosystem services in Cambodia 2010-2030. 10.13140/RG.2.2.13786.39360
2. Abu S.M.G.Kibria[a]AlisonBehie[a]RobertCostanza[b]ColinGroves[a]TracyFarrell[c]2017.The value of ecosystem services obtained from the protected forest of Cambodia: The case of Veun Sai-Siem Pang National Park. Ecosystem Services 26: 27-36. *https://doi.org/10.1016/j.ecoser.2017.05.008*
3. P. CHOU 2017. The Importance of Non-timber Forest Products in Rural Livelihoods and Ecosystem Services at Phnom Prich Wildlife Sanctuary, Cambodia. IJERD – International Journal of Environmental and Rural Development (2017) 8-1
4. Watkins, K., C. Sovann, L. Brander, B. Neth, P. Chou, V. Spoann, S. Hoy, K. Choeun, and C. Aing. 2016. Mapping and Valuing Ecosystem Services in Mondulkiri: Outcomes and Recommendations for Sustainable and Inclusive Land Use Planning in Cambodia. WWF Cambodia. Phnom Penh.
5. Valuing Ecosystem Services in the Lower Mekong Basin. *https://www.weadapt.org/knowledge-base/economics-of-adaptation/valuing-ecosystem-services-in-the-lower-mekong-basin*
6. 2015 Ecosystem Services **o**f Wetlands In Cambodia **a**nd Vietnam**.** *https://fishbio.com/projects/ecosystem-services-of-small-wetlands-in-cambodia-and-vietnam*
7. John Talberth 2015. Valuing Ecosystem Services in the Lower Mekong Basin: Country Report for Cambodia. USAID
8. NILAR CHIT TUN 2015. Promoting healthy insect ecosystems in Cambodia to ensure agricultural sustainability. *http://www.ifpri.org/blog/promoting-healthy-insect-ecosystems-cambodia-ensure-agricultural-sustainability*
9. Emerton, Lucy. (2013). The economic value of ecosystem services in the Mekong Basin: what we know, and what we need to know. 10.13140/2.1.4583.0728. WWF
10. Clements, T. and E. J. Milner-Gulland 2014. Impact of payments for environmental services and protected areas on local livelihoods and forest conservation in northern Cambodia. *https://doi.org/10.1111/cobi.12423*

The use of specific scientific data produced by InVEST in provincial spatial land-use planning assisted in determining the ideal locations for conservation and development activities. In addition to information on the value ecosystem services, the initiative provided information on how different plans and policies can affect the ecosystem services under current and 3 future land-use scenarios (conservation (or low deforestation) scenario, green economy (or moderate deforestation) scenario and business-as-usual (high deforestation) scenario). These scenarios were discussed and developed in collaboration with key stakeholders to ensure an inclusive, participatory approach. Some results are presented in Box 8 for illustration purposes.

6.2 Connectivity/corridor

As part of the reforms that the Royal Government of Cambodia undertook to ensure the best management and conservation of the country's natural resources, the government announced in early 2017 a sub-decree that protects 1,427,940 hectares of land as "Biodiversity Conservation Corridors". Addition of biodiversity conservation corridors to the country's protected area estate is an extraordinary initiative of the Government to not only connect existing protected areas and allowing protected species to move normally through their ranges, but also to take into account present and, as much as possible, potential future impacts of climate change. The sub-decree elaborates on the responsibilities of the ministry to prepare and implement policies and management plans for the protected areas, and to propose new areas to be protected.

Box 7: Valuation of the ecosystem services provided by Veun Sai-Siem Pang National Park
(Source of data: Kibria *et al*., 2017[257])



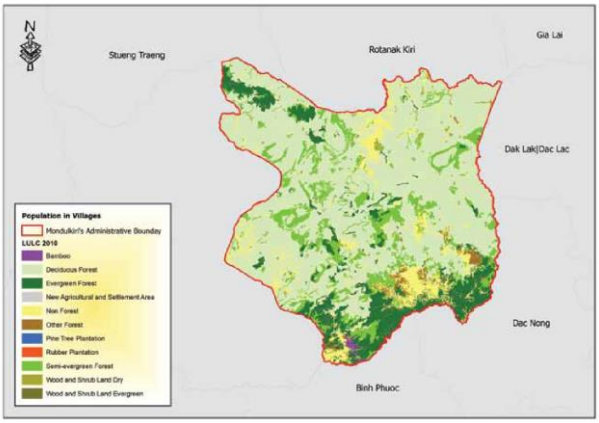
Veun Sai-Siem Pang National Park (VSSPNP) is a forested area extremely significant in terms of biodiversity value. A conservation area listed as a key biodiversity area, VSSPNP was granted National Park status in May 2016. It is home to several indigenous hill tribes and other people including Brao, Lao, Kavet and Kinh as well as 255 animal species comprising 4 that are classified as critically endangered, 12 as endangered, and 19 as vulnerable on the IUCN Red List of Threatened Species.

The total annual contribution of VSSPNP was estimated at US$129.84 million. Traditionally the forest is used for timber and non-timber forest products, which composed only 1.36% of the total benefits. In addition, the cultural importance of the national park for indigenous people was highlighted. Indigenous people believe that their ancestors live inside that forest and protect them from vulnerabilities. VSSPNP faces multiple threats such as illegal logging, poaching, population pressure and corruption. The current estimation of its value is expected to assist in the sustainable management of VSSPNP.

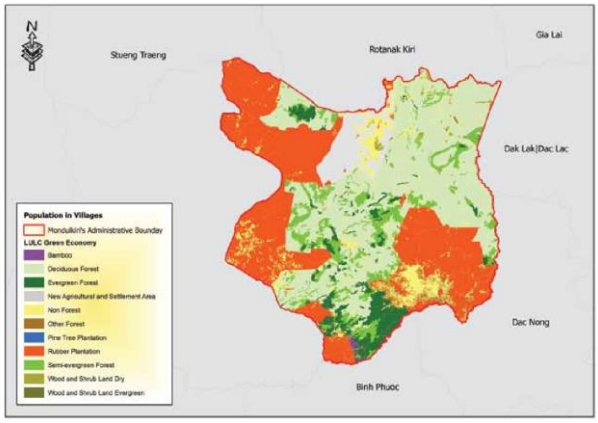
[257] Kibria, A.S.M.G., A. Behie, R. Costanza, C. Groves, and T. Farrell 2017. The value of ecosystem services obtained from the protected forest of Cambodia: The case of Veun Sai-Siem Pang National Park. Ecosystem Services 26 (2017) 27–36)

Box 8: Land Use and Land Cover Map of Mondulkiri in 2030 in accordance to 3 scenarios

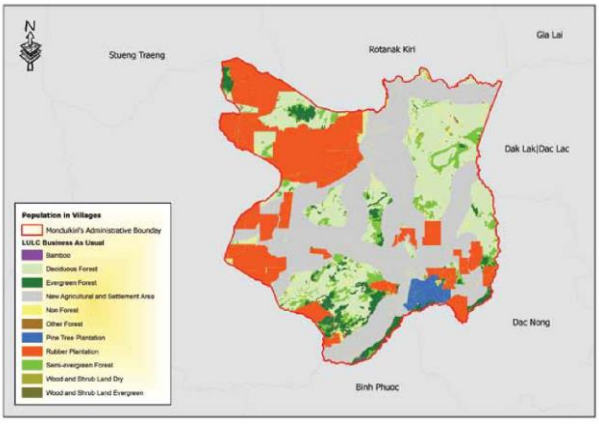
Baseline map (using 2010 data)



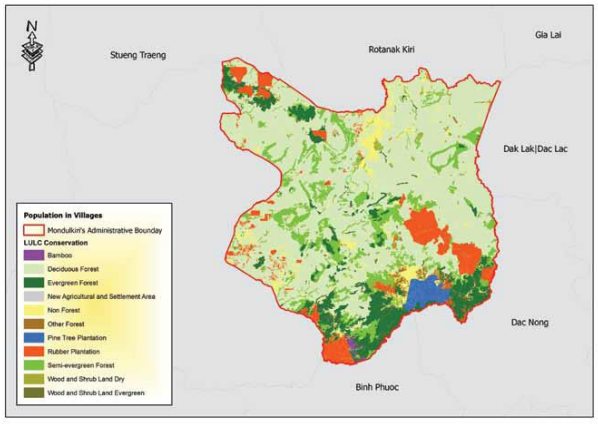
Green Economy scenario



Business-as-usual scenario



Conservation Scenario



Scenarios are based on the following:

• low deforestation. This is the Conservation Scenario (CN) that places a high value on the conservation of significant natural resources, while development activities are allowed mostly in areas outside of these designated plots. In addition, sizeable financial incentives are assumed to be earmarked for conservation of significant resources located within or adjacent to development areas.

• moderate deforestation. This is the green economy (GE) scenario that recognizes the value of natural capital, reflected in local actions. There is increased protection of areas with high biodiversity, carbon stocks, and watersheds. This scenario assumes that there is be improved governance, adherence to spatial plans and implementation of sustainable finance mechanisms.

• high deforestation. This is the business as usual (BAU) scenario that places importance on economic development activities. It also refers to the continuation of the current plans, e.g. road development plans, rubber plantations. This scenario assumes development follows its current trajectory, with weak governance and limited financial incentives for sustainable development.

Results:

1. Under the CN scenario, from 2010 until 2030, non-forest areas inside and outside Economic Land Concessions (ELCs) in Mondulkiri Province (based on 2010 data (MAFF 2011)) are assumed to be agricultural development areas. There is no further forest loss in Mondulkiri Province, including in Protected Areas and Protected Forests. All other areas remain unchanged.
2. In GE, from 2010 until 2030, there is no further forest loss in protected areas and protected forests. This means that existing non-forest areas inside ELCs and Forest Concessions (FCs) are regarded as agricultural development land areas / rubber plantations, depicted in orange and grey on the map
3. In BAU, from 2010 until 2030, existing ELCs, covering 26% of the total area of Mondulkiri in 2010, would be further kept as agricultural development areas. Protected Areas and Protected Forests would no longer be protected for environmental purposes, but development activities would be allowed in all parts of the province resulting in considerably fewer trees, fewer natural forests to regulate the climate, hydrological cycles and provide other ecosystem services.

In 2017, Cambodia established 3 sets of corridors but counted as one. Additional corridors will be added as deemed necessary. Identification of areas requiring corridors, their mapping and their prioritization required careful studies that included an assessment of ranges of species needing protection and the threats and their impacts, an assessment of current land-uses, ecosystem mapping, wide consultations to come to agreements, and spatial prioritization that delivers a ranking of sites from high conservation value at one end, sustainable use in the middle, and community use at the end. This background work started some years back in particular as part of the Biodiversity Conservation Corridor Initiative (BCI), the flagship program of the Core Environment Program (CEP-BCI) of the Great Mekong Subregion (GMS) endorsed by the GMS Leaders at their Summit in 2005. Through that regional project, Cambodia conducted a pilot project on "Biodiversity Conservation Corridors Initiative Pilot Projects in Cardamom Mountains and Eastern Plains of Cambodia" and has an ongoing project in Koh Kong province, the Kandoal sea barrier subproject[258].

The importance of biodiversity conservation corridors is emphasized through the provisions in the Environment and Natural Resources Code of Cambodia. Titles 1 and 2 in Book 4 (Sustainable Management of Natural Resources) are fully devoted to protected areas and Biodiversity Conservation Corridors. Article 305 (Objectives of Biodiversity Conservation Corridors) In Chapter 1 (General Provisions) of Title 2 (Management of Biodiversity Conservation Corridors and Protected Areas) is worth reminding. It states that all Biodiversity Conservation Corridors, nationally-designated Protected Areas, and any other protected areas established at the provincial, district, or commune level shall be managed according to the following objectives:

(a) Biodiversity, wildlife, and natural resource conservation: Ensure the conservation of natural resources, including biological diversity, and to ensure the long-term sustainability of these resources through proper management, research, and awareness raising.

(b) Conservation of ecosystem values, goods, and services: Ensure full consideration of the various values, goods, and services that ecosystems provide, such as water supply and watershed integrity, natural resource products, pollination, pollution filtration, climate stabilization and change mitigation, prevention of soil erosion, clean water supply, and watershed integrity, and the need to ensure the long term optimization of these goods and services; and

(c) Livelihoods development: Ensure the due recognition of the customary rights to non-commercial traditional use of natural resources and occupancy of local and indigenous communities, and in consideration of the sustainable livelihood requirements of the local and indigenous communities whose livelihoods are linked to and dependent on these areas and their natural resources, so as to maintain and improve their customary rights and livelihoods in a manner consistent with the long term sustainability of the conservation and ecosystem service values of the areas.

Article 306 (Biodiversity Conservation Corridor Management Plans) calls for the development of management plans for each corridor.

[258] https://www.adb.org/sites/default/files/project-documents/40253/40253-023-iee-en.pdf

6.3 Integration in national sustainable development goals and national green growth strategies, plans and programmes

As the value of protected areas and other conservation areas is increasingly realised through the number of studies being carried out and the perception of local communities of the benefits accrued when ecosystems are protected and used more sustainably, protected areas and other conservation areas are more and more integrated in strategic plans and programmes. The 2016 forest reform also highlighted the importance of protected areas and other conservation areas by emphasizing the need to manage them in a more coherent, efficient and effective manner.

Protected areas are central to many provisions in "the Environment and Natural Resources Code of Cambodia" (still under review before finalization). In this code, Title 1 (Biodiversity Conservation Corridors and Protected Areas) and Title 2 (Management of Biodiversity Conservation Corridors and Protected Areas) in Book 4 on Sustainable Management of Natural Resources are fully devoted to protected areas and other conservation areas. The importance of protected areas is also highlighted in many other sections of the code particularly regarding the requirements to ensure their effective protection. Offences against the Code that are taking place in the protected areas and other conservation areas are covered in a lot of details; environmental impact assessments need to take protected areas and their role into consideration.

The important role of protected areas and other conservation areas is also highlighted and taken into consideration in key documents guiding on national sustainable development and green economy. The following are some examples from recent documents that illustrate this point:

(a) Cambodia has achieved sustained economic growth over the past two decades, attaining lower middle-income country status in 2016. Cambodia's socio-economic development will experience a "New Transformation" towards the upper middle-income country. This transition requires among, other things, further stepping up the effectiveness of the protection and conservation of the environment, natural resources, ecosystem, biodiversity, forest and wildlife sanctuaries as well as adaptation to climate change. Thus, one of Cambodia's priorities in the sixth Legislature of the National Assembly (see Rectangular Strategy-Phase IV), is to further strengthen the management of protected areas, biodiversity conservation, natural resource conservation (See "Side 4. Ensuring the environmental sustainability and pre-emptive response to the climate change" in the Rectangular Strategy);

(b) One of the priority adaptation actions in Cambodia's Intended Nationally Determined Contribution under the United Nations Framework Convention on Climate Change is: Implementing management measures for protected areas;

(c) In Cambodia Climate Change Strategic Plan (2014-2023), protected areas are listed in a number of priority actions. For example, (i) under Strategic Objective 1 ("Promote climate resilience through improving food, water and energy security"), one action is to "Increase capacity to identify climate-induced opportunities in agricultural production systems, ecosystems and nature protected areas"; (ii) under Strategic Objective 2 ("Reduce sectoral, regional, gender vulnerability and health risks to climate change impacts"), priorities include "to improve water and forest ecology, mangrove ecosystems, coastal zones and protected areas"; and (iii) Strategic Objective 3 is about ensuring climate resilience of critical ecosystems (Tonle Sap Lake, Mekong River, coastal ecosystems, highlands, etc.), biodiversity, protected areas and cultural heritage sites;

(d) In the National REDD+ Strategy 2017-2026, consolidation of Cambodia's protected areas under the Ministry of Environment and the establishment of biodiversity conservation corridors are some of the policy measures that aim to address deforestation and forest degradation in Cambodia;

(e) Cambodia's National Voluntary LDN Targets and Measures[259] described in the National Action Program to Combat Land Degradation 2018-2027 call for reforestation, restoration of degraded and deforested forests and the maintenance of protected forests and wildlife conservation areas at 390 km^2 per year, among other targets;

[259] https://www.unccd.int/sites/default/files/inline-files/Cambodia_1.pdf

(f) Species action plans as well As country programmes developed with partners have integrated protected areas and other conservation areas. For example: (i) the Cambodian Tiger Action Plan[260] or the Ten-Year Species Action Plan for the Giant Ibis *Thaumatibis gigantea*[261] emphasize the importance of adequate management of protected area ecosystems to provide the best conditions for species recovery and maintenance at adequate levels; and (ii) country programmes such as the 2018 UNDP, UNPF and UNO Draft country programme document for Cambodia (2019-2023) and UNESCO Country Strategy for Cambodia 2019-2023 contains plans to strengthen the management and increase the benefits from protected areas and other conservation areas.

The GEF-funded CAMPAS project is a good example of how Cambodia operationalize the integration of protected areas. The project entitled "Strengthening national biodiversity and forest carbon stock conservation through landscape- based collaborative management of Cambodia's Protected Area System as demonstrated in the Eastern Plains Landscape (CAMPAS project)" was developed to enhance the management effectiveness of Cambodia's protected area system and secure forest carbon through improving inter-sectoral collaboration, landscape connectivity and sustainable forest management. One of the key objectives of this 5-year project started in 2015 is to integrate the value of protected areas, forest biodiversity and related ecosystem services, including the carbon sequestration, in development planning, decision-making and processes.

In short, Cambodia has already met its target of integrating protected areas and other conservation areas in its strategies, plans and actions for sustainable socioeconomic development. Cambodia continues to do so in the process of translating the 2015 global sustainable development goals (SDG) into national sustainable goals, building on achievements in the framework of the Millennium Development Goals and the implementation of many relevant strategies and action plans, in particular the country's National Biodiversity Strategy and Action Plan approved in early 2016.

7. Increasing the total area of protected forests

Cambodia's target regarding protected forests is to reach 3.0 million hectares of protected forests by 2029, in line with the objectives of the National Forest Programme 2010-2029. The 2010 Fourth National Report to the Convention on Biological Diversity reported 6 protection forests covering 1,350,000 ha[262]. As noted in the MAFF 2017 "Annual Report for Agriculture, Forestry and Fisheries 2016- 2017 and Direction 2017-2018", the Royal Government of Cambodia transferred to MoE, through Sub-decree No. 69[263], the 13 protected forests and areas of conservation forests covering 1,684,755 hectares that were under MAFF jurisdiction. The MAFF reports also that 5 additional forests (all production forests) equivalent to 951,325 hectares that were in the process of classification as protected forests were also part of the transfer. Today, many protected areas, including protected areas that have been established after the promulgation of sub-decree 69 such as Chhaeb Wildlife Sanctuary and Sre Pok Wildlife Sanctuary, contain large areas of forests, the sum of which, together with the forest areas transferred to MoE from MAFF exceeds the 3 million ha targeted in the National Forest Programme 2010 - 2029.

[260] DWB/GTI (2016) *Cambodian Tiger Action Plan*. Department of Wildlife and Biodiversity, Forestry Administration, MAFF and Global Tiger Initiative. Phnom Penh, Cambodia [in Khmer]

[261] Loveridge, R. & Ty S. (2015) *Ten-Year Species Action Plan for the Giant Ibis Thaumatibis gigantea in Cambodia. 2015-2025*. BirdLife International–Cambodia Programme, Phnom Penh, Cambodia.

[262] Fourth National Report to CBD (2010): Cambodia's protected area system includes 7 national parks (742,250 ha), 10 wildlife sanctuaries (2,030,000 ha), 3 protected landscape (9,700 ha), 3 multiple use areas (403,950 ha), , and 8 fish sanctuaries (23,544 ha).

[263] Sub-decree No. 69 on the Transfer of the Protected Forest, Forest Conservation and Production Forest Areas, and Economic Land Concessions between MAFF and MoE. Through this sub-decree, 13 protected forests and areas of forest conservation, and 5 areas of production forests, were transferred from MAFF to MoE. The production forests will be integrated to the protected area system.

NATIONAL TARGET 9 ON PROMOTING PAYMENT FOR ECOSYSTEM SERVICES AS INCENTIVE FOR THE CONSERVATION AND SUSTAINABLE USE OF BIODIVERSITY

Target 9:
By 2020, Payment for Ecosystem Services (PES) is used throughout the country as an incentive for the conservation and sustainable use of biodiversity.

1. Introduction

1.1 Scope of the subsection

This subsection presents progress made towards the wide use of payment for ecosystem[264] service (also referred to as payment for environmental services) (PES) approaches throughout the country as an incentive for the conservation and sustainable use of biodiversity. It will thus consider reports referring to direct payments, PES and Reducing Emissions from Deforestation and Forest Degradation[265] (REDD$^+$).

In the country's National Biodiversity and Action Plan updated in 2016, PES is considered as an important component of the enabling environment being put in place and strengthened for the effective implementation of the national biodiversity strategy in line with other country's strategies for the conservation and sustainable use or management of the country's natural assets such as certification, tax-based mechanisms, and access and benefit sharing. The NBSAP refers to payment for ecosystem services as a way to contribute to resources mobilization or as incentives for sustainable use and conservation of components of biodiversity. The NBSAP also calls for capacity building to promote the use of payment for ecosystem services, in particular REDD$^+$. Payment for ecosystem services is referred to in the NBSAP under theme 1 on protected area system, theme 8 on biodiversity and climate change, theme 17 on Industry, Technology and Services (Manufacturing, Biotechnology and Biosafety, and Tourism), and theme 18 on resource mobilization. Payment for ecosystem services is also considered as an incentive for the implementation of actions needed to achieve almost all the national biodiversity targets where drivers of biodiversity loss need to be controlled or avoided.

This subsection will present an overview of the ongoing projects where PES and other forms of payment, in particular REDD+, are used with the mechanisms in place (policies, contracts and compliance, monitoring and evaluation of success with regard to biological conservation and improved human well-being) as well as the opportunities for scaling up the use of these incentive mechanisms.

1.2 Main findings from the 5th National Report on the use of Payment for Ecosystem Services

The fifth national report indicated that by 2014 no implementation took place to make progress towards encouraging programs or projects using Payment for Ecosystem Services (PES) throughout the country. To reach this conclusion, the following indicators were considered: (i) number of biodiversity friendly incentives and PES programs or projects developed and implemented; (ii) number of legislations regarding PES developed and implemented; and (iii) identification of key ecosystem services and their benefits.

[264] 'Ecosystem' is used rather than 'environmental' to emphasize the focus on biodiversity, ecosystem being one of the 3 levels of biological organization enshrined in the term biodiversity, together with species and genetic levels
[265] REDD$^+$ i.e. including the role of conservation, sustainable management of forests and enhancement of forest carbon stocks

2 Overview of progress towards the achievement of Cambodia Biodiversity Target 9 on payment for ecosystem services

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Cambodia's experience with payment for ecosystem services (PES) is that this innovative financing tool can be an effective incentive for the protection/conservation and sustainable use/management of biodiversity and related ecosystem services. PES was referred to in new strategic and policy documents. For example, PES is featured in the National Action Program to Combat Land Degradation (NAP) 2018 – 2027, Cambodia climate change strategic plan (2014-2023), and the National Strategic Development Plan 2014 -2018. The Environment and Natural Resources Code of Cambodia (under review before finalisation) devotes a lot of articles to PES schemes. However, there is not yet a specific law or regulatory framework on PES. The issue of land property right is of particular concern among local communities and indigenous peoples. Discussions are under way to agree on modalities and possible contents of a regulatory mechanism for PES. In this report, we considered (i) direct payments for biodiversity conservation of threatened species of fauna and flora, particularly the Nest Protection Programme; (ii) community conservation agreements particularly in the context of watersheds and ecotourism; (iii) the Ibis Rice Programme or agri-environmental payment; and (iv) the REDD^{+} projects and programmes in which the environmental service is carbon sequestration and the aim is to secure buyers from the voluntary carbon market. The direct payments for the conservation of threatened species of fauna and flora, particularly the Nest Protection Programme, and the Ibis Rice Programme are functioning well. Examples of successful protection of nests and wildlife are reported. A key success factor is that these schemes are small in scale and have a relatively simple payment system without cumbersome transaction costs. Regarding the REDD+ programme, Cambodia was able to sell some carbon but the carbon market is still rather weak. During the reporting period, Cambodia started two new REDD+ projects: (i) the Southern Cardamom REDD+ project (Forestry Administration, Wildlife Alliance (WA) and other partners) and (ii) Tumring REDD+ Project (TRP) (Forestry Administration, Korea Forest Service, Agence française de développement (AFD)). In 2016, the Walt Disney Company bought 360,000 carbon credits from Keo Seima Wildlife Sanctuary REDD project for US$2.6 million. In early 2018, following a report by forestry NGO Fern, Virgin Atlantic Airways announced the removal of the Oddar Meanchey REDD+ project from its carbon offset portfolio. However, in the past 4 years, Cambodia's progress on REDD+ readiness activities and on activities supported by the Forest Carbon Partnership Facility (FCPF) was on track. The National REDD+ Strategy (NRS) 2017-2026 was endorsed by the government in December 2017 as well as

	the National Protected Area Strategic Management Plan (NPASMP) 2017-2031. The National Forest Monitoring System (NFMS) as well as the forest reference emission level (FREL) were reviewed in 2018. Some challenges being addressed included: (i) the lack of a system for data collection on safeguards and data sharing; (ii) the need to address the drivers of forest loss/degradation from outside the forest, bearing in mind that so far REDD+ in Cambodia focused only on interventions in the forest sector; (iii) needs of adequate financial and human resources for the effective law enforcement, and (iv) incentivization of local and indigenous ethnic minorities.

2. Overview of recent PES activities in Cambodia

2.1 Payment for ecosystem services' (PES) and PES-like scheme

In broad terms, the payment for ecosystem services (PES) scheme in Cambodia's context entails some monetary transfer from a non-public source to individuals or groups of people to compensate and/or incentivize them for their engagement in activities that support the conservation and/or provision of ecosystem services[266]. PES schemes in practice in Cambodia differ essentially in their purpose, the ecosystem services they target, in the sources of funding and possible intermediaries involved in design and implementation. They can be categorized as[267]: (i) direct payments for biodiversity conservation of threatened species of fauna and flora, particularly the Nest Protection Programme; (ii) community conservation agreements particularly in the context of watersheds and ecotourism; (iii) the Ibis Rice Programme or agri-environmental payment; and (iv) the REDD$^+$ projects and programmes in which the environmental service is carbon sequestration and the aim is to secure buyers from the voluntary carbon market. Schemes for the conservation of threatened species are driven essentially by three international non-governmental organizations — Wildlife Conservation Society (WCS), Conservation International (CI) and WWF —working in collaboration with the Ministry of Agriculture, Forestry and Fisheries (MAFF), particularly the Forestry Administration, and/or the Ministry of Environment (MoE).

Agreements whereby a private sector agrees to support financially an environment conservation bodies such as a national park for conservation activities because these activities will benefit the private sector's business have been made many years ago. The Chambok Community-Based Ecotourism program is one such an example[268]. The programme was introduced by the NGO Mlup Baiting in 2001 and is still serving both local and international tourists through homestead services, restaurants, bird-watching services, and other cultural activities, which are run by the villagers. Both livelihood and natural resources have been notably improved and conserved through this program.

Table 10 and Table 11 summarize information about the most important Wildlife PES and REDD$^+$ activities. Watershed PES, driven essentially by FFI and Wildlife Alliance, in partnership with government partners, are still being tested and negotiated. These schemes aim to secure private investors or companies as the buyers of watershed services in the context of hydropower dams and town water supplies.

[266] Modified from Heng N. and Kong S. 2016. A review of PES implementation in Cambodia. EEPSEA SRG Report No. 2016-SRG5. Economy and Environment Program for Southeast Asia, Laguna, Philippines

[267] Based on Donal, Y. 2016. Payments for Ecosystem Services (PES) Programs in Cambodia. WCS Accessible at http://www.gms-eoc.org/uploads/resources/923/attachment/2.%20WCS.pdf

[268] Chambok Community-Based Ecotourism program, which was introduced by the NGO Mlup Baiting (in Khmer) in 2001, is continuing to serve both local and international tourists through homestead services, restaurants, bird-watching services, and other cultural activities, which are run by the villagers. Both livelihood and natural resources have been notably improved and conserved through this program (Heng N. and Kong S. 2016. A review of PES implementation in Cambodia. EEPSEA SRG Report No. 2016-SRG5. Economy and Environment Program for Southeast Asia, Laguna, Philippines).

Table 10: Examples of wildlife payment for ecosystem services

Name of the scheme	Payee	Lead implementer	Payer	Target Ecosystem Service
A variety of direct payments schemes for bird nest protection, e.g. Preah Vihear and Kompong Tom (WCS); Kratie and Stung Treng (WWF); Ratanakiri (BirdLife International)	Individual villagers	WCS, WWF and BirdLife International	WCS, WWF and BirdLife International	Protection of specific endangered bird species
Direct contracts for turtle nest protection in Kratie and Stung Treng	Individual villagers	CI	CI	Protection of specific endangered turtle species
Community-based Ecotourism in Preah Vihear	Village Fund	WCS	Tourists	Protection of endangered bird species and their habitats/ecosystems
Agri-environment payments: Wildlife- friendly products (Ibis- Rice) in Preah Vihear	Individual farmers	WCS	Urban consumers, hotels and restaurants	Protection of endangered bird species (e.g. Giant Ibis) and their ecosystem
Conservation incentive agreements in Ratanakiri	Village fund and Individual villagers	Poh Kao	Poh Kao	Conservation of forest
Conservation incentive agreements in the Cardamom Mountains	Commune fund and individual villagers	CI	CI	Conservation of forest and critically endangered species like Siamese crocodile and dragon fish (Asian Arowana).

Source: Slightly modified from Milne S and Chervier C. 2014. A review of payments for environmental services (PES) experiences in Cambodia. Working Paper 154. Bogor, Indonesia: CIFOR.

Regulatory framework (national policies and laws) for PES

Encouraged by experiences in other countries, Cambodia has adopted the 'payment for ecosystem services' (PES) scheme to ensure the effective use of its natural resources while contributing to the well-being of the custodians of biodiversity. Cambodia's experience with PES has been very positive. The importance and opportunities from the application of PES are enshrined in some of the country's strategic documents such as the National Forest Programme 2010 - 2029, the National Green Growth Roadmap as well as the National Strategic Plan on Green Growth 2013-2030, the 2016 National Biodiversity Strategy and Action Plan (NBSAP), the National Action Program to Combat Land Degradation (NAP) 2018 – 2027, and Cambodia climate change strategic plan (2014-2023), National Strategic Development Plan 2014 - 2018, the REDD+ Readiness Forestry Program for 2010–2029, and the Environment and Natural Resources Code of Cambodia (under review before finalization). Here are some highlights from these documents:

(a) In the National Forest Programme (NFP) 2010 - 2029, the need to identify new and innovative sources of funding was emphasized to mobilize enough funds for the implementation of the programme. Opportunities in international markets for processed and high-value forest products along side potential markets for carbon sequestration were noted. 'Payment for environmental services' for the conservation of forest resources and biodiversity was highlighted as one of the emerging innovative forms of financing. The NFP 2010-2029 provides under the strategic direction for objective 7 ("Environmental protection and conservation of forest resources") that full economic assessment of forest products and services will be undertaken and available for land-use decisions. Such valuations will include ecosystem functions in relation to water supply, infrastructure protection, biological diversity and potential income from carbon sequestration, and that conservation of healthy forests will attract state revenue through payments for environmental services. Innovative financing from payments of environmental services and carbon credit are considered among the sustainable and transparent mechanisms required in meeting all the NFP objectives;

(b) The government identified the development of a scheme for innovative investments among the priority interventions listed in the National Green Growth Roadmap as well as the National Strategic Plan on Green Growth 2013-2030. The scheme would have to include Payment for Ecosystem Services along with other tools such as the green tax, budget reform or the swap of debts schemes with international investors;

(c) The National Strategic Development Plan 2014 -2018 addressed some gaps identified for the implementation of national policies on green development and the national strategic plan on green development adopted in 2013. Among the policy priorities for the sustainable management of natural resources, the government decided to "step up cooperation with relevant development stakeholders under the framework […] through the development of regulatory frameworks and mechanisms for carbon trading, strengthening the capability, preparation and implementation of climate change adaptation measures, assessment of the scope of the use of environmental financing mechanisms including payment for environmental services and environmental fund, strengthening the management of protected natural areas including protection of biodiversity, rain forests, and wetland areas; and environment and ecosystem monitoring and control mechanism at both national and sub-national levels;"

(d) Strategic Objective 3 of the Cambodia Climate Change Strategic Plan (2014-2023) is to "ensure climate resilience of critical ecosystems (Tonle Sap Lake, Mekong River, coastal ecosystems, highlands, etc.), biodiversity, protected areas and cultural heritage sites." The strategic actions needed to achieve this objective include the promotion of payment for ecosystem services including REDD+, bearing in mind the vast land area covered by forest and the current level of deforestation. The other strategic actions, which are also relevant in the PES schemes, are the strengthening of biodiversity conservation and restoration of ecosystems threatened by climate change; the promotion and encouragement of community-based, ecosystem-based approaches and ecotourism as cost-effective ways of addressing climate change; and the promotion of the participatory land-use planning;

(e) In the 2018 - 2027 National Action Program to Combat Land Degradation (NAP), payment for ecosystem services including REDD+ is among the innovative financing mechanisms put forward to combat land degradation. In addition, the development as well as the application of policies and legislations for payment for ecosystem services (PES) to provide incentives for the conservation and sustainable use of biodiversity is one of the Cambodia's National Voluntary Land Degradation Neutrality Targets and Measures for 2030[269].

[269] https://prais.unccd.int/sites/default/files/2018-08/Cambodia_1_0.pdf

There is currently no specific and comprehensive law or regulation on PES. Even the Environment and Natural Resources Code of Cambodia, which is still under review, does not provide a definition of payment for ecosystem services nor specific guidance on how to design, implement and monitor the PES schemes. The only references to payment for ecosystem services are (i) in Book 2 on Environmental Assessment and Monitoring, Title 1 on Risk Assessment, where it is inferred in Article 12 that payment for ecosystem services needs to be considered during risk assessment as part of the requirements for project approval; and (ii) in Book 3 on Environmental Management and Sustainability Mechanisms, under Title 2 on Climate Change: Development of REDD+ action plans for forest areas is among the objectives pursued in Article 5.

So far, absence of a specific legislation on PES has not been a major constraint because the existing regulatory system in the country allows those small-scale projects on nest protection or of the Ibis -Rice – type to take place. REDD+ and watershed projects will require the development of a PES specific regulatory framework. The Royal Government of Cambodia is considering the needs and modalities of a regulatory framework for PES. On the one hand the Government is in dialogue with conservation NGOs currently involved in PES schemes in Cambodia. Wildlife Alliance, for example, is working with the Ministry of Environment in coordination with the guidance of the Supreme National Economic Council to develop a Payment for Environmental Services (PES) policy for the Phnom Kulen watershed that feeds into the Tonle Sap Lake with some focus on the highly visible tourism and industrial sectors[270]. After many PES consultative work sessions with staff of different Ministries, local communities and the private sector, they agreed on a pilot PES project to ensure effective protection of Phnom Kulen Watershed, a draft provincial legislation (Deyka) and development of White Paper for Payment for Ecosystem Services Policy and Pilot Project in Stung Siem Reap. The aim of this initiative is to ensure that the users of natural resources, such as hydroelectric developers who install dams which affect the free flow of water resources, are required to contribute funds for forest and watershed conservation and community development. The outcomes of the Phnom Kulen PES project are expected to inform the development of a national PES policy.

On the other hand, particularly as part of the REDD roadmap[271], Cambodia is reviewing existing laws relating to the conservation and sustainable management of natural resources, such as the laws on (i) protected areas (because PES schemes are often implemented near or inside protected areas, and are used to strengthen compliance with the law on protected areas and other conservation laws), (ii) land ownership (because PES schemes often entail attempts to clarify land or other property rights), (iii) community forestry, fisheries, and water and energy (because payments for watershed services schemes are increasingly being designed for dam catchments) to find ways and means to harmonize any new regulation or policies regarding PES design, implementation and monitoring. Building on experience, "any legal development work should be based on identifying and modifying areas of law where gaps, conflicts or overlapping jurisdictions that hinder effective implementation exist. This would include enacting new sub-decrees, or prakas, or regulations under existing laws[272]". In this framework, the following activities are under way: understanding how to integrate REDD+ into Community Forestry, Community Fisheries, Community Protected Areas and Indigenous Communal Land titles, including implementation within larger forest management units (e.g. Protected Areas or Protection Forests or Forestry Concessions) that contain smaller community-managed or owned forest areas; legal analysis and development as recommended by the REDD+ strategy; analyzing how to link projects to subnational and national implementation; establishing national-level guidelines for REDD+ and other PES activities; analyzing links with other Government policy processes and laws; establishing conflict management and resolution mechanisms, as mandated under the NFP and 2008 PA Law; and review suitability of these laws for REDD+ and recommend modifications if required[273]. The Government studied also the PES modalities in Costa Rica and Vietnam

[270] https://theredddesk.org/countries/actors/wildlife-alliance-cambodia
[271] E.g., https://theredddesk.org/sites/default/files/8_redd_roadmap_cambodia_v4_0_official_222_5.pdf
[272] https://theredddesk.org/sites/default/files/8_redd_roadmap_cambodia_v4_0_official_222_5.pdf
[273] https://theredddesk.org/sites/default/files/8_redd_roadmap_cambodia_v4_0_official_222_5.pdf

while Cambodian universities with foreign partners are conducting research to better understand the strengths, weaknesses, opportunities and obstacles to the Cambodian model, with an overall objective to contribute information that will allow the crafting of the best-informed decisions and policies regarding PES.

Additional points that are being discussed include[274]: clarification of property rights; decision-making structures of the PES schemes; sustainable sources of funding in direct payments; cost of provision of ecosystem services[275]; and transaction costs.

Examples of specific activities

The nest protection programme:

The **Bird Nest Protection Program** was initiated on a pilot basis in 2002 by the Wildlife Conservation Society (WCS) in collaboration with the Ministry of Environment and the Forestry Administration of the Ministry of Agriculture, Forestry and Fisheries. The program was designed to contribute to the protection of threatened bird populations against the threats of hunting and egg/chick collection in the Northern Plains of Cambodia, in Preah Vihear Province. These Plains consist of Kulen Promtep Wildlife Sanctuary (KPWS), Prey Preah Roka Wildlife Sanctuary and Chhep Wildlife Sanctuary, and are home to many globally endangered bird species, including for example the Giant Ibis, the White-Shouldered Ibis, three species of vulture, the White-Winged Duck and the Masked Finfoot. By 2009 the program was operating in 24 villages. The same approach has subsequently been replicated at other sites in Cambodia by several other organisations. In the early years, shortcomings were noted[276], addressed and integrated to the schemes applied today e.g., the use of predator exclusion devices, improved guard diligence, enhanced community buy-in and integration wherever possible additional measures to simultaneously address other threats than loss of nests.

As direct payments to communities or individuals have gained traction in Cambodia, scientists[277] evaluated again the effectiveness of this scheme as a tool for species conservation by monitoring nests and implementing a direct payment nest protection programme for six sandbar-nesting bird species on the Mekong River from 2010 to 2014. They also tested if nest protection with and without exclosures, improved reproductive success. Overall, nest protection involving direct payments was highly effective, but required diligent use of nest exclosures, frequent monitoring, and strong community relationships[278].

[274] Tacconi L. 2015. Regional Synthesis of Payments for Environmental Services (PES) in the Greater Mekong Region. Working Paper 175. Bogor, Indonesia: CIFOR

[275] In some schemes, the cost is approximated by the daily rate of labor

[276] E.g., Sok K., Claassen, A.H., Wright, H.L. & Ryan, G.E. (2012) Waterbird nest protection on the Mekong River: a preliminary evaluation, with notes on the recovery and release of white-shouldered ibis *Pseudibis davisoni* chicks. Cambodian Journal of Natural History, 2012, 29–41

[277] Claassen, A.H., K. Sok, T. W. Arnold and F. J. Cuthbert 2017. Effectiveness of direct payments to increase reproductive success of sandbar-nesting river birds in Cambodia. Bird Conservation International 27: 495-511. *https://doi.org/10.1017/S0959270916000368*

[278] Nest protection improved survival rates of River Tern (*Sterna aurantia*) nests and chicks, and Small Pratincole *Glareola lactea* nests. River Tern nest success was 60% for exclosed (and guarded) nests, 29% for guarded (but unexclosed) nests, and 5% for unprotected nests. River Tern fledging success was 82% for exclosed chicks, 40% for chicks that were guarded only, and 2% for unprotected chicks. Small Pratincole nest success was 21% for guarded and 6% for unguarded nests. Egg harvest by humans was lower among protected nests and declined during the study. Nest predation by animals increased during the study despite nest guarding; however, predator exclosures effectively protected nests and chicks. Additional predator control measures could further improve reproductive success of sandbar-nesting birds.

A 2018 survey of the knowledge, attitudes and practices of selected communities along the Sekong, Sesan, and Srepok (3S) Rivers in Southeast Asia regarding their perceptions about the nest protection program indicated that waterbird populations increased, and threats decreased as a result of the program. Overall, communities had positive impressions of the program and believed the program provided them with significant livelihood benefits[279]. There are plans to use the results of this research as educational and diagnostic tools to assess the effectiveness of the conservation program to meet community needs and to be able to improve this and other such community-based programs in the future.



Figure 35: Royal turtle hatchlings in a nest at the Kaong River in Cambodia's Koh Kong province
Source https://phys.org/news/2017-05-hatchlings-cambodia-endangered-royal-turtle.html#jCp

Another study[280] used the contingent valuation methods to assess the willingness of the communities living in the Sekong, Sesan, and Srepok (3S) River basin to accept compensation for their participation in the protection of the six waterbird nests in the region and for associated opportunity costs. The study evaluated the acceptability of different payment levels and thus established appropriate levels of conservation incentives for the communities to take part in conservation activities. This information is useful for future implementation of the waterbird nest protection program across the country, as well as for other community-based conservation projects in Cambodia.

The Turtle nest protection programme

The Government of Cambodia and Wildlife Conservation Society (WSC) run a nest protection programme for the freshwater turtle (*Batagur affinis*), also known as the southern river terrapin, and the Asian giant softshell turtle (*Pelochelys cantorii*)[281]. Both species are listed as globally endangered.

The southern river terrapin

The southern river terrapin (Figure 35) was thought to be extinct in Cambodia until 2000, when a small population was re-discovered in the Sre Ambel river[282]. The species was designated as Cambodia's National Reptile by a royal decree in 2005. Since 2001, a joint project between the government and the Wildlife Conservation Society to search for and protect nests has saved 39 nests with a total of 564 eggs that

[279] Sophat S., Chandara P., Claassen A.H. (2019) Assessment of Local Community Perceptions of Biodiversity Conservation in the 3S Rivers of Cambodia: Using a Knowledge, Attitudes, and Practices (KAP) Approach. In: Stewart M., *Coclanis P.* (eds) Water and Power. Advances in Global Change Research, vol 64. Springer, pp 199-216 *https://www.researchgate.net/publication/329627094_Assessment_of_Local_Community_Perceptions_of_Biodiversity_Conservation_in_the_3S_Rivers_of_Cambodia_Using_a_Knowledge_Attitudes_and_Practices_KAP_Approach*

[280] Chandara, P., Sophat S., Claassen A.H. (2019). Using the Contingent Valuation Method to Assess Communities' Willingness to Accept Compensation for Waterbird Nest Protection in the 3S Rivers, Cambodia. *In*: Stewart M., Coclanis P. (eds) Water and Power: Environmental Governance and Strategies for Sustainability in the Lower Mekong Basin, Edition: Advances in Global Change Research book series, volume 64, Publisher: Springer, pp.187-198 DOI: *10.1007/978-3-319-90400-9_11* , *https://www.researchgate.net/publication/329627050_Using_the_Contingent_Valuation_Method_to_Assess_Communities'_Willingness_to_Accept_Compensation_for_Waterbird_Nest_Protection_in_the_3S_Rivers_Cambodia*

[281] https://phys.org/news/2017-05-hatchlings-cambodia-endangered-royal-turtle.html#jCp (May 2017)

[282] *https://phys.org/news/2017-05-hatchlings-cambodia-endangered-royal-turtle.html#jCp*

resulted in 382 hatchlings[283]. The hatchlings were raised in captivity and later released into the wild with the challenge that their survival chances were low due to the loss of their habitat.

In 2015, Wildlife Conservation Society (WCS), in partnership with the government, initiated a community-based protection system around Sre Ambel, hiring former nest looters to search for and protect the nests, instead of harvesting the eggs[284]. Since then, 39 nests with a total of 564 eggs had been protected, resulting in 382 hatchlings kept in protected enclosures before the baby turtles were then transferred to a facility and raised for several years in captivity, enabling them to reach a size where they would be less vulnerable to predators upon release. That year, Wildlife Conservation Society (WCS) released 25 individuals to boost the wild population and, using acoustic-telemetry, monitored every individual to understand their post-release dispersal and monitor their survival[285].

In 2016, 206 turtles were released in muddy waters at a new breeding and conservation centre, the Koh Kong Reptile Conservation Center in western Cambodia[286]. Only one nest was located that year, compared to four in 2015[287]. In 2017, one nest of Royal Turtle with 14 eggs was found by a villager along the Kaong River. After being protected for three months, nine new hatchlings of Royal Turtle successfully hatched and were taken to Koh Kong Reptile Conservation Centre for feeding and raising[288].

In 2017, conservation team found only one nest compared to two nests found in 2016 and three nests in 2015. The programme released two batches of Royal Turtles, consisting of equal numbers of sub-adult males and females, into their natural habitat in 2015 and 2017[289]. In 2018, the turtles were thriving in the river system since their release. One turtle had even travelled to another river system nearly 100 kilometres away from the release site and another was captured by a fisherman and handed over to the project. The released turtles are now dispersing over a wider area. Following this success, MAFF Fisheries Administration prepared a draft directive to turn more sections of the Sre Ambel river system into conservation zones for Royal Turtles and the Siamese Crocodile [290]. In 2018, Wildlife experts discovered a nest with 16 eggs[291].

In brief, the nest protection programme is achieving substantial results for a relatively small investment[292]. But funds are mainly from foreign sources and thus the programme's future may be compromised.

The Asian giant softshell turtle (Pelochelys cantorii)

The giant softshell turtle was thought to be extinct in the Cambodian portion of the Mekong River until it was rediscovered it in 2007 in the river between Kratie and Stung Treng provinces. In partnership with Conservation International, the government undertook a project whereby villagers are compensated for protecting the turtles' nests from human and animal predators. As needed, the animals are raised in captivity until they are large enough to resist predators like birds, fish and snakes, for releases back into the river. The project is now run by MAFF Fisheries Administration and WCS in collaboration with Wildlife

283 https://www.ctvnews.ca/sci-tech/cambodia-works-to-save-nearly-extinct-royal-turtle-1.3069536
284 https://www.khmertimeskh.com/news/14332/---royal-turtle----is-back-from-the-brink/
285 Brook, S. 2015. Integrated in situ and ex situ conservation has prevented the extinction of the southern river terrapin *Batagur affinis* in Cambodia. Cambodian Journal of Natural History (1):13 https://www.researchgate.net/publication/274380245_Cambodian_Journal_of_Natural_History_Volume_2015_Issue_1
286 https://www.ctvnews.ca/sci-tech/cambodia-works-to-save-nearly-extinct-royal-turtle-1.3069536
287 https://www.thestar.com/news/world/2016/04/25/cambodias-royal-turtle-nearly-extinct-as-fewer-than-10-remain.html
288 https://cambodia.wcs.org/About-Us/Latest-News/articleType/ArticleView/articleId/10047/Nine-New-Royal-Turtle-Hatchlings-Taken-to-Conservation-Center-in-Koh-Kong.aspx
289 https://www.khmertimeskh.com/50540828/ministry-drafts-directive-to-save-royal-turtles/
290 https://www.khmertimeskh.com/50540828/ministry-drafts-directive-to-save-royal-turtles/
291 https://www.reuters.com/article/us-cambodia-turtles/cambodia-discovers-nest-of-critically-endangered-royal-turtles-idUSKCN1G30EK
292 Local people are offered a reward of up to US$5 for reporting nests. Protectors receive $1/day for their work and an extra $1/day worked upon completion if the chicks successfully fledge

Reserve Singapore (WRS) and the Turtle Survival Alliance and includes an important awareness raising programme. *Pelochelys cantorii* experienced a remarkable recovery in just a few years. In 2011, the Mekong Turtle Conservation Center was created in Kratie province for feeding, raising and breeding turtles. Researchers saw a dip in numbers in 2013 and 2014, when reduced program funding limited the number of paid nest guards[293] but alternatives such as trading turtle eggs, a local delicacy, for duck eggs were used and everything was back on track. The Asian Giant Softshell Turtle is officially protected in Cambodia. In 2015, about 200 four-month-old turtles were released[294]. In 2018, 20 nests of the Asian Giant Softshell Turtle containing 663 eggs were found on sand bars along the Mekong River in Kratie Province[295]. Fifteen other nests were empty, indicating that illegal collections and/or animal predation were still going on. About 565 hatchlings from nests that were guarded by local communities were released[296]. Since 2007, 402 nests have been protected and 9,047 hatchlings released. The community-based protection project encouraged the participation of local communities living in Kratie and Stung Treng provinces and is increasing their incomes.

The success of these types of PES relies mainly on their small-scale size, and thus their low transaction costs and the flexibility to improve and adapt their design to changing conditions. In addition, they entail the organization of simple and local programs; their modalities for benefit-sharing to service providers are relatively transparent; and they promote active participation from villagers in complying with the regulations of programs[297]. However, because transaction costs (and even payments to suppliers), although relatively small, are paid by external donors, the sustainability of current PES schemes needs to be studied. Also, Cambodia is considering ways and means to address the increase in transaction costs when the scale of these PES schemes is widened.

Community-based agri-environmental ecotourism payment program

Ibis Rice (also see Box 9): The forests and wetlands of northern Cambodia and the Tonle Sap Biosphere Reserve are home to over 30 Globally Threatened species, including 8 listed as Critically Endangered, notably the Giant Ibis (*Thaumatibis gigantea*), Cambodia's national bird. Local communities depend on these forest and wetland resources for their livelihoods. They primarily rely on subsistence rice farming and are thus in direct competition with wildlife for the use of the ecosystem. The area is also known to have been traditionally plied by loggers and poachers. IBIS Rice is a not-for-profit conservation enterprise launched in 2009 working with Cambodian farmers (Figure 36) to protect a precious and vulnerable ecosystem while growing premium organic jasmine rice[298]. The Wildlife Conservation Society (WCS), with the support of the Darwin Initiative, assisted Sansom Mlup Prey (SMP), a local NGO, to implement a payment for environmental services (PES) scheme, through which 'Ibis Rice' engages local people in conservation and assists them financially by buying their rice (Jasmine rice - Pka Malis) at premium prices. Participating farmers agree to limit field expansion to within agreed land use plans and commit to zero poaching. Very early, the project showed positive results in terms of increased incomes for the

[293] https://blog.conservation.org/2015/08/hatch-and-release-can-turtle-tourism-save-a-species-in-cambodia/
[294] https://blog.conservation.org/2015/08/hatch-and-release-can-turtle-tourism-save-a-species-in-cambodia/
[295] http://www.xinhuanet.com/english/2018-03/21/c_137055028.htm
[296] http://www.xinhuanet.com/english/2018-09/20/c_137482099.htm
[297] Chhinh and Kong, 2013 cited by Brander, Luke. (2018). Incentive and market-based mechanisms to promote sustainable land management in Cambodia an inventory. 10.13140/RG.2.2.17141.83687
[298] https://ibisrice.com/



Figure 36: Ibis Rice farmers at Chikraeng
Source: Fondation Ensemble, BFCA © WCS
https://www.fondationensemble.org/en/projet/empowering-rice-farmers-to-manage-a-threatened-grassland-ecosystem-2/

participating rice-farming families, certified as Wildlife Friendly. The project thus grew rapidly from 141 families across 7 villages in 2011, to 339 families across 11 villages in 2014[299]. The long-term goal was to expand the project to 15 villages to further increase the wellbeing of local communities whilst protecting key endangered species. Compliance to the project is verified by a locally elected Village Marketing Network committee, supported by SMP and WCS with a satellite monitoring team, to enhance community-based management and capacity-building. As a result, the Giant Ibis population has been slowly recovering, along with the populations of other threatened species.

Box 9: Ibis Rice registered in 2015 as a member of the United Nations Partnerships for the SDGs

Description/achievement of initiative

The Wildlife Conservation Society launched the Ibis Rice initiative in 2009 to promote and market wildlife-friendly rice grown in the communities located in areas in the northern plains of Cambodia protected for their biodiversity value. Ibis Rice links wildlife conservation to improving livelihoods of villagers whose opportunities are limited by the constraints of living in a remote area with little opportunity to expand their farms and limited market access.

Implementation methodologies

Ibis Rice was launched in 2009 to promote and market wildlife-friendly rice grown in the communities located in areas protected for their biodiversity value in Cambodia. Its work links wildlife conservation to improving livelihoods of villagers whose opportunities are limited by the constraints of living in a remote area with little opportunity to expand their farms and limited market access. Ibis Rice buys paddy at a premium from village marketing networks, whose members are made up of farmers who are often not food secure and rely on forest resources for income. Ibis Rice has worked to market wildlife-friendly produce that is produced by local communities in the Northern Plains. Target buyers include domestic tourist hotels and restaurants, food retailers and potentially, international markets.

Coordination mechanisms/governance structure

A partnership of non-governmental organizations (NGO) and government agencies, this project provides local communities with an incentive to engage in conservation, by offering farmers a premium price for their rice if they agree to abide conservation agreements that are designed to protect the rare water birds and other species that use the protected areas.

The first of these agreements is a land-use plan that is developed by the local community and which clearly delineates the areas that farmers are permitted to clear for growing rice or other produce. This therefore limits the conversion of wetland areas to rice fields. They then develop a 'no-hunting' agreement, which outlaws the hunting and collection of rare waterbirds and their chicks. These agreements are enforced by a locally elected natural resource management committee, which is composed of representatives from the village, and thus guarantees a high degree of 'local ownership' of the scheme.

Expected achievements

Since the majority of the inhabitants of rural communities in Cambodia are engaged in rice farming, the scheme has the potential to benefit a high proportion of the population within each village. The implementation of the project in each

[299] http://www.darwininitiative.org.uk/assets/uploads/2014/05/Trade-and-Biodiveristy-Darwin-Newsletter-March-2015_Final-20th-March.pdf

village follows a prescribed number of simple steps. Firstly, a Village Marketing Network (VMN) is formed in the village. The VMN is responsible for purchasing the rice from farmers and verifying that the farmers have respected the conservation agreements, with oversight from the natural resource management committee. The VMN then stores the rice at a central location within the village. Transportation, processing and packaging, as well as the eventual marketing and sale of the rice, is coordinated by Sansom Mlup Prey (SMP). SMP organizes the collection of rice from each of the participating villages and delivers it to a mill for processing. The rice is then packaged and branded as Ibis Rice, and delivered to those outlets that have been contracted to sell the rice.

WCS Cambodia has received certification from the Wildlife Friendly Enterprise Network (WFEN) for Ibis Rice so the rice is also labeled as Wildlife Friendly™ certified. All contracts are negotiated by SMP, which is a non-profit organization. Farmers are paid when they supply their rice to the VMN, with the VMN funding the purchases from a cash advance provided by SMP; revenue earned by SMP is used to cover these advances, as well as funding their operating costs.

Source: *https://sustainabledevelopment.un.org/partnership/?p=9701* accessed on 31 January 2019

The Kulen Prom Tep Wildlife Sanctuary programme: This community-based agri-environmental ecotourism payment program started in 2007 as a partnership between the government (MoE and the Forestry Administration), Conservation International, a local NGO, Sansom Mlup Prey (SMP), and the local community. Details about the functioning of partnership have been detailed in many publications[300].

A study published in 2014 used impact evaluation methods to quantify the impact of PES on local livelihoods and forest conservation in villages within and outside Kulen Promtep Wildlife Sanctuary and Preah Vihear Protected Forest. PES reduced deforestation rates significantly relative to controls. The impacts of PES on household well-being were related to the magnitude of the payments provided. The two higher paying market-linked PES programs had significant positive impacts, whereas a lower paying program that targeted biodiversity protection had no detectable effect on livelihoods, despite its positive environmental outcomes. Households that signed up for the higher paying PES programs, however, typically needed more capital assets; hence, they were less poor and more food secure than other villagers. Therefore, the PES program had significant positive impacts on livelihoods for those that could afford to participate. Thus, a well-designed PES is a suitable tool for delivering conservation goals whilst benefiting local people.

4. REDD+ (REDD+ (reducing emissions from deforestation and forest degradation, and enhancing forest conservation, sustainable management and carbon stocks))

Cambodia considers REDD+ as an important strategy to address deforestation and forest degradation in the country. The country developed a national roadmap for REDD+ readiness in 2010 and is implementing pilot and demonstration REDD+ projects such as the Oddar Meanchey community Forest and the Keo Seima Wildlife Sanctuary project. An overview of ongoing REDD projects is presented in Table 11. Some details about activities that took place between 2014 and 2018 are described in the following paragraphs as well as the progress made towards REDD+ readiness under the climate change convention.

4.1 The Oddar Meanchey Community Forest REDD+

Oddar Meanchey Community REDD+ Project is the world's first project to complete verification of emission reductions under the Verified Carbon Standard (VCS) with a triple gold Climate, Community and

[300] E.g., http://www.eepseapartners.org/wp-content/uploads/publication/2016-SRG5HengKong_OnlineEdition.pdf Heng N. and Kong S. 2016. A review of PES implementation in Cambodia. EEPSEA SRG Report No. 2016-SRG5. Economy and Environment Program for Southeast Asia, Laguna, Philippines.

Biodiversity (CCB) accreditation for emission reductions[301]. The Oddar Meanchey Community Forest REDD+ was initiated by Community Forestry International in 2008, adopted by the Forestry Administration and is currently being implemented in partnership with PACT. Funding support has been provided by Danida, DFID, NZAID, and the Clinton Climate Initiative through the Technical Working Group on Forestry and Environment. Project partners also include Terra Global Capital, the local NGO Children's Development Association (CDA), Monks CF Association, and local authorities in Oddar Meanchey province. Terra Global Capital developed the REDD carbon offset project, the first one in Cambodia. The project involved 13 community forestry (CF) groups, comprised of 58 villages, which protect 63381hectares of forestland in the Northwestern province of Oddar Meanchey. The project was expected to sequester 7.1 million metric tons of CO_2 over 30 years. In 2013, FA missed an opportunity to sell carbon credits[302].

In 2014[303], (i) the 13 communities of the Oddar Meanchey Community REDD+ Project continued to address threats of deforestation from illegal logging and the presence of military activity in the province with the support of the Forestry Administration. The largest community forestry group, Sang Rukhawan, the Monk's community forestry group, were managing 18,000 hectares, or 30% of the project. To enhance biodiversity, the communities reported impressive results in their combat of illegal hunting of wildlife with captured photos of 195 species in the project areas including photos of the Giant Ibis (*Thaumatibis gigantean*) and the Wild Bantang (*Bos javanicus*). They built dedicated ponds for wildlife to further enhance the quality of forest habitat. The project organised workshop to share experience on participatory process and the implementation of community-based forest carbon conservation, particularly with regard to forest monitoring and the participation and grievance mechanisms, with other communities including from Keo Seima Wildlife Sanctuary REDD project and started preparing its second verification of its GHG emissions. Small initial sales of credits were made[304] and the funds distribution mechanisms were operationalized and workplans activities prioritized to deploy these initial proceeds.

A key lesson learned[305] from the pilot phase was the importance to put in place measures to respect indigenous rights and ensure the "full and effective participation" of local communities bearing in mind their rich traditional knowledge and cultures, and well understood mechanisms for benefit-sharing and to explain to all stakeholders how the voluntary carbon market functions, particularly the need to actively pursue sales.

In early 2018, following a report by forestry NGO Fern, Virgin Atlantic Airways announced they removed from its carbon offset portfolio the Oddar Meanchey REDD+ project[306]. The Verified Carbon Standard (VCS) released a rebuttal calling the report inaccurate and misleading[307].

[301] http://www.terraglobalcapital.com/sites/default/files/OM%20REDD%20Monitoring%20Summary%20Oct%202014%20v1-0_0.pdf "Reduced Emissions from Degradation and Deforestation in Community Forests – Oddar Meanchey, Cambodia 2013/2014 Project Update" - October 15, 2014

[302] Brander, Luke. (2018). Incentive and market-based mechanisms to promote sustainable land management in Cambodia an inventory. 10.13140/RG.2.2.17141.83687

[303] http://www.terraglobalcapital.com/sites/default/files/OM%20REDD%20Monitoring%20Summary%20Oct%202014%20v1-0_0.pdf

[304] The approximate value of these credits was around US$ 7 and 9/tons of CO_2

[305] YEANG Donal,*, Harri WASHINGTON, KEN Sereyrotha, Paris CHOUP, Jeffrey SILVERMAN, TENG Rithiny & Simon MAHOOD 2018 —REDD+ in Cambodia: how local communities can benefit from forest conservation Cambodian Journal of Natural History 2018 (2) 53–55)

[306] https://redd-monitor.org/2018/01/10/virgin-atlantic-has-stopped-buying-carbon-credits-from-the-oddar-meanchey-redd-project/

[307] https://www.greenaironline.com/news.php?viewStory=2437

Table 11: Overview of REDD+ projects in Cambodia

Project name and type	Project description	Project start and end	Proponents and partners
Oddar Meanchey REDD Project[308]	Establish Community Forest groups to reduce deforestation, improve livelihoods and protect biodiversity. Activities include reinforcing land-tenure status, land-use plans, forest protection, assisted natural regeneration, fire prevention and development activities for non-timber forest products	2008-2038	**Forestry Administration, Community Forestry International Inc. (CFI), Terra Global Capital LLC (TGC),** and such partners as Children's Development Association, Monk's Community Forestry Association, Community Forestry Federation of Oddar Meanchey Province, Community Forestry International, Terra Global Capital (TGC), William J. Clinton Foundation - Clinton Climate Initiative, DANIDA/DFID/NZAID
Keo Seima Wildlife Sanctuary REDD project	The Community-Based Production Forestry project (CBPF) consists of two main areas of activities: - A Core Protection Forest for REDD+ project, and Buffer Protection Forest areas, where suitable development activities (e.g., sustainable harvesting of timer) can occur.	2010-2069	**Forestry Administration, Wildlife Conservation Society (WCS)** and local NGOs, Cambodia Rural Development Team (CRDT), Sam Veasna Centre, World Education Inc. and Community Legal Education Centre (CLEC)
Northern Plains REDD project or Preah Vihear REDD+ project	Income from REDD+ is expected to help conserve the Northern Plains landscape which covers an area of 400,000 ha of mosaic forest types and species of high conservation value.	No data	**Wildlife Conservation Society (WCS)**
Southern Cardamom REDD+ project	Reduce deforestation while providing alternative livelihoods and revenues to local communities and local stakeholders, and extend activities to the surrounding threatened areas, addressing the drivers of deforestation.	2015 - 2045	**Forestry Administration**, **Wildlife Alliance (WA),** with partners e.g., Institut Gaspard Monge and partners from Rennes, France, Provincial Government of Koh Kong, local communities, and Technical Working Group on Forestry and the Environment
Siem Reap Community Forestry REDD+ project	The Siem Reap REDD project aims to provide long-term sustainable financing through the voluntary carbon market to prevent deforestation and forest degradation with maximum benefits flowing to local communities in	2011 - 2014	**Flora and Fauna International (FFI),** Non-Timber Forest Products Exchange Programme (NTFP-EP), PACT, Clinton Climate Initiative (CCI) and Terra Global Capital (TGC)

[308] Afforestation, reforestation and revegetation (ARR)

Project name and type	Project description	Project start and end	Proponents and partners
	order to improve livelihoods and ensure the sustainable management of community forests across the province.		
Tumring REDD+ Project (TRP)	Increase forest protection by expanding the current ranger and community member protection force. Ans assist local communities with promoting effective land use planning and granting secure land tenure. Promote new income generating activities and improved agricultural methods.	2015-2045	**Forestry Administration**, Korea Forest Service, Agence Française de Développement (AFD)

Table 11: Overview of REDD+ projects in Cambodia (ctd)

Project name and type	Number of inhabitants in the area	Deforestation drivers	Expected socioeconomic benefits	Biological benefits
Oddar Meanchey REDD Project[309]	13 Community Forestry Groups, 58 villages, nearly 8,000 households	Energy wood; fire; illegal logging; industrial wood exploitation; local livelihoods; oil extraction	Participatory Rural Appraisal (PRA); - Employment and income for communities; - Participation in decision though Forestry Community groups; - Secured land tenure Micro-credits; processing and commercialization. Communities managing and protecting these Community Forests see the presence of the unique protected species as a source of pride	The project area is composed of lowland evergreen, semi-evergreen, and dry deciduous forests, constituting some of the last remaining intact tracts of forest in Cambodia. These forests promote watershed protection and erosion control, critically important as Oddar Meanchey province is one of the driest regions in Cambodia. Numerous globally threatened mammals make their home in the Oddar Meanchey project area, including the IUCN threatened species: sun bear, sarus crane,

[309] Afforestation, reforestation and revegetation (ARR)

Project name and type	Number of inhabitants in the area	Deforestation drivers	Expected socioeconomic benefits	Biological benefits
				northern pig-tailed macaque, and gibbon sunda pangolin, green peafowl, Asian wild buffalo and banteng. The forests of Oddar Meanchey also support some of the last significant wild populations of elephants, leopards, and white rumped falcons in Cambodia[310].
Keo Seima Wildlife Sanctuary REDD+ Project[311]	Preserves forest areas that provide the basic needs and traditional cultural identity for over 2,500 households (approximately 12,500 people) within the 20 REDD+ participating villages	Industrial agriculture or cattle ranching; infrastructure; slash and burn agriculture	Close involvement and interaction with Community Councils; - Education; - Income generation through the sale of timber and non-timber forest products; - Secured land tenure Ecotourism; micro-credits; plantation forestry; tree planting: Sustainable timber harvesting; direct benefit sharing of carbon revenue supporting community investment priorities	Home to more than 60 species of animal and plants that are threatened with extinction. International importance for the conservation of primates, including the world's largest known populations of black-shanked douc and southern yellow-cheeked crested gibbons. Also important for many species of wild cats, Asian elephants, Banteng and several bird species
Northern Plains REDD project or Preah Vihear REDD+ project	ND	ND	Improved livelihoods through additional revenues and the sale of carbon credits.	
Southern Cardamom REDD+ project	530 rural families have been provided with alternatives to slash and burn farming	Illegal logging; local livelihoods; slash and burn agriculture	- Project developer working directly with communities in ways that reduce their dependence on the forest; - Improvement	

[310] http://www.terraglobalcapital.com/oddar-meanchey-community-redd-project-cambodia

[311] Independent Forest Monitoring (IFM) programme

Project name and type	Number of inhabitants in the area	Deforestation drivers	Expected socioeconomic benefits	Biological benefits
			of communities' standards of living; - Better access to healthcare and schools for children. Ecotourism; and microenterprise	
Siem Reap Community Forestry REDD+ project	34 Community Forests (CF), involving 59 villages and approximately 19000 CF members	Industrial agriculture or cattle ranching; industrial wood exploitation; local livelihoods	Secured land tenure; - New income thanks to the sale of carbon credits	
Tumring REDD+ Project (TRP)	There are 7 communes with 26 villages within 5km of the Project that utilize the project area and its surrounding forests for their livelihoods	Industrial agriculture or cattle ranching; local livelihoods; slash and burn agriculture	There are 7 communes with 26 villages within 5km of the Project that utilize the project area and its surrounding forests for livelihoods. Community benefits include: • Creating additional employment opportunities • Improved farming techniques of local communities • Alternative sources of income and livelihoods • Enhanced food security • Improving and strengthening the social infrastructure between provincial government and local communities • Enhanced local participation and management of forest resources[312] Agriculture; processing and commercialization; tree planting: The goal of the TRP will be to support the improvement of the resin and wild honey.	Protection of a corridor that connects viable populations of many threatened species, even those with large home ranges such as the clouded leopard, dhole and bear • Buffer for the Prey Long Wildlife Sanctuary a high priority landscape of national and global conservation, which is an extremely rare example of lowland evergreen tropical forest that contains an abundance of globally threatened species

[312] Primary Project Proponent Royal Government of Cambodia, Forestry Administration Prepared By Wildlife Works Carbon LLC: Jeremy T. Freund, Simon Bird, Yuni Campbell N., Brian Williams.

4.2 Keo Seima Wildlife Sanctuary REDD+ project

This project is one of the first REDD projects in Cambodia. The selection of the Keo Seima Wildlife Sanctuary (KSWS) (previously known as the Seima Protection Forest REDD+ project) was based on its rich biological diversity and wealth of forest resources which need to be protected. The project also aims to prevent forest loss through land clearance, and to minimize threats from unauthorized logging[313]. Located in the core area of the Wildlife Sanctuary in Mondulkiri Province with a small area extending into Kratie Province, the project was initiated in 2008 with the feasibility study by the Forestry Administration (FA) and the Wildlife Conservation Society (WCS). Building on existing management, the project provides additionality mainly through expanded and sustained finance, thus enabling management activities to extend across the whole landscape and to fully address all key threats, while enhancing the contribution of the wildlife Sanctuary to the well-being and livelihoods of local communities[314].

The project started officially in 2010. The carbon surveys were carried out between 2009 and 2011. The Free and Prior Informed Consent (*FPIC*) and the project design, benefitting from experience gained with the Oddar Meanchay REDD project, were completed in 2013[315].

Credit validation and verification were done in 2014 and 2015 by the Verified Carbon Standard (VCS) and the Climate, Community and Biodiversity Standard (CCB) (9.2 million credits).

The report prepared by WCS for the Forestry Department as part of the documentation for credit verification, highlighted interesting benefits in the period 2010 – 2015 (Box 10).

In 2016, the Walt Disney Company agreed to hand over US$2.6 million for carbon credits[316]. They bought 360,000 carbon credits from the project at US$7.20 each.

In 2017[56], several community consultation meetings and workshops on the REDD+ benefit sharing were organised to identify and prioritize the community development needs, and explain and agree on modalities for benefit-sharing. Each village signed a Community Agreement that inter alia clarified carbon ownership and free and informed confirmed community consent for the project. Funds were shared (US$ 11700/village) in 2018 and agreed community development programmes initiated. Villages have now access to clean water with water pumps, better roads, community meeting halls, renovated schools, and improved facilities for community-based ecotourism. Process for second verification was on the way in 2018.

The project has strengthened the respect of the laws protecting natural resources and the rights of the Community to use these resources sustainably. In 2012 one of the villages inside Seima Protection Forest became the first indigenous community to receive a collective land title in Cambodia. All 20 villages participating in the project are expected to benefit from land tenure security. In its 2017 Activity Report[317], WCS reported a few success stories. One of them is about Keo Seima Wildlife Sanctuary REDD project that enhanced in an effective manner the protection of the Yellow-cheeked Crested Gibbon (*Nomascus gabriellae*) and the Black-shanked Douc Langur. their habituation in the forest surrounding Jahoo Gibbon Camp in the Andoung Kralong's community-based ecotourism project was allowing tourists spent time watching these two globally endangered species of primate gibbons and make extra payment for the privilege into the community fund.

[313] Keo Seima Wildlife Sanctuary REDD+ Project (https://www.researchgate.net/project/Keo-Seima-Wildlife-Sanctuary-REDD-Project)

[314] Brander, 2018

[315] http://www.nature.org.vn/en/wp-content/uploads/2018/06/250618_REDD-Benefit-Sharing-in-Cambodia.pdf D. Yeang 2018 REDD+ Benefit Sharing in Cambodia. WCS paper presented at the 7th Annual CSO Forum Meeting, 24-25 June 2018 Da Nang, Vietnam

[316] https://redd-monitor.org/2016/09/16/contradictions-in-wildlife-conservation-societys-seima-redd-project-in-cambodia/ and https://newsroom.wcs.org/News-Releases/articleType/ArticleView/articleId/9125/Cambodias-Keo-Seima-Wildlife-Sanctuary-Sells-First-Carbon-Credits.aspx

[317] WCS Cambodia 2017 Activity Report

Box 10. Benefits accrued in the period 2010 – 2015 from Keo Seima Wildlife Sanctuary REDD project

Climate Benefits

· The project prevented 3,081,314 tCO2e emissions from avoided unplanned deforestation.

Community Benefits

· Preserved forest areas that provide the basic needs and traditional cultural identity for over 2,500 households (approximately 12,500 people) within the 20 REDD+ participating villages. · Strengthened tenure rights and reduced landlessness of Seima forest communities through legal and planning support for indigenous communal land titling (ICT), participatory land-use planning (PLUP), and land-use agreements. · Supported alternative livelihoods that reduced deforestation providing income generation and skill development opportunities. This included literacy and numeracy education for increased off farm livelihood options. · Provided agricultural extension and infrastructure support increasing food security, incomes, and resilience to climate change.

Biodiversity Benefits

· Prevented the destruction of 28,825 ha of lowland southern Annamitic forest and deciduous dipterocarp forest. The 292,690 hectares Project Area contains some of the largest intact blocks of these important and threatened ecosystems. · The project ensured the persistence of a full range of intact, ecologically functional habitats that are minimally degraded and disturbed by humans. Likewise, the project ensured the persistence and recovery of numerous species of global conservation concern including a regionally significant population of Asian Elephant.

Biodiversity Gold

The Seima REDD+ Project qualifies for CCB Biodiversity Gold for the following criteria: a. Vulnerability –over 40 confirmed Globally Threatened species occur in the Project Zone b. Irreplaceability – the Project Zone holds at least three species with both significant populations with restricted range (Black-shanked Douc, Yellow-cheeked Crested Gibbon, Banteng) as well as at least three other globally significant populations (Green Peafowl, Pygmy Loris, Yellow-Headed Temple Turtle, Elongated Tortoise)

4.3 Southern Cardamom REDD+ project

Under the Ministry of Environment and Wildlife Alliance The project started in 2015 although Wildlife Alliance had already commenced REDD+ activities, including e.g., the preparation of the feasibility study in 2012, prior to this date. The project carbon stock measurement was done in 2017 and the leakage area assessment was completed in early 2018.

Several consultations, training workshops of REDD+ matters took place in 2017. For example, Social and Biodiversity Impact Assessment (SBIA) workshops were held in August 2017 at the MOE district office in Koh Kong for 73 local government staff and local decision makers from the project. A Project Sub-Office was established in the Koh Kong MOE office branch in late 2017, and a REDD+ office was created. Community Free and Prior Informed Consent (FPIC) meetings took place in 2017 and 2018, and were attended by more than 2,500 community members from the Project Zone.

The monitoring report prepared in 2018 by Wildlife Alliance[318] for the period 2015 to 2017 showed good progress in reducing deforestation and forest degradation i.e. carbon emission from the Project area. This action was reportedly achieved through the following measures[319]:

(a) Two hundred families received technical support in their Community Agricultural Development Project (CADP) as required from Wildlife Alliance including the development of a community orchard. CADP had increased the incomes and agricultural yields of members by more than 300%;

[318] https://www.wildlifealliance.org/wp-content/uploads/2018/03/S_Cardamoms_RP_Monitoring-Report_M1_CCBv3.0-_-VCSv3.4_4.pdf

[319] https://www.wildlifealliance.org/wp-content/uploads/2018/03/S_Cardamoms_RP_Monitoring-Report_M1_CCBv3.0-_-VCSv3.4_4.pdf

(b) The Southern Cardamom REDD+ Project supported Community Based Eco-Tourism (CBET) in Chi Phat and in the Areng Valley[320], within the Project zone. The CBET project in Chi Phat has become one of the country's most successful Community Based Ecotourism projects and is financially sustainable. Following this success, Wildlife Alliance replicated the work in 2016 with eight additional communities in the Areng Valley and established the Stung Areng Community Based Eco-tourism (STAR- CBET);

(c) Rangers from the project rescued more than 500 live animals from illegal wildlife trade; and Asian elephants had been consistently spotted in the area with zero poaching reported;

(d) Additional reported benefits include the development of Women's Community Saving Credit Groups, adoption of participatory land use planning, the development and strengthening of Community Organizations (e.g., the Sovanna Baitong Agriculture Association in addition to the Chi Phat and Stung Areng Community Based Ecotourism), enhanced security and law enforcement e.g. through better equipped patrols, establishment of a Community Scholarship Fund, and direct employment and training on income generating activities.

Project Validation, Verification and registration took place in 2018.

4.4 Siem Reap Community Forestry REDD+ project

This project has been completed. It was carried out in 2013 and 2014 by Fauna & Flora International (FFI) in partnership with the Forestry Administration (FA) and the Non-Timber Forest Products Exchange Programme (NTFP-EP), in Siem Reap Province and as part of FFI's REDD+ Asia-Pacific Community Carbon Pools and REDD+ Programme (2011 -2014). As noted on the REDD-desk website[321], Siem Reap Community Forestry REDD+ project built on previous work conducted by PACT, the Clinton Climate Initiative (CCI), Terra Global Capital (TGC) and the Forestry Administration (FA), who started implementation of a REDD+ pilot project in 2011, based on the same methodology used for the Oddar Meanchey Community Forestry REDD+ project. FFI took over the project in June 2012 and conducted additional activities, including: (1) pioneering a Carbon Rights and Benefit Sharing study for Cambodia; (2) supporting community members in the legalisation process for the proposed Changkran Roy CF; (3) conducting biodiversity assessments in 12 CF areas; (4) completing a REDD+ feasibility assessment based on carbon indicators; and (5) coordinating the training and mobilisation of 37 forest patrol and biodiversity monitoring team members.

4.5 Northern Plains REDD project or Preah Vihear REDD+ project

This project was developed and is implemented in partnership with the MoE. Members of the Northern Plains staff were trained in forest carbon plot sampling techniques[322]. In 2012 maps of current and historical land use had been developed.

4.6 Tumring REDD+ Project

The Forest Administration (FA) signed an MOU with Korea Forest Service (KFS) in December 2014 to implement the project 'Korea-Cambodia Reducing Emissions from Deforestation and Forest Degradation (REDD+) Joint Project (KCRP) in Kampong Thom province[323]'. The project covers 70,042 hectares, but only 56,751 hectares of forest land is defined as project accounting area (PAA), and whole area of Kompong Thong province is defined as a project reference region (RR). The project life is 30 year (2015- 2045), it is expected to sequester 12 - 19 million metric tons of CO2eq over 30 years.

[320] The Areng Valley is inhabited by eight forest communities (total population 461 families), the majority of which are ethnic Chong. Prior to this project, the Chong did not have sustainable livelihoods that would enable them to find sufficient revenues from the forest. They thus relied on illegal hunting and logging combined with unsustainable swidden agriculture.

[321] https://theredddesk.org/countries/initiatives/siem-reap-community-forestry-redd-project

[322] https://theredddesk.org/countries/initiatives/northern-plains-redd-project

[323] http://www.tumringredd.org/wp-content/uploads/2016/12/Year-1-report-in-English.pdf

The Project Management Unit (PMU) and the stakeholder coordination were established and operationalized in 2015[324]. Progress towards project objectives included: (i) the use of the *Methodology for Avoided Ecosystem Conversion*[325] developed by Wildlife Work Carbon (WWC) and approved in 2014. The methodology was also applied to the projects in the Southern Cardamoms with Wildlife Alliance (WA), Samlout Multi-use Area with Maddox Jolie-Pitt Foundation, and in the northern plains with Wildlife Conservation Society (WCS). (ii) the use of GIS and remote sensing for developing Community Forestry maps and more precise maps of deforested areas using; (iii) organisation of training workshops on biomass inventory, carbon field measurement and REDD in general for various stakeholders with information shared on biodiversity, social aspects and threats to forests.

More training workshops were organized in 2016[326]. More importantly, the PMU calculated the average NERs for the 30-Year Project as 327,741 tCO2e/yr, designed the Biodiversity Monitoring Indicators, finalised the preparation of the Project Validation and Verification, enhanced Forest Protection Activities e.g., forest patrolling and forest law enforcement; initiated training on sustainable resin production and sustainable agriculture for improved local livelihood.

Implementation of the 30-year strategic action plan of Tumring REDD+ Project was officially started in 2017[327] with the completion of the design of Tumring REDD+ Project Designment Document (Tumring REDD+ PDD). The PMU reported a good performance of community forest patrol team and the forest law enforcement unit e.g., 66.6 ha of illegal forest land clearing were confiscated; and 62 illegal charcoal kilns were destroyed).

4.7 Prey Lang REDD+ Project

The Prey Long Wildlife Sanctuary (PLWS) [328] contains the largest remaining lowland evergreen forest in Cambodia and is part of the Indo-Burma hotspot, one of the world's top 34 biodiversity hotspots. The PLWS is the primary watershed of central Cambodia that regulates water and sediment flow to the Mekong River and Tonle Sap Lake. An estimated 700,000 Cambodians depend on these watersheds for irrigation. PLWS forests are also recognized for their importance in securing rural livelihoods, with more than 250,000 people, mostly indigenous Kuy, living in and or adjacent to them. Much of Prey Long is unsuitable for rice cultivation, but freshwater systems in Prey Long are important spawning areas for fish and people rely heavily on non-timber forest products as a source of income and livelihoods. The Sanctuary is also inhabited by many wild animals, including endangered/threatened species. However, illegal logging and reclamation of land for farming by local communities have resulted in progressive deforestation of the area. On opposite sides of Prey Lang forest are two Korea-Cambodia partnership projects: the Korea-Cambodia Tumring REDD+ Project, established in 2015 and the afforestation/reforestation project in Kratie Province, established in 2010, between the Forest Administration and the Think Biotech Cambodia, co. Ltd. Phnom Penh, Cambodia, a subsidiary of Korea's Hanwha Corporation.

In 2017, the government of Cambodia signed a deal with Conservation International[329] and the Sumitomo Mitsui Banking Corporation to study the potential for a carbon trading project involving the Prey Lang Wildlife Sanctuary and that will reinforce forest patrols to prevent illegal logging and provide local communities with alternative sources of livelihood to avoid reliance on logging. Mitsui also planned to register the project with the Joint Crediting Mechanism, a scheme promoted by the Japanese government[330].

[324] http://www.tumringredd.org/wp-content/uploads/2016/12/Year-1-report-in-English.pdf
[325] This methodology quantifies greenhouse gas emission reductions generated from avoiding either planned or unplanned (or both) deforestation as well as protection from native grassland conversion as initiated by a variety of agents and drivers.
[326] http://www.tumringredd.org/wp-content/uploads/2016/12/Year-2-Progress-Report-in-English.pdf
[327] http://www.tumringredd.org/wp-content/uploads/2018/06/Progress-report-Year-3_2017.pdf
[328] (see doc "THE TUMRING REDD+ PROJECT unlocked") Primary Project Proponent Royal Government of Cambodia, Forestry Administration Prepared By Wildlife Works Carbon LLC: Jeremy T. Freund, Simon Bird, Yuni Campbell N., Brian Williams.
[329] https://www.conservation.org/stories/Pages/2018-Impact-Report.aspx
[330] https://www.mitsui.com/jp/en/topics/2018/1225795_11241.html

Progress on REDD+ readiness activities and on activities supported by the Forest Carbon Partnership Facility (FCPF)

In addition to the specific REDD projects under way, Cambodia undertook a REDD+ process guided by a roadmap approved in 2010. The roadmap covers six main components of REDD+ Readiness: (i) management of National REDD+ Readiness; (ii) consultation, stakeholder engagement and awareness raising; (iii) development and selection of REDD+ strategies; (iv) implementation framework (including benefit sharing and safeguards); (v) development of the Reference Scenario against which performance will be measured; and (vi) development of the monitoring system for national Measurement, Reporting and Verification (MRV) of emissions reductions.

Cambodia's progress in the past 4 years has been on track:

(a) As planned, all key stakeholders continue to be engaged in the implementation of REDD+ readiness activities through several capacity building workshops and awareness raising initiatives with input from the REDD+ Taskforce (RTF), REDD+ Taskforce Secretariat (RTS), the four Technical Teams (TT), Consultation Group (CG) and Gender Group (GG) and other partners such as the Royal University of Agriculture;

(b) The National REDD+ Strategy (NRS) 2017-2026 was endorsed jointly by MAFF, the MoE and the RGC in December 2017. Other useful tools were also completed and endorsed: National Protected Area Strategic Management Plan (NPASMP) 2017-2031; Technical guideline for developing Protected Area (PA) and Biodiversity Conservation Corridors (BCC) Management Plan finalised in 2018; and the National Production Forest Strategic Plan (NPFSP) 2018-2032;

(c) Capacity to manage REDD+ continued to be improved between 2017 and 2018. The FCPF Project supported government agencies on forest governance and REDD+ activities. GDANCP implemented subnational REDD+ capacity building activities in Botum Sarkor National Parks in Koh Kong province and Phnom Kulen National Park in Siem Reap Province. The Fisheries Administration (FiA) implemented activities in the Mangrove Protection and Conservation Area in Preah Sihanouk Province and in a flooded forest conservation area in Kampong Chhnange province. The Forestry Administration has implemented capacity-building activities for communal land-use planning in the Samroang commune, Pursat Province;

(d) The National Forest Monitoring System (NFMS) as well as the forest reference emission level (FREL) were reviewed.

Some challenges being addressed are lack of a system for data collection on safeguards and data sharing; the need to address the drivers of forest loss/degradation from outside the forest, bearing in mind that so far REDD+ in Cambodia focused only on interventions in the forest sector; needs of adequate financial and human resources for the effective implementation of initiatives such as demarcation and zoning of protected areas and other conservation areas, law enforcement, and incentivization of local and indigenous ethnic minorities by addressing their needs and priorities.

Cambodia considers its REDD+ programme as one of the mechanisms to generate financial support for the implementation of its policies and measures related to sustainable forest management, effective management of protected areas, many of which contribute to the reduction of deforestation and forest degradation, and poverty alleviation. PES schemes, and REDD+ in particular, are also relevant to Cambodia's programme on combating land degradation and achieving its land degradation neutrality targets.

NATIONAL TARGET 10 ON IDENTIFICATION OF ALL SPECIES OF FAUNA AND FLORA THREATENED AT THE NATIONAL LEVEL AND IMPROVEMENT OF THEIR STATUS

Target 10:
By 2020, all species of fauna and flora threatened at national level have been identified and their status has been improved significantly as a result of applying measures to address their respective threats.

1. Introduction

1.1 Scope of the subsection

This subsection presents progress made towards (i) the identification by 2020 of all species of fauna and flora threatened at national level and (ii) the significant improvement of their status by applying measures to address their respective threats.

Some of the species of fauna and flora being considered under this target were also considered under other targets. For example, freshwater threatened species were considered under target 4; and ecosystem restoration and contribution to climate change adaptation included recovery of threatened species. Among the threats posed to the species of fauna and flora in Cambodia, the following threats are also addressed in the other sub-sections. For example, unsustainable production and consumption activities under target 7; habitat degradation and fragmentation, pollution, overharvesting, introduction of invasive alien species and their impacts on natural forests, coral reefs and other natural habitats under target 12; pollution, exploitation, sedimentation and other anthropogenic pressures on coral reefs and vulnerable ecosystems impacted by climate change under target 15; pollutant pressures on terrestrial and aquatic ecosystems under target 16; and major invasive alien species and their pathways under target 18.

1.2 Main findings from the 5th National Report on threatened flora and fauna

1. The country is a sanctuary to some 1.6% of globally threatened species on the IUCN's Red List. This includes 2.5% of globally threatened mammals, 2% of globally threatened birds, and 5% of globally threatened reptiles. The list of globally threatened species includes 34 mammals 39 birds and 20 reptiles.
2. A wide range of globally threatened species have been shown to be present in relatively high numbers in the Cardamom mountains, including tiger, Asian elephant, Asiatic wild dog, gaur, pileated gibbon, Siamese crocodile, elongated tortoise, various hornbills and green peafowl. The Cardamom Mountains represent one of the largest intact tropical forest areas in mainland Southeast Asia.
3. Main threats (only reported qualitatively i.e. without quantitative data on the extent/level of the pressures)
    a. Habitat Loss
        i. The causes of forest decline and degradation include commercial logging, slash and burn cultivation, land encroachment for human settlements, farming and infrastructure development and cutting wood for fuel. The loss in forest quality is significantly higher than the loss in forest cover area, as logging has concentrated on commercially valuable species and larger-size trees;
        ii. Habitat is further impacted by other drivers of changes in land use such as the conversions of state land to agriculture by large corporations through economic land concessions and the actions of landless people. The former conversions affect very large areas, the latter much smaller areas;

iii. Road developments are considered to be a significant driving factor for habitat loss, increasing accessibility and, thus, facilitating increases in other threats, including agricultural expansion and intensification; illegal logging (for fuel wood and timber); mining; residential and tourism development; and dam construction. Increased access to previously isolated areas results in an expanding number of new land claims, increased wildlife hunting, and a flourishing of wildlife trade networks on local and international levels;

b. Political factors and legislation
   i. Overlap across legislation and as such confusion for implementation and difficulties for enforcement;
   ii. The open access nature of aquatic resources, fisheries in particular, which do not require land ownership (commons), can easily lead to overharvesting and illegal activities;

c. Climate Change
   i. Cambodia has been identified as being highly vulnerable to the impacts of climate change and is regularly ranked in the top 10 most vulnerable countries.
   ii. The reliance on agriculture and especially rain-fed rice makes the potential impacts of drought and flood major issues.
   iii. The Royal Government of Cambodia officially launched the first-ever, Cambodia Climate Change Strategic Plan (CCCSP) 2014-2023 in November 2013;
   iv. Rise in sea level would affect:
      1. the hydrology, freshwater fishery and agriculture.
      2. the salinity of the Mekong and Tonle Sap, it will also directly impact on the fish species diversity
      3. the coastal zone as increasing water level would lead to considerable habitat loss.

d. Water: Changes in Hydrological Regime
   i. Sediments carried in by the Mekong River partly settle along the Tonle Sap River. They bring in the nutrients that are essential for the food chain leading to the production of fish and several of the globally threatened bird species.
   ii. Change in land use and infrastructure development, particularly on the Mekong and its tributaries pose potential severe threat to the hydrological regime of the Mekong and Tonle Sap systems.
   iii. The contentious issues now are related to the fact that a series of hydropower projects on both mainstream of the Mekong and its tributaries are planned to go ahead in the Mekong riparian countries. The Mekong River Commission has modelled some of the hydropower project scenarios showing significant potential impacts to downstream countries such as Cambodia

e. Alien Invasive Species & Genetic Erosion: "At present there are not documented cases of detrimental effects of alien invasive species in Cambodia. However, a number of known aggressive invaders are reported to present in Cambodia, including Mimosa: efforts are being made to better understand and manage the impacts".

f. Marine Threats
   i. major threat as Management Issues: enforcement issues, assessment of management plans, overlapping legislations, cross border issues, encroachment and coastal development issues etc.
   ii. Cambodia's coral reefs and sea-grass are in trouble, threatened by an increasing array of impacts from unsustainable and destructive fishing practices; sedimentation and waste dumping; and increasing population and development in coastal areas.
   iii. The mangrove forests have experienced threats from charcoal production the expansion of salt farms and widespread shrimp aquaculture.

4. Conclusion: Activities to "protect and conserve all known threatened species (fauna & flora) at national level" were considered on track to reach target in 2020. The assessment was made on the basis of the following indicators:
    a. Population distribution of threatened species (fauna & flora) has been identified in a national document.
    b. Red List of threatened species has been updated in every two years.
    c. Number of restoration programs and action plans to manage and conserve threatened species.
    d. Size and distribution of habitats for threatened species identified
    e. Number and size of habitats to be identified.
    f. Number of illegal activities on the threatened species has been declined.

1.3 Threatened species in the National Biodiversity Strategy and Action Plan

In its 2016 updated National Biodiversity Strategy and Action Plan (NBSAP), Cambodia considered threatened species under Theme 2. Direct pressures on fauna and flora were reviewed and it was noted that in order to succeed in slowing down biodiversity loss, indirect drivers must be tackled, where possible, together with direct pressures, so as to break the link between the indirect and direct drivers of biodiversity loss and thus prevent underlying pressures from inevitably leading to pressures impacting biodiversity directly. The underlying drivers considered were human population, economic activity, technology and socio-political and cultural factors. The strategic objectives and key actions adopted to address threatened species focused on the need to (i) identify species of fauna and flora that are threatened, and on improving knowledge about their status and trends, as well as the threats and socioeconomic consequences of losing these species, (ii) describe the status and trends of species vulnerability in the face of climate change. They also provided some guidance on ways and means to improve the status of threatened species, including through the establishment of in-situ conservation facilities; rescue, recovery and reintroduction programmes; the rehabilitation and restoration of degraded habitats; and the prevention and control of invasive alien species.

2 Overview of progress

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	The Royal Government of Cambodia adopted the Rectangular Strategy and many other strategies, decrees and action plans that have been serving as roadmaps towards the conservation, sustainable use and restoration of the country's natural assets. Despite these safeguards and roadmaps, trend in the number and status of threatened species is still downward. Being a sanctuary to about 1.6% of all globally threatened species on the IUCN Red List including 2.5% of globally threatened mammals, 2% of globally threatened birds, 5% of globally threatened reptiles, 1.6% of globally threatened fish and a bit less than 1% of globally threatened amphibians, Cambodia is conscious about the importance of its work on threatened and has mobilized a lot of resources accordingly. List of threatened species exists and are regularly updated. During the reporting period, development of lists and description of threatened species took place within MoE (e.g., the 2016 Biodiversity Status Report and 2016 NBSAP), MAFF (e.g. through CITES and annual reports), in universities and other research institutions and by partner national and international organisations. The CJNH is a flagship publication that gather scientific data on latest discoveries and observations for Cambodia. The Red List and other databases like FishBase are the

	international references that capture observations we make at the local, national and regional levels. In order to improve the status of threatened species, Cambodia continued to work with many non-governmental organisations. Measures taken are successful. We report on many success stories regarding rescues, care and breeding at some centers (e.g., the Phnom Tamao Wildlife Rescue Center where thousands of rescued animals found sanctuary between 2014 and 2018 and some animals were born or hatched); release in nature, essentially within protected areas; and recovery away from the release sites. The bird and turtle nest protection programmes are producing positive results as well as other programmes linked to ecotourism such as the IBIS Rice. We report on the measures taken to successfully improve the status of many threatened birds, reptiles, mammals, fishes and few invertebrates. Also, Cambodia and collaborating partners developed "endangered species action plans" and improved in-country capacity to monitor and trace the released animals. Not all the threatened species receive the same conservation attention. Ecosystem/habitat protection and restoration are enabling all the threatened species to recover as their habitats is restored and protected. The recent expansion of the PA system (from 2016 to 2018), including the establishment of new wildlife sanctuaries and refuge ponds for fishes (see section on protected areas – National Target 8), work on defining and demarcating conservation zones within protected areas, and the improved patrolling with the support of tools like the 'Spatial Monitoring and Reporting Tool' (SMART) have been key factors in enabling Cambodia make positive progress toward the achievement of target 10. In its combat against illegal wildlife trade, Cambodia pays more and more attention to the entire illegal wildlife trade chain. Attention is paid not only to what is happening locally but also in the region and at the global level, from poachers to buyers of illegally acquired wildlife or their parts. Cambodia is also actively involved in CITES. In addition, Cambodia carried out a lot of awareness-raising initiatives and research generating information needed by policy and decision-makers (e.g., characterization of species at the genetic level to facilitate tracing; valuation of threatened species and cost of losing them). Assessments indicate that the training programmes and workshops/conferences carried out during the reporting period influenced people's behaviour positively toward more conservation of the natural assets. All these measures are yielding a lot of positive results visible at the site level. However, when considered as a whole, the trend in the recovery of threatened species is still downward, which calls for more actions and involvement.

3. List of threatened species of fauna and flora

3.1 The IUCN Red List[331]

Inventories like the IUCN Red List provide decision makers with information on which species exist, areas of endemism, species abundance and rarity, where and in which habitats the species occur, which species are under threat, and which ones need immediate conservation interventions.

The IUCN Red List identified (Table 12):

- 37 plant species (10.1% of all the plant species assessed) that are either critically endangered (0.3 % of all the plants assessed), endangered (4.6 %) or vulnerable (5.2 %) out of a total of 367 plant species (consisting of 7 species of ferns and allies, 347 species of flowering plants and13 of gymnosperms)
- 143 vertebrate species (8.4 % of all the vertebrate species assessed) that are either critically endangered (1.4 %), endangered (2.5 %) or vulnerable (4.5 %) out of a total of 1712 vertebrate species assessed (consisting of 58 species of amphibians, 512 of birds, 860 of fishes, 168 of mammals and 114 of reptiles);
- 79 species of invertebrates (11.3 % of all invertebrate species assessed) that are either endangered (1.0 %) or vulnerable (10.3 %) out of a total of 697 species of invertebrate assessed consisting of 4 species of arachnids, 344 of corals, 17 of crustaceans, 68 of insects, 222 of molluscs and 42 species of other invertebrates)
- Five of the 13 endemic species of vertebrates are threatened as well as one of the 9 endemic invertebrates.

Table 12: Number of threatened species in three taxonomic groups with information on the number of threatened endemic species.

Taxonomic Group	Total number of assessed species	Critically Endangered species (CR)	Endangered species (EN)	Vulnerable species (VU)	Total known threatened species (CR, EN & VU)	Total endemic species assessed	Total known threatened endemic species
Vertebrates	1712	24	42	77	143	13	5
Invertebrates	697	0	7	72	79	9	1
Plants	367	1	17	19	37	1	0

Source: IUCN 2018. IUCN Red List of Threatened Species. Version 2018-2[332] <www.iucnredlist.org>

Cambodia is a sanctuary to about 1.6% of all globally threatened species on the IUCN Red List as deducted from the IUCN red list webpage. This includes 2.5% of globally threatened mammals, 2% of globally threatened birds, 5% of globally threatened reptiles, 1.6% of globally threatened fish and less than 1% of globally threatened amphibians.

[331] IUCN 2018. IUCN Red List of Threatened Species. Version 2018-2 <www.iucnredlist.org>

[332] This Table is based on data from Table1 "Totals of all species in each IUCN Red List category by major taxonomic group, irrespective of whether the group has been comprehensively assessed, with extinction risk assessments published on The IUCN Red List (Version 2016-2)" and Table 3 "Total number of species endemic to Cambodia assessed in each Red List category in the IUCN Red List (Version 2016-2) (all taxonomic groups)." in IUCN 2018. IUCN Red List of Threatened Species. Version 2018-2 <www.iucnredlist.org>

3.2 Other lists

Fishbase presents a list of 46 threatened fish species[333] with 6 critically endangered species, 13 endangered species and 27 vulnerable species. The critically endangered species are the giant salmon carp (*Aaptosyax grypus*), the giant barb (*Catlocarpio siamensis*), the siamese tiger perch (*Datnioides pulcher*), the Mekong giant catfish (*Pangasianodon gigas*), the giant pangasius (*Pangasius sanitwongsei*) and the longcomb sawfish (*Pristis zijsron*). Birdlife International maintains a database on birds and 'Important Bird and Biodiversity Areas' with the Red List category for each bird[334].

Figure 37 is an overview of all the groups of species assessed in Cambodia with their IUCN Red List categories. In Cambodia, vertebrates have more threatened species (total of CR, EN &VU is 143) than invertebrates and plants assessed. More specifically 49 species of fishes, 39 of mammals, 28 species of birds and 20 of reptiles are threatened with a relatively larger percentage of critically endangered for mammals and reptiles. Corals have the highest number of threatened species, most of which are vulnerable (64 species) with only a few (3 species) being currently endangered.

The Royal Government of Cambodia adopted the Rectangular Strategy and many other strategies, decrees and action plans that have been serving as roadmaps towards the conservation, sustainable use and restoration of the country's natural assets. Implementation of these policies and the planned actions, with the effective support of many stakeholders, in particular non-governmental organizations, is yet to bear fruit. The IUCN Red List Index[335] of species survival, which is a measure of the overall trends in extinction risk for sets of species and an indicator of progress in achieving the reduction of biodiversity loss, continues to show a downward trend (Figure 39).

[333] *https://www.fishbase.ca/Country/CountryChecklist.php?c_code=116&vhabitat=threatened&csub_code=*
[334] *http://datazone.birdlife.org/country/cambodia/ibas*
[335] The IUCN Red List Index (RLI) is calculated from the genuine changes in IUCN Red List Categories of all assessed species in a taxon over time. A decreasing RLI value means the expected rate of extinctions is increasing (i.e. the rate of biodiversity loss is increasing). An upward trend or increasing RLI value means that there is a decrease in expected future rate of species extinctions (i.e. a reduction in the rate of biodiversity loss) (IUCN 2015 The "IUCN Red List of Threatened Species" accessible at *https://www.iucnredlist.org/resources/brochure*).

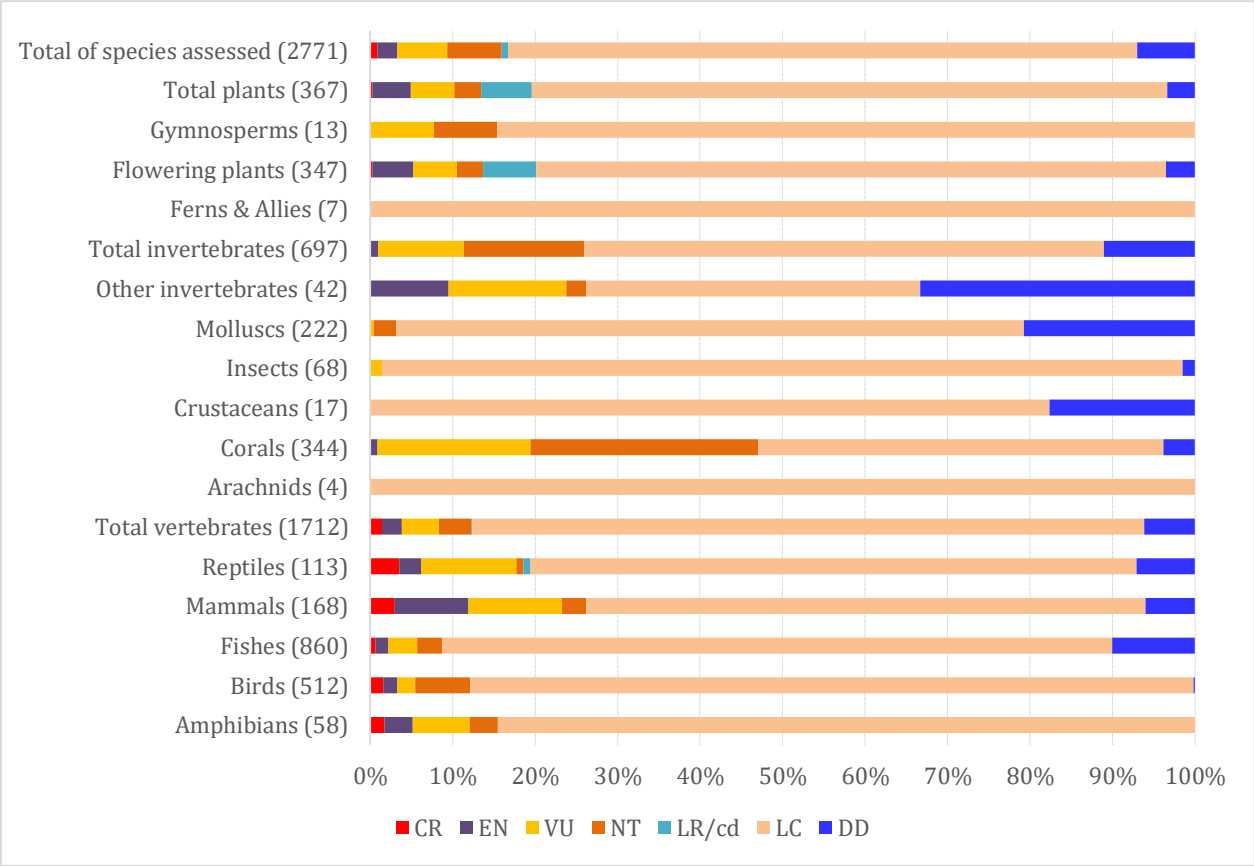


Figure 38: Proportion of extant species

Source: BirdLife International, IUCN and UNEP World Conservation Monitoring Centre, 2018. IBAT Country Profile for Cambodia, Version 2018/5. Available at: http://www.ibat-alliance.org/ibat-conservation

4. Threats

The following threats to the flora and fauna in Cambodia were identified in the 5th national report:

(a) Habitat loss particularly from conversion of natural ecosystems to other land-uses: (i) forest cover decline and degradation were reported caused by commercial logging, slash-and-burn cultivation, land encroachment for human settlements, farming and infrastructure development, and the cutting of wood for fuel. The loss in forest quality was found significantly more important than the loss in forest cover bearing in mind that logging was concentrated on commercially valuable species and larger-size trees; (ii) as expected, conversions of state land to agriculture by large corporations affected larger ecosystems than land exploitation by landless rural communities; (iii) road constructions increased accessibility to remote and natural areas and thus facilitated other threats, such as agricultural expansion and intensification, wildlife hunting and trade, illegal logging (for fuel wood and timber), mining, residential and tourism development as well as dam construction; (iv) the mangrove forests have experienced threats from charcoal production and the expansion of salt farms and widespread shrimp aquaculture;

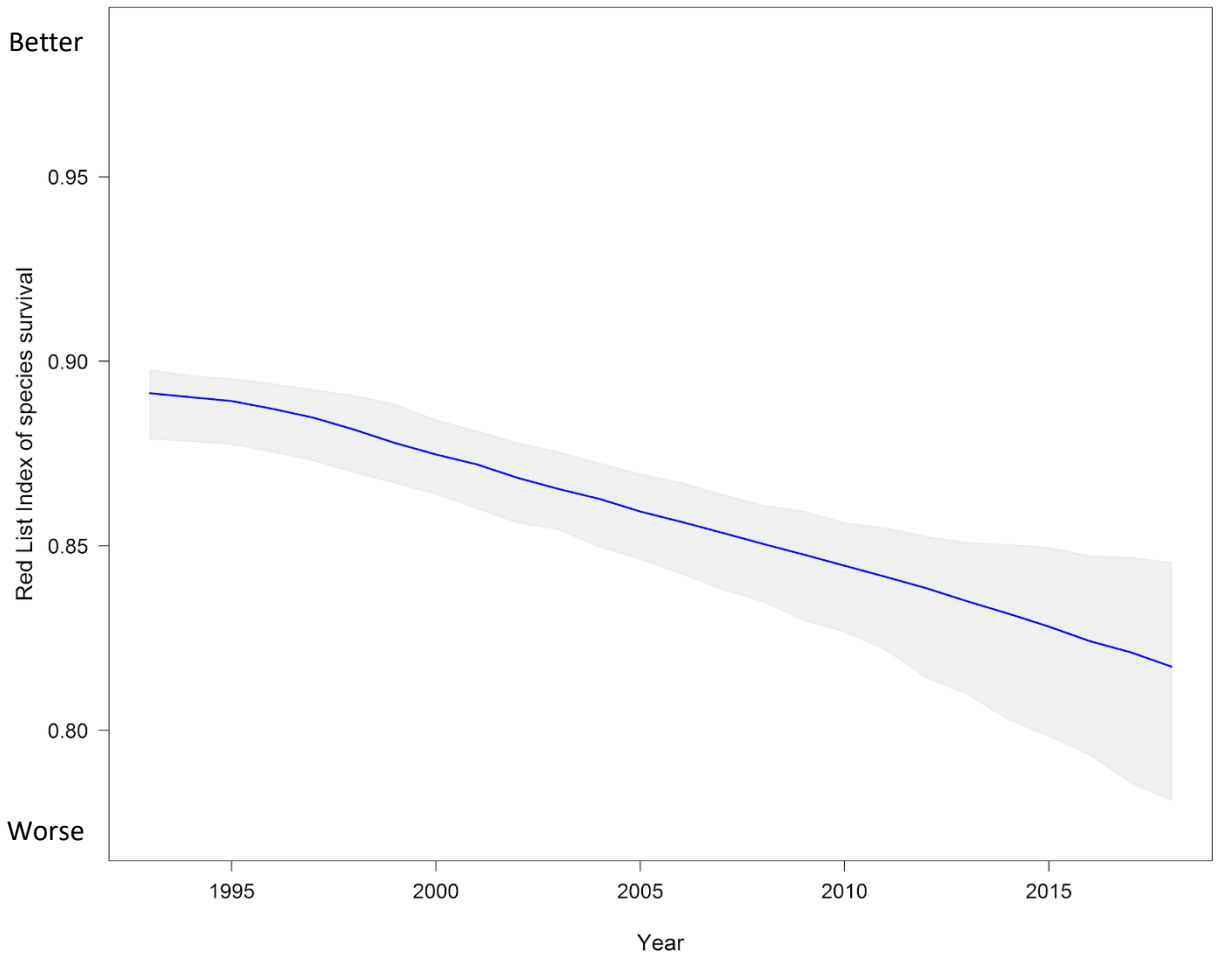


Figure 39: Red List Index of Species Survival for Cambodia between 1993 and 2018.

Source: BirdLife International, IUCN and UNEP World Conservation Monitoring Centre, 2018. IBAT Country Profile for Cambodia, Version 2018/5. Available at: *http://www.ibat-alliance.org/ibat-conservation*

(b) Climate Change: Cambodia is highly vulnerable to the impacts of climate change and is regularly ranked in the top 10 most vulnerable countries. This is partly because the country relies significantly on rain-fed rice subjected to frequent droughts and floods caused by climate change. Sea level rise is expected to affect (i) the country's hydrology, freshwater fishery and agriculture; (ii) the salinity of the Mekong and Tonle Sap and thus directly impact on fish species diversity; and (iii) the coastal zone as increasing water level would lead to considerable habitat loss;

(c) Construction of dams has affected the life of many fish;

(d) Invasive alien species and genetic erosion: Mimosa is noted as a threat. The fifth national report noted that there were no documented cases of detrimental effects of invasive alien species in Cambodia;

(e) Cambodia's coral reefs and sea-grass are seriously threatened by an increasing array of impacts from unsustainable and destructive fishing practices; sedimentation and waste dumping; and increasing population and development in coastal areas.

Underlying these direct threats, the following indirect drivers were mentioned in the 5th national report: (i) overlap across legislation leading to possible confusion for implementation and difficulties for enforcement; and the open access nature of aquatic resources, fisheries in particular, which do not require land ownership (commons), can easily lead to overharvesting and illegal activities.

Figure 40 presents the importance of major threats (among the threats of significance in the world) occurring in Cambodia to all the species that were assessed in the development of the country's Red Lists and classified as threatened (Critically Endangered, Endangered and Vulnerable. See Table 12 and Figure 37 for their numbers). More than 140 species assessed as critically endangered, endangered and vulnerable in Cambodia are threatened by "fishing and harvesting of aquatic resources". Residential and commercial development for human settlement, the establishment of industries, tourism and recreational facilities as well as pollution from agriculture, forestry, other economic sectors, and domestic and urban wastewater, or aquaculture development and deforestation are also among the prevalent threats in Cambodia. Floods and droughts, the major concerns from climate change in Cambodia particularly in Mondul Kiri, Rotanak Kiri, and Kampong Speu, the three provinces that are most vulnerable to climate change, as well as the construction of dams are being reported in recent reports as important drivers of biodiversity loss in Cambodia, particularly in fisheries.

Figure 41 displays the threats that affect assessed taxonomic groups in Cambodia. All the major categories of threat (i.e. fishing and harvesting of aquatic resources; agriculture and aquaculture; natural system modifications; energy production and mining; human intrusion and disturbances; and invasive and other problematic species, genes and diseases) appear to be equally responsible for the threatened status of corals. Mammals, birds and fishes are threatened by a wider range of threats, but each of the threats impact a smaller number of species as compared to threats impacting corals. In all the cases (mammals, birds, fishes, flowering plants, reptiles and amphibians), 'biological resource use' (overfishing and overharvesting; unsustainable fishing, logging, wood harvesting, hunting and trapping of terrestrial animals) is more prevalent in the threat risk facing mammal, bird, fish, flowering plant, reptile and amphibian species in Cambodia.

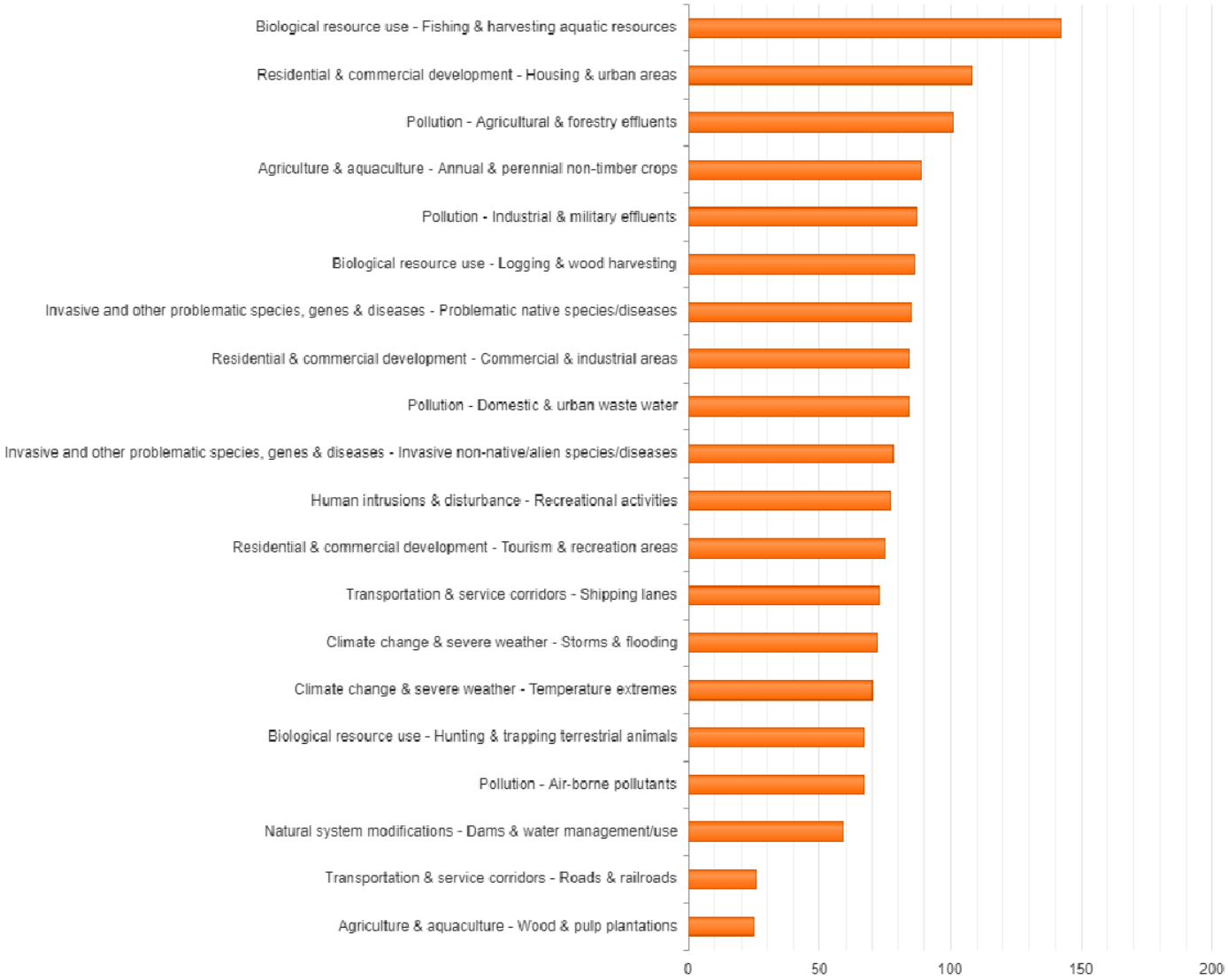


Figure 40: Most significant threats to species assessed in Cambodia

Note: The IUCN Red List uses a hierarchical structure of threat types. The IUCN Threat Classification is accessible at *https://www.iucnredlist.org/resources/threat-classification-scheme* with details in the working document attached to the page. **Source**: BirdLife International, IUCN and UNEP World Conservation Monitoring Centre, 2018. IBAT Country Profile for Cambodia, Version 2018/5. Available at: *http://www.ibat-alliance.org/ibat-conservation*

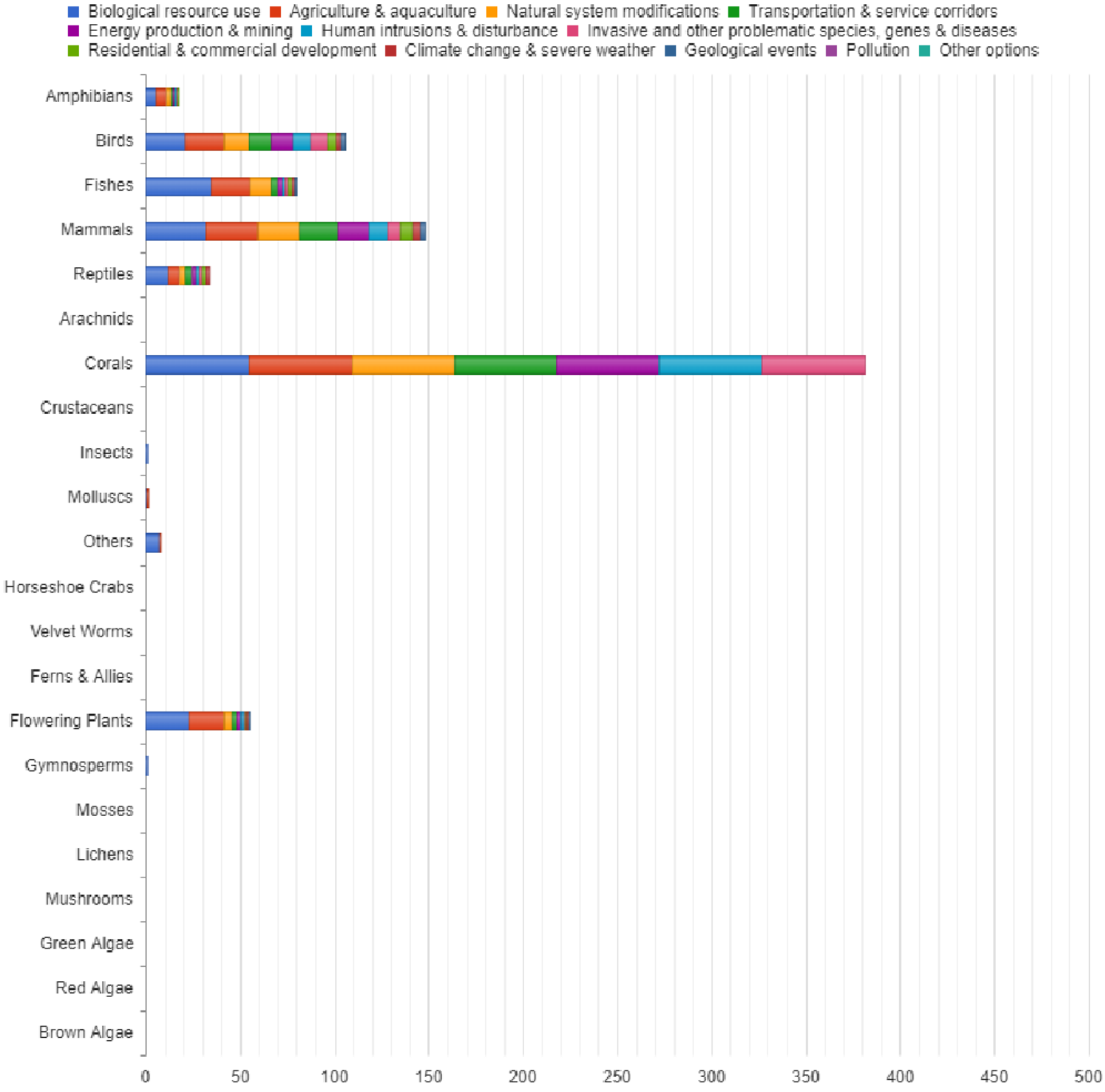


Figure 41: Threats affecting different taxonomic groups assessed in Cambodia

Source: BirdLife International, IUCN and UNEP World Conservation Monitoring Centre, 2018. IBAT Country Profile for Cambodia, Version 2018/5. Available at: *http://www.ibat-alliance.org/ibat-conservation.*

Note: Only major classes of threats are shown.

5. Measures taken and achievements

The Royal Government of Cambodia undertook various initiatives with the participation of many national, regional and international organizations to (i) identify, describe threatened species of fauna and flora, as well as the threats, costs and socioeconomic consequences of losing these species and maintain records; (ii) improve the status of threatened species through the following: rescue, recovery and reintroduction programmes; establishment of vital in-situ conservation facilities and rehabilitation and restoration of degraded habitats; prevention and control of invasive alien species; and (iii) combat illegal wildlife trade including awareness raising and changing people mindset about wildlife, enhancing community involvement, education and research, and legislation and law enforcement.

5.1 Lists and description of threatened species

1. The Department of Biodiversity, under the National Council for Sustainable Development/Ministry of Environment, updated the country's Biodiversity Status Report[336] released in 2016. The report reviewed, among other things, the numbers of threatened species of fauna and flora. The updated National Biodiversity Strategy and Action Plan[337], also published in 2016, reviewed in broad terms the status and trends of threatened species of fauna and flora under theme 2, as well as their ecological and socioeconomic importance, and where possible the consequences of their loss.
2. In the past years, Universities and research organisations had increased their work on discovery, identification and/or description of species of flora and fauna present in Cambodia. The description is done of the taxonomy, ecology and characterization at the genetic level. Example of this work is regularly published in the Cambodian Journal of Natural History[338]. The volume published in December 2018[339], i.e. at the end of the period covered by this 6th National Report, provides latest data on the record of some species (from the mammal or insect groups) and their conservation threats. The Journal contains also an article that draws attention to the situation of the river tern *Sterna aurantia* assessed as Near Threatened in the IUCN Red List[340]. Its population in Cambodia has decreased by over 80% since the late 1990s, from ca. 300 to fewer than 70 adults and should qualify the species as nationally, and probably regionally, Critically Endangered. The Journal also publishes articles covering the ecological and socioeconomic importance of threatened flora and fauna as well as the possible consequences of their loss. This information is essential for policy- and decision-making.
3. MAFF annual reports, reports by MOE, collaborating national, regional and international/global organizations maintain records of the status and trends of threatened species in Cambodia.

5.2 Improving the status of threatened species

1. Many organizations have partnered with MAFF or MOE to rescue animals, especially among threatened species, take care of rescued animals until they are ready for release in nature, often with the participation of local communities. For example, thousands of rescued animals find sanctuary at Phnom Tamao Wildlife Rescue Center. Wildlife Alliance's Care for Rescued Wildlife program was able to release over 3,500 of these rescued animals back onto protected habitat and more than 70 animals were born or hatched at the rescue center[341]. Another success story is summarized in Box 11.

[336] Department of Biodiversity 2016. Cambodia's Biodiversity Status Report Update 2015. Royal Government of Cambodia, National Council for Sustainable Development/Ministry of Environment, Phnom Penh, Cambodia.
[337] Accessible at http://www.chm.gdancp-moe.org/publications/national-biodiversity-strategy-and-action-plan.html
[338] Accessible at https://www.fauna-flora.org/publications/cambodian-journal-natural-history
[339] https://api.fauna-flora.org/wp-content/uploads/2019/01/FFI_201812_Cambodian-Journal-of-Natural-History.pdf
[340] https://www.iucnredlist.org/species/22694537/93456605 accessed on 26 January 2019
[341] https://www.wildlifealliance.org/201612152016-year-in-review/

2. In very recent years, Cambodia further increased the coverage of its protected area system, including the establishment of new sanctuaries for threatened species as well as refuge ponds for fishes. The creation in 2016 of the first large-scale marine protection around the islands of Koh Rong and Koh Rong Sanloem, the 405-km^2 Marine Fisheries Management Area (MFMA), is worth noting. The Koh Rong Archipelago is home to coral reef, seagrass and mangrove habitats which support many charismatic and threatened species including sea turtles and seahorses.

Box 11: Success of an ex-situ conservation breeding programme: The Angkor Centre for Conservation of Biodiversity (ACCB)

Breeding success between January 2014 and November 2018

Species Name	Scientific Name	IUCN	Number of Offspring
Elongated Tortoise	*Indotestudo elongata*	EN	232
South-east Asian Box Turtle	*Cuora amboinensis kamaroma*	VU	162
Asian Woolly-necked Stork	*Ciconia episcopus episcopus*	VU	11
Lesser Adjutant Stork	*Leptoptilos javanicus*	VU	12
Burmese Python*	*Python bivittatus*	VU	34
Yellow-headed Temple Turtle	*Heosemys annandalii*	EN	2
Indochinese Green Peafowl	*Pavo muticus imperator*	EN	2

*ACCB does not operate a breeding programme for Burmese Python. The offspring resulted out of two rescues of eggs, which then hatched at ACCB. The resulting offspring has been released to the wild.

5.3 Combatting illegal wildlife trade

1. Cambodia is paying attention to the entire illegal wildlife trade chain with the aim of ending illegal wildlife trade
2. With the support of some international organizations, Cambodia is using appropriate technology to monitor species and design the best strategies for law enforcement and patrolling protected areas as well as other conservation areas to discourage and eventually stop illegal hunting, fishing and logging and illegal domestic and cross-border trade. Positive results will be mentioned below.
3. The Royal Government of Cambodia relies on a methodical strategy for awareness raising and capacity building at all levels (local communities, patrols, educators, staff in Ministries etc.). Among the motivating strategies, Cambodia is promoting for example payment for ecosystem services. The country has also maintained conditions for attracting/mobilizing financial resources additional to its domestic budget allocation, which has also been increasing, to meet the needs.
4. Universities and research organizations have also increased their scope and are generating a great deal of data and information needed for planning, and decision and policy-making. The increasing number of collections, characterizations and *ex-situ* as well as *in-situ* conservations of wild relatives of food crops (e.g., *Vigna* sp.[342] and *Oryza* sp.) and native ornamental plants such as orchids; and valuation of biodiversity components, at the genetic, species and ecosystem levels, including the cost and benefit analyses of the goods and services provided by biodiversity are among some of the activities that are attracting beneficial partnerships with foreign institutions and experts and where young Cambodian scientists are investing efforts to make the best contributions in the fields of agriculture, forestry, fisheries and other sectors that lead to poverty reduction.

[342] E.g., Tomooka, N., P. Phal, S. Lay Heng, T, Channa and O. Makara, 2013, Collection and Conservation of Leguminous Crops and Their Wild Relatives in Cambodia, 2012. AREIPGR 29: 135 - 159

5. As shown in Table 12, there are 143 vertebrate, 79 invertebrate and 37 plant threatened species in Cambodia. Some of them are being addressed individually while others are being protected through the conservation and/or restoration of their habitats. Partnering organisations have also decided on their priority species. FFI for example focused their work in 2017 to conserve 76 priority species and 132 secondary species that were the subject of some interventions or directly benefited as a result of the conservation work on priority species.
6. MOE and MAFF are collaborating with development partners and environmental NGOs on a range of relevant biodiversity related programmes, including "endangered species action plans". For example, with FFI, action plans were produced for 12 species.
7. Collaboration at the national and regional levels made the combat against illegal trade very effective in number and results. For example, 35 FFI projects in 2017 dealt with illegal wildlife trade. In 2016, the Wildlife Rapid Rescue Team (WRRT) conducted over 400 successful undercover operations, rescued over 3,200 animals from the illegal wildlife trade, apprehended more than 66 wildlife traders, and received over 1,400 calls to the wildlife crime hotline. In addition, in June 2017, representatives from the Ministry of Justice (MoJ), MoE, MAFF, Ministry of Interior, Military Police, Anti-Corruption Unit, the diplomatic sector, and conservation NGOs met for the first time to discuss law enforcement options and responses to wildlife trafficking, which is an increasing threat in the region and the world[343]. In September of the same year, the Mondulkiri Department of Environment, in partnership with the Wildlife Conservation Society (WCS), organized a third bi-lateral meeting since 2015, between Cambodia (Mondulkiri and Kratie provinces) and Vietnam (Binh Phuoc and Dak Nong provinces) on "Combatting illegal wildlife trafficking between Cambodia and Vietnam"[344].
8. Many training programmes and workshops/conferences were carried out during the reporting period to influence behaviour through targeted awareness raising, education and outreach. Practically each NGO working in Cambodia in the field of natural resources organizes some form of conservation awareness and outreach activity. Through these empowering activities, the Government and partners are putting communities at the heart of conservation. Government and customs officials trained in wildlife trafficking identification and law enforcement play an important role to stop wildlife trafficking not only at the national level but also at the global level. As an example, in 2016, trained customs officers successfully stopped a woman carrying 35 kg of rhino horn, valued between US$3.5 million and US$7 million[345].

[343] *https://cambodia.wcs.org/About-Us/Latest-News/articleType/ArticleView/articleId/10205/Cambodias-Ministries-Come-Together-to-Address-Wildlife-Trafficking.aspx*
[344] *https://cambodia.wcs.org/About-Us/Latest-News/articleType/ArticleView/articleId/10539/Cambodia--Vietnam-Joint-Efforts-to-Combat-Transborder-Wildlife-Trafficking.aspx*
[345] *https://www.wildlifealliance.org/201612152016-year-in-review/*

6.4 Examples of actions and achievements for selected threatened species:

Amphibians

Out of 58 species of amphibians assessed, IUCN Red List notes 7 threatened species including the critically endangered *Megophrys damrei* from the Bokor Plateau in the Cardamom Mountains of southern Cambodia. The main threat to this frog is believed to be habitat degradation and loss[346]. Some of threatened species such as *Chiromantis samkosensis* (Samkos bush frog) and *Philautus cardamonus* (Cardamom bush frog) are endemic[347]. There are two nature reserves in the Cardamom Mountains, Phnom Samkos Wildlife Sanctuary and Phnom Aural Wildlife Sanctuary. It is expected that adequate management of these protected areas will protect the habitats of this and other amphibians found in the region.

Scientists have recently discovered a new species of legless amphibian, *Ichthyophis cardamomensis* (Figure 42), in southwest Cardamom Mountains. The area is considered under threat from habitat loss[348]. So far, only three specimens of *I. cardamomensis* have been recorded, all within the Phnom Samkos Wildlife sanctuary[349]. Thus, scientists recommend its inclusion in the IUCN Red List as data deficient. Future research is urgently needed to gather data on the actual distribution and population size of *I. cardamomensis*. In the meantime, conservationists warn that illegal logging and other habitat destruction could mean that the new species become extinct shortly after discovery[350].



Figure 42: A new species of legless amphibian, *Ichthyophis cardamomensis*, in southwest Cardamom Mountains
(***Source***: *Neang Thy 2018*)

Birds

The IUCN Red List notes that, out of 512 species of birds assessed, 28 are threatened, among which the following 8 species are critically endangered: (i) Giant Ibis, (ii) Greater Adjutant, (iii) Green Peafowl, (iv) Masked Finfoot, (v) Sarus Crane, (vi) vultures, (vii) White-shouldered Ibis, and (viii) White-winged Duck[351].

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[346] IUCN Red List

[347] Endemic amphibians: (*http://lntreasures.com/cambodiab.html*) List of all endemic Amphibians : This list of amphibian species found exclusively in Cambodia is based on the species recognized in AmphibiaWeb as of 28 October 2018. For further details on possible inaccuracies in the list see Sources & Caveats: *Leptobrachella melica* (Anura - Megophryidae) Musical Leaf-litter Toad, *Xenophrys auralensis* (Anura - Megophryidae) Aural Horned Frog, *Xenophrys damrei* (Anura - Megophryidae), *Chiromantis samkosensis* (Anura - Rhacophoridae) Samkos Bush Frog, *Philautus cardamonus* (Anura - Rhacophoridae) Cardamom Bush Frog, *Ichthyophis cardamomensis* (Gymnophiona - Ichthyophiidae)

[348] According to Fauna and Flora International (FFI) *https://www.news24.com/Green/News/New-legless-amphibian-species-found-in-Cambodia-20150116*

[349] Geissler, P. & Nikolay A. Poyarkov Jr. & Lee Grismer & Truong Q. Nguyen & Hang T. An & Thy Neang & Alexander Kupfer & Thomas Ziegler & Wolfgang Böhme & Hendrik Müller 2014 New *Ichthyophis* species from Indochina (Gymnophiona, Ichthyophiidae): 1. The unstriped forms with descriptions of three new species and the redescriptions of *I. acuminatus* Taylor, 1960, *I. youngorum* Taylor, 1960 and *I. laosensis* Taylor, 1969. Org Divers Evol *DOI 10.1007/s13127-014-0190-6* (Published online)

[350] According to Fauna and Flora International (FFI) *https://www.news24.com/Green/News/New-legless-amphibian-species-found-in-Cambodia-20150116*

[351] *http://cambodia.panda.org/projects_and_reports/endangered_species/birds/* (Accessed on 27 Jan. 2019).

The two endemic species, Cambodian Tailorbird (*Orthotomus chaktomuk)* and Cambodian Laughingthrush (*Garrulax ferrarius*)[352], are classified in the IUCN Red List as Near-threatened.

Giant Ibis

In a near past, the Giant Ibis (*Thaumatibis gigantea*) was relatively widespread in mainland South-east Asia. This unique bird, now listed as Critically Endangered, is almost entirely restricted to the dry forests of northeastern Cambodia (Figure 43)[353]. About 99 percent of the global population, estimated to consist of 194 mature individuals, lives in Cambodia, making it the most important country in the world for the conservation of the Giant Ibis[354].

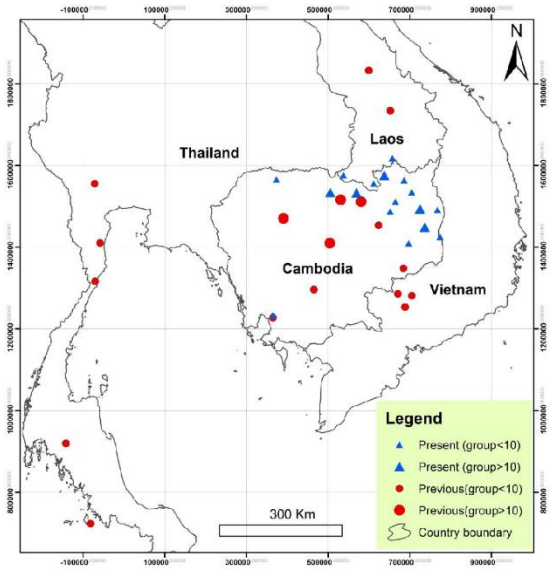


Figure 43: Map based on the range map of the Giant Ibis (2014)
Source: Loveridge and Ty, 2015

Forest loss and drainage of wetlands, driven primarily by land-clearing for industrial agriculture (rubber, cassava, wood pulp and teak plantations), small scale agricultural encroachment and infrastructure developments are the key threats to the species. Part of their decline may be because of the decline in large grazing animals, particularly wild water buffalo, as these birds rely on the pools and wallows dug by buffalo as feeding sites[355]. The Giant Ibis may also be hunted for meat by people and its eggs may be predated by other animals such as the Asian palm civet[356]. Local droughts, resulting likely from climate change, are also considered among factors that compromise the breeding habitat and behaviour of the species.

Various actions have been undertaken to protect the Giant Ibis. One such successful action is the **Ibis Rice** launched in 2009 in partnership with BirdLife and the World Conservation Society (WCS)[357]. IBIS Rice[358] is a not-for-profit conservation enterprise working with Cambodian farmers to protect a precious and vulnerable ecosystem that is home to a rich biodiversity. The enterprise promotes the production of world-class, Wildlife Friendly™, organic jasmine rice. The enterprise buys paddy rice directly from the farmers—paying up to 50% above market price to ensure adequate household incomes and reduce food insecurity, processes it, packages it, markets it and sells a range of jasmine wholefoods and snacks, allowing the farmers to focus on premium organic jasmine rice production. In exchange, they commit to zero

[352] (http://Intreasures.com/cambodiab.html) This list of bird species found exclusively in Cambodia is based on the taxonomy used in del Hoyo & Collar (2014 & 2016). The source list based on the December 2017 update is available online here. del Hoyo, J. & N.J. Collar *HBW and BirdLife International Illustrated Checklist of the Birds of the World*. 2014 Vol. 1: Non-passerines & 2016 Vol. 2: Passerines. Lynx Edicions, Barcelona.

[353] Map was produced by Keo (2008) and includes additional confirmed sightings from the literature - camera trap data from Koh Kong (Evans and Goes 2011), and two new sites presented at the Giant Ibis workshop 2014- camera trap photos from Sang Sahakum Rukhavoan Community Forest in Oddar Meanchy, and Sesan river. See Loveridge, R. and Ty, S. (2015). Ten-year species action plan for the Giant Ibis Thaumatibis gigantea in Cambodia. 2015-2025. Phnom Penh, Cambodia. BirdLife International Cambodia Programme. Accessible at *http://www.birdlife.org/sites/default/files/giant_ibis_national_action_plan_final_english.pdf*

[354] From doc 75 WCS 2017 report; and Loveridge, R. and Ty, S. (2015). Ten-year species action plan for the Giant Ibis *Thaumatibis gigantea* in Cambodia. 2015-2025. Phnom Penh, Cambodia. BirdLife International Cambodia Programme.

[355] http://www.edgeofexistence.org/species/giant-ibis/

[356] https://en.wikipedia.org/wiki/Giant_ibis

[357] https://www.birdlife.org/worldwide/news/ibis-rice-bird-friendly-rice-scheme-boosting-livelihoods-cambodia

[358] https://ibisrice.com/about-us/)

deforestation and zero poaching. Through this initiative, hundreds of affiliated farmers are now the guardians of 500,000 hectares of forests and wetlands in a national park and more than 50 threatened species, including the Giant Ibis, in an area traditionally plied by loggers and poachers. As a result, the Giant Ibis population is slowly recovering, along with many other threatened species.

In 2015, a 10-year Giant Ibis National Action Plan[359] was developed by MoE, the Forestry Administration (FA), WCS, WWF, BirdLife International and Angkor Center for Conservation of Biodiversity. The plan aims were that by 2025 a stable or increasing Giant Ibis population would inhabit a network of well-protected sites. This objective was to be achieved through: (i) the protection of priority habitats of Giant Ibis at all key sites where the species occur; (ii) improvement of the survival and breeding success through targeted species interventions; and (iii) research that will inform conservation actions. The top priority actions were to establish protected forests around key Giant Ibis habitat, to identify key Giant Ibis habitat for prioritisation within protected area management plans, to incorporate Giant Ibis as a priority species within site level management plans and to establish a Giant Ibis Working Group to share information from Giant Ibis research for well informed conservation measures. The Plan is being implemented very successfully e.g., (the list of achievements is very long. Just very few are listed here) the entirety of the Western Siem Pang Important Bird and Biodiversity Area (IBA) has been designated as wildlife sanctuary; the successful "Ibis Rice" programme; restoration of foraging habitats around waterholes; the successful Bird Nest Protection Program ; village-level agreement to create Important Ibis Areas (IIAs); and Systematic monitoring schemes are in place[360].

In addition to these achievements, 19 nests of the Giant Ibis (*Thaumatibis gigantea*) have been discovered during the 2017 breeding season in the Northern Plains of Cambodia in Preah Vihear Province[361]. Fourteen nests were located in Chhep Wildlife Sanctuary and five in the Kulen Promtep Wildlife Sanctuary. Community members and conservationists worked together under the Bird Nest Protection Program to protect these nests from human disturbances and other threats. That same year, WCS and MoE staff found for the first time in more than a decade two pairs of Giant Ibis in Mondulkiri's Keo Seima Wildlife Sanctuary[362]. These findings raise hopes about the Giant Ibis' future.

From 2013 the Wildlife Conservation Society (WCS), with the support of the Darwin Initiative, assisted Sansom Mlup Prey (SMP), a local NGO, to implement the payment for environmental services (PES) scheme 'Ibis Rice' to engage local people in conservation whilst meeting their aspirations for development. The project rapidly grew from 141 families across 7 villages in 2011, to 339 families across 11 villages in 2014[363]. The long-term goal is to expand the project to 15 villages to further increase the wellbeing of local communities whilst protecting key endangered species.

The Bird Nest program included many partners and covered the following threatened species[364] , in addition to the Giant Ibis: White-shouldered Ibis (*Pseudibis davisoni* , Critically Endangered (CR)), Slender-billed Vulture (*Gyps tenuirostris*, CR), Red-headed Vulture (*Sarcogyps calvus*, CR), White-rumped Vulture (*Gyps bengalensis*, CR), Black- necked , stork (*Ephippiorhynchus asiaticus*, Near Threatened), Woolly-necked stork (*Ciconia episcopus*), Greater Adjutant (*Leptoptilos dubius*, Endangered), Lesser Adjutant

[359] Loveridge, R. and Ty, S. (2015). Ten-year species action plan for the Giant Ibis *Thaumatibis gigantea* in Cambodia. 2015-2025. Phnom Penh, Cambodia. BirdLife International Cambodia Programme.
[360] IUCN RedList (*https://www.iucnredlist.org/species/22697536/134200680#conservation-actions*)
[361] From doc 75 WCS 2017 report
[362] *https://theculturetrip.com/asia/cambodia/articles/giant-ibis-11-facts-about-cambodias-national-bird/*
[363] Darwin project report 2016: *http://www.darwininitiative.org.uk/project/19005/* and *http://www.darwininitiative.org.uk/assets/uploads/2014/05/Trade-and-Biodiveristy-Darwin-Newsletter-March-2015_Final-20th-March.pdf*
[364] *https://samveasna.org/major-project/nest-protection/*

(*Leptoptilos javanicus*, Vulnerable), Bengal Florican (*Houbaropsis bengalensis*, CR), Sarus Crane (*Antigone antigone*, Vulnerable)

Since 2015, Sam Veasna Center (SVC) has been working with Wildlife Conservation Society Cambodia (WCS) on the Bird Nest Program in Preah Vihear and made the following achievements[365]:

- Up to 500 nests of threatened birds protected by local people annually in the northern plains, including Giant Ibis and Sarus Crane. Success rates of protected nests were more than twice that of unprotected.
- Bengal Florican populations have remained stable at Stoung-Chikraeng, the site SVC visits, in contrast to declining populations everywhere else.
- Rapid recovery of the water bird colony at Prek Toal: now 25,000 nests of nine species are protected annually by community Rangers.
- Population stability, and in some cases growth of White-shouldered Ibis.

White-shouldered ibis *Pseudibis davisoni*

The current population of the white-shouldered ibis is quite small and highly fragmented. Its global population is estimated at 1,000 individuals, 95% of which are located in northern Cambodia (BirdLife International, 2018)[366], with the largest known Cambodian white-shouldered ibis subpopulation in Western Siem Pang Important Bird Area (minimally 346 individuals)[367]. The species has also been recorded in the following Important Birds Areas (IBAs): Ang Tropeang Thmor, Lomphat, Mekong River from Kratie to Lao PDR, Stung Sen / Santuk / Baray, Upper Srepok Catchment, Upper Stung Sen Catchment and Veal Srongae[368]. The species also appears to rely on microhabitats created by the traditional local agriculture, specifically by the grazing and trampling of forest vegetation by domestic cattle and water buffalo or the wallowing of ungulates in mud.[21] This ibis's reliance on human-mediated activity and herbivore-altered habitats makes the species vulnerable to various anthropogenic threats. Seventy four percent of the Cambodian population roosted at sites outside of existing protected areas[369] (see example in Figure 44), indicating a possible spatial mismatch between important roosting sites and the protected area system[370]. This may be because most protected areas are established far from human settlements while the white-shouldered Ibis microhabitats are relatively close to human settlements.

[365] https://samveasna.org/major-project/nest-protection/
[366] Loveridge, R., Eang S. & Eames, J.C. (2017) Attracting white-shouldered ibises to safe roosting sites in Siem Pang Kang Lech Wildlife Sanctuary, Cambodia. *Cambodian Journal of Natural History*, 2018, 58–62
[367] https://en.wikipedia.org/wiki/White-shouldered_ibis
[368] http://datazone.birdlife.org/species/factsheet/white-shouldered-ibis-pseudibis-davisoni/details
[369] Loveridge, R., Eang S. & Eames, J.C. (2017) Attracting white-shouldered ibises to safe roosting sites in Siem Pang Kang Lech Wildlife Sanctuary, Cambodia. *Cambodian Journal of Natural History*, 2018, 58–62
[370] https://en.wikipedia.org/wiki/White-shouldered_ibis

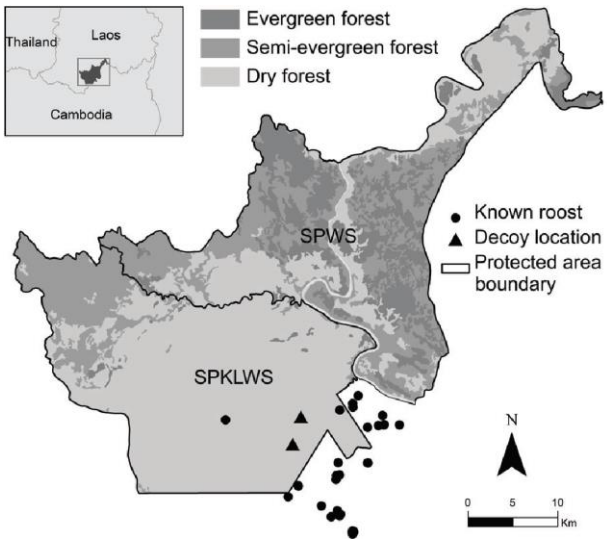


Figure 44: Presence of roosts in Siem Pang Kang Lech Wildlife Sanctuary (SPKLWS) and adjoining Siem Pang Wildlife Sanctuary (SPWS), in 2016.

At the time of the creation of SPKLWS in 2016 only two of the 22 roost sites known were located within SPKLWS.

Source: Loveridge, R., Eang S. & Eames, J.C. (2017) Attracting white-shouldered ibises to safe roosting sites in Siem Pang Kang Lech Wildlife Sanctuary, Cambodia. *Cambodian Journal of Natural History*, 2018, 58–62

Threats:

The white-shouldered ibis is considered one of the most threatened birds of SE Asia. Populations of the white-shouldered ibis have been declining as a result of habitat loss, through logging, the clearance of lowland forests, the conversion of wetlands to agricultural lands (essentially rice-paddy field along the Mekong River) and for agro-industrial and infrastructure development, including dam constructions[371]. These threats leading to the loss of secure feeding, roosting and nesting areas affect the four largest known populations of the white shouldered ibis at Western Siem Pang IBA, Kulen Promtep and Lomphat Wildlife Sanctuaries and the dry forest around the Mekong River channel. These threats are compounded by hunting of adult birds, eggs and chicks for food. The white-shouldered ibis roosts communally in large numbers which makes it vulnerable to hunting and protection of communal roosts is central to conserving the species[372].Poisoned baits set for hunting, competition with humans particularly during amphibian and swamp eel harvesting during the dry season, mammalian predators such as civets and yellow-throated marten *Martes flavigula*, fire and wind also affect some ibis populations to some extent.

Measures taken

Among the actions reported, the following can be highlighted:

(i) Monitoring of the white-shouldered ibis in the Mekong flooded forest started in 2009 with a nest protection programme through which local people were paid to protect bird nests. The project[373] paid the local community to count roosts four times every year during the rainy season. In 2014, the national annual census recorded 892 birds in five protected areas. The Mekong flooded forest supported the third largest white-shouldered ibis population in Cambodian protected areas with 170 individuals (approximately 20% of the national total recorded in 2014). Eighty-three chicks fledged over five seasons from 53 nests; a success rate of 60%. The mean number of chicks per

[371] https://www.speciesonthebrink.org/species/white-shouldered-ibis/

[372] Loveridge, R., Eang S. & Eames, J.C. (2017) Attracting white-shouldered ibises to safe roosting sites in Siem Pang Kang Lech Wildlife Sanctuary, Cambodia. *Cambodian Journal of Natural History*, 2018, 58–62

[373] Doc 12 CJNH 2015 PHAN Channa, SOK Ko and Thomas N.E. GRAY 2015

nest was 2.08. Forty-seven percent of nest failures were due to anthropogenic disturbance and robbery. Twenty-three percent of nest failures were due to eggs falling from nests. Predators were also a problem with 16% of nest failures due to predation. It is important to note that robbery from nests by local people had been eliminated since 2012, thanks to increased local awareness through the bird nest protection programme;

(ii) Conservation sites were identified over the entire range of the species[374]. Siem Pang Kang Lech Wildlife Sanctuary (SPKLWS) (Figure xx above) was designated in May 2016[375]. The wildlife sanctuary encompasses a large portion of the Western Siem Pang Important Bird Area and suitable deciduous dipterocarp habitat for the white-shouldered ibis. In addition, a sub-decree was signed in 2016 declaring the new Prey Siem Pang Lech Wildlife Sanctuary, which covers about half of the Western Siem Pang IBA (65,389 ha), while the Protection Forest designation for the remaining 66,932 ha was upgraded to Wildlife Sanctuary status[376]. This has been achieved through a concerted BirdLife programme that included community awareness-raising among local people about development plans and threats to their land from proposed concessions and working closely with the Forestry Administration and the Ministry of Environment;

(iii) Preliminary research results published in 2018[377] indicate that white-shouldered ibises tend to select roost trees which are significantly taller than most trees in the landscape of SPKLWS and are closer to villages than would be predicted by chance. Decoys seem to attract effectively the white-shouldered ibis, although several months may be required before results are observed;

(iv) Research and monitoring continue to be carried out, focusing on the foraging ecology of the species, nesting and flock size at roost sites and examining the value of trapeangs to the assemblies of waterbirds at the site. Pilot conservation work to deepen two key trapaengs in 2015 provided habitat for longer through the dry season and 15 further trapaengs have been deepened in 2017-2018[378];

(v) The Northern Plains landscape supports some of the most important populations in the region of at least 15 globally threatened bird species, including five listed as Critically Endangered on the IUCN Red List. The evidence suggests that nest protection payments were an effective way to ensure that the white-shouldered ibis and other globally threatened bird species in the Northern Plains of Cambodia that were threatened by nest collection successfully bred[379]. The Northern Plains is characterized by two important protected areas: the 4025 km^2 Kulen Promtep Wildlife Sanctuary and the 1900 km^2 Preah Vihear Protected Forest. Since the program's inception in 2003 until 2012, it has protected >2700 nests of 11 globally threatened or Near-threatened species including the white-shouldered ibis, over >2000 km^2 of habitat at a cost of $30,000 annually, with 71–78% of the costs paid directly to local people. The success rate of protected nests was 88.5% during the 2009– 2011, in comparison with a success rate of 36.9% for unprotected controls of the

[374] *https://www.iucnredlist.org/species/22697531/134189710*

[375] Loveridge, R., Eang S. & Eames, J.C. (2017) Attracting white-shouldered ibises to safe roosting sites in Siem Pang Kang Lech Wildlife Sanctuary, Cambodia. *Cambodian Journal of Natural History*, 2018, 58–62

[376] *https://www.speciesonthebrink.org/species/white-shouldered-ibis/* and *https://www.iucnredlist.org/species/22697531/134189710#conservation-actions*

[377] Loveridge, R., Eang S. & Eames, J.C. (2017) Attracting white-shouldered ibises to safe roosting sites in Siem Pang Kang Lech Wildlife Sanctuary, Cambodia. *Cambodian Journal of Natural History*, 2018, 58–62

[378] *https://www.speciesonthebrink.org/species/white-shouldered-ibis/* and *https://www.iucnredlist.org/species/22697531/134189710#conservation-actions*

[379] Clements, T., Rainey, H., An, D., Rours, V., Tan, S., Thong, S., Sutherland, W.J. and Milner-Gulland, E.J. 2013. An evaluation of the effectiveness of a direct payment for biodiversity conservation: the bird nest protection program in the Northern Plains of Cambodia. *Biological Conservation* 157: 50-59

same species during the same period. The program benefitted about 100 households each year, of the approximately 4000 households across the 24 villages where the program was operating.

Lesser Adjutant

Leptoptilos javanicus has an extensive range across South and South-East Asia. Its largest population is found in Cambodia in or around large rivers and lakes within wooded areas, freshwater wetlands in agricultural areas, and coastal wetlands. It feeds mainly on fish, frogs, reptiles, large invertebrates, rodents and small mammals. It has been recorded in many IBAs such as Ang Tropeang Thmor, Lomphat, Lower Stung Sen, Mondulkiri - Kratie Lowlands, Sre Ambel, Stung Kampong Smach, Upper Stung Sen Catchment and Western Siem Pang. Reports published in 2013 note over 600 known pairs at Tonle Sap and the northern forests and a national total estimated in the range of 1,500-3,500 pairs.

The populations of the lesser adjutant are considered declining rapidly. Among the threats causing the decline, the loss of nest-sites through the felling of colony nest-trees particularly outside protected areas is a major threat. In many areas, drainage and conversion of wetland feeding areas, agricultural intensification, increased pesticide use, disturbance and large-scale development in coastal areas, the collection of eggs and chicks and the hunting of adults are major threats[380]. The spread of invasive water hyacinth (*Eichhornia crassipes)* may become an additional threat, like in some neighbouring countries, as well as the practice of poisoning pools to catch fish, which leads to incidental mortality of the lesser adjutant.

Conservation Actions:

In Cambodia, the breeding colonies at Prek Toal and Moat Khla/Boeng Chhma are core areas in the Tonle Sap Biosphere Reserve. Conservation programmes at Prek Toal and in Preah Vihear have effectively protected colonies from egg and chick harvesting since the early 2000s[381]. In parts of Cambodia, like for the white-shouldered ibis, nest protection payments have been an effective way to protect the nests and obtain much higher rates of nesting success.

In 2016, 149 total nests were found in the Northern Plains, the lesser adjutant's second largest stronghold in the country after Prek Toal Ramsar Site. Conservationists from the Ministry of Environment (MoE), WCS (Wildlife Conservation Society) and local communities discovered 121 lesser adjutant nests (65 in Chhep Wildlife Sanctuary, and 56 in Kulen Promtep Wildlife Sanctuary) at the beginning of the 2017 breeding season. The search for new nests continued and more nests were found. WCS hired local community teams, under the bird nest protection program to locate, monitor and protect the nests until fledging[382]. WCS reports[383] that 172 Lesser Adjutant chicks have been successfully protected in 2017 after being guarded by local community members for almost three months. WCS has employed local community members to protect nesting colonies threatened by egg collection, predation and loss of habitat, with financial support from the eco-tourism partner, Sam Veasna Centre who bring bird watchers to see the birds of the Northern Plains, as well as the 'Agence Française de Développement' (AFD) and Margaret A. Cargill Philanthropies.

[380] *http://datazone.birdlife.org/species/factsheet/lesser-adjutant-leptoptilos-javanicus/text* BirdLife International (2019) Species factsheet: *Leptoptilos javanicus*. Downloaded from *http://www.birdlife.org* on 28/01/2019. Recommended citation for factsheets for more than one species: BirdLife International (2019) IUCN Red List for birds. Downloaded from *http://www.birdlife.org* on 28/01/2019

[381] *http://datazone.birdlife.org/species/factsheet/lesser-adjutant-leptoptilos-javanicus/text* BirdLife International (2019) Species factsheet: *Leptoptilos javanicus*.

[382] *https://newsroom.wcs.org/News-Releases/articleType/ArticleView/articleId/10733/121-And-Counting-Nests-of-Globally-Vulnerable-Lesser-Adjutant-Located-in-Northern-Plains-of-Cambodia.aspx*

[383] WCS Cambodia 2017 Activity Report

In July 2017, Angkor Centre for Conservation of Biodiversity (ACCB) in collaboration with the Ministry of Environment and the WCS released a threatened Lesser Adjutant back to the wild in Kulen Promtep Wildlife Sanctuary, Preah Vihear Province after this Adjutant had been rehabilitated at ACCB for more than a year.

WCS is working to save both the critically endangered greater adjutant and vulnerable lesser adjutant as well as other waterbirds in Cambodia's Northern Plains and at Prek Toal, part of Tonle Sap, which is home to huge colonies of storks[384]. In addition, WCS with Critical Ecosystem Partnership Fund (CEPF) carried out a project, under the Satoyama Initiative titled "Conserving a Suite of Cambodia's Highly Threatened Bird Species[385]." The project arose from work already being undertaken by WCS and its partners in Cambodia since 2000, and received US $699,125 in financial support from CEPF from October 2009 through June 2013 as part of CEPF's initial investment in the Indo-Burma Hotspot. The project main goal was to secure core populations of selected globally threatened bird species at four sites in Cambodia through innovative conservation interventions focusing on providing direct incentives to local communities, namely (i) payments for birds' nest protection, (ii) improved value chains for "wildlife friendly" produce and (iii) ecotourism development. The threatened bird species were: (i) critically endangered: Bengal Florican (*Houbaropsis bengalensis*), Giant Ibis (*Thaumatibis gigantea*), White-shouldered Ibis (*Pseudibis davisoni*); (ii) endangered: Greater Adjutant (*Leptoptilos dubius*), Green Peafowl (*Pavo muticus*), Masked Finfoot (*Heliopais personatus*), White-winged Duck (*Cairina scutulata*); and (iii) vulnerable: Greater Spotted Eagle (*Aquila clanga*), Imperial Eagle (*Aquila heliaca*), Milky Stork (*Mycteria cinerea*), Lesser Adjutant (*Leptoptilos javanicus*), Manchurian Reed Warbler (*Acrocephalus tangorum*), Sarus Crane (*Grus antigone*). Another goal was to strengthen the capacity of local organizations to engage in long-term conservation efforts for the bird species.

The project achieved the following[386]:

- The project directly benefitted more than 450 households across the landscapes, with many communities receiving increased income from the three financial incentive components. In return for the local communities safeguarding the forest and protecting the rare species, the ecotourism scheme established at each village included (i) a community conservation fund set-up on an incentive basis to maximize the tourists' chances of seeing the target birds; (ii) payments for services rendered either through a guesthouse fee or directly by guests; and (iii) a community-based Conservation Management Committee (CMC) that is responsible for the organization of all tourism activities within the village and the fair and equitable sharing of benefits. The number of tourists increased from 2011-2012 to 2012-2013 as well as the revenue.

  CEPF funding allowed expansion of ecotourism to Prey Veng, Sambour and Prolay Commune. Some funds were also used to co-finance parts of a vulture restaurant at Dongplat. In all cases, WCS facilitated the development process and provided training including bookkeeping.
- The project established a supply chain for Ibis Rice, linking participating farmers in the Tonle Sap Inundation Zone with points of sale in Siem Reap and Phnom Penh. WCS and SMP worked together to form Village Marketing Networks at two villages and CEDAC provided training to participating farmers to improve agricultural efficiency and profitability of the crop. The Ibis Rice scheme expanded with CEPF's support to six additional villages, with the number of farmers involved rising from 12 in 2008-2009 to 216 in 2012-2013. Over the same period, the total amount of paddy purchased by the scheme has risen from 7.72 tonnes to 282.70 tonnes, causing the total annual benefit paid to participating farmers to increase from $1,325 in 2008-2009 to $7,908 in 2012-2013.

[384] https://thewebsiteofeverything.com/animals/birds/Ciconiiformes/Ciconiidae/Leptoptilos-javanicus
[385] https://satoyama-initiative.org/conserving-a-suite-of-cambodias-highly-threatened-bird-species/
[386] https://satoyama-initiative.org/conserving-a-suite-of-cambodias-highly-threatened-bird-species/

- The nest protection programme addressed the threat of collection of eggs and chicks for the trade market by making conditional payments to local people to protect nests. CEPF's support allowed WCS to consolidate the program that was already operating in the Northern Plains and expand to Prek Toal in the Tonle Sap. At Prek Toal, the birds' nest protection program expanded from 12 community rangers in 2003 to 32 in 2013. In the Northern Plains, the program benefited approximately 100 households each year and protected 2,981 nests of 11 species, from which 5,379 chicks fledged successfully.
- Throughout the project, WCS improved the capacity of 32 community-based organizations to map, develop rules and regulations and manage natural resources and land. The project focused on raising awareness and building capacity for biodiversity management through a mixture of formal training sessions and on-the-job mentoring in sustainable livelihood activities and natural-resource use. Overall, it is estimated that more than 20,000 community members benefitted from the project's activities.
- Many of the targeted globally-threatened bird species saw population increases throughout the project term. At Prek Toal, the Endangered greater adjutant (*Leptoptilos dubius*) increased by 157 percent from 2007 to 2012, from 77 nests to 198 nests; and the Vulnerable lesser adjutant (*Leptoptilos javanicus*) increased by 14 percent from 2007 to 2012, from 253 nests to 289 nests. In the Northern Plains, the Critically Endangered white-shouldered ibis (*Pseudibis davisoni*) increased from one nest in 2002 to seven in 2012.
- A key to success was the close liaison between government (the Ministry of Environment and the Forestry Administration), an international NGO (WCS), and national civil society (the Sam Veasna Center for Conservation (SVC), Sansom Mlup Prey (SMP) and Centre d'Etude et développement Agricole Cambodgien (CEDAC)) in enabling the complex requirements of the activities to be met smoothly.

Greater Adjutant

The Greater Adjutant (*Leptoptilos dubius*) population is estimated at 150-200 birds in Cambodia, which is the only place in the world where it still breeds. The majority of the Cambodian population congregates in the Tonle Sap Biosphere Reserve, a few pairs are found in areas of dry forest in the northern plains as well as possibly along the Mekong mainstream north of Kratie. Thus, strict protection of nesting sites and enforcement of water-bird conservation legislation are the main strategies used to protect this species from threats of chick and egg collection and other forms of disturbance[387]. The protection through the nest protection programme in Battambang is having positive results[388].

Sarus crane

Sarus crane (*Antigone antigone*) is listed as Vulnerable on the IUCN Red List. Its global population is rapidly declining due to widespread degradation and destruction of wetland habitats, hunting, egg collection, and the effects of pollutants and poisons exacerbated by climate change. The species global population is around 10,000, of which 500 - 800 individuals live in Cambodia[389] mainly in the Northern Plains of Cambodia consisting of dry forests and seasonally flooded grasslands that provide key nesting habitat for this threatened species.

Conservation activities:

- The government has designated three Sarus Crane Conservation Areas (SCCAs) at key feeding sites used in the non-breeding season (November to June): Ang Trapeang Thmor (Banteay Meanchey

[387] http://cambodia.panda.org/projects_and_reports/endangered_species/birds/greater_adjutant/

[388] WCS Annual Report for 2017/Cambodia

[389] https://newsroom.wcs.org/News-Releases/articleType/ArticleView/articleId/10559/Fifty-Globally-Vulnerable-Sarus-Crane-Chicks-Successfully-Hatch-in-Northern-Plains-of-Cambodia.aspx

Province), Boeung Prek Lapouv (Takeo) and Anlung Pring (Kampot)[390]. Conservation management in these sites currently focuses on alleviating human pressures and disturbance. During the breeding season (July to October), the birds disperse to wet meadows in dry deciduous forests in North and Northeast Cambodia. The Ang Trapeang Thmor Protected Landscape (ATTPL) designated in 2016 supports half of Cambodia's Sarus Crane population during the non-breeding season, together with thousands of other waterbirds including storks, pelicans and ducks. ATTPL also supports a population of the Endangered Eld's Deer. These species and the beautiful wetlands attract thousands of tourists each year.

- Bird habitat selection is strongly influenced by security and food availability. Because the major food items consumed by sarus cranes, and their availability at sites where the species congregates during the non-breeding season, are largely unknown in Cambodia, a study[391] was carried out in 2015 to enhance our knowledge of the ecological and feeding requirements of sarus crane. The information was used in the development of strategies to conserve these cranes. The study results indicated that sarus cranes prefer foraging areas characterized by an abundance of *Eleocharis dulcis* and *E. spiralis* that produce underground tubers and shallow water.
- Local communities were supported by WCS to hired people to protect nests. As a result, 26 nests were successful, and one nest was flooded by rain. 50 new chicks hatched and left the nests.
- The nest protection programme was successful in the Northern Plains. This success over the past five years has significantly contributed to conserving the species.
- "Anlung Pring management plan for January 2014 – December 2018" was developed to increase the use of Anlung Pring by Sarus Cranes by appropriate management of hydrology and habitats; and manage, maintain and enhance wetland biodiversity in Anlung Pring to support human livelihoods

Other conservation actions that are done regularly and have been successful include:

- Control of pesticide use and industrial effluent disposal around feeding areas;
- Enhancement of conservation awareness among communities in and around important sites;
- Information of private landowners;
- Development and/or maintenance of small natural wetlands in heavily farmed areas
- Restoration of deteriorating and degraded wetlands

White-winged Duck

The white-winged duck (*Asarcornis scutulata*) can be in dense tropical evergreen forests, near rivers and swamps in Cambodia. The draining of swamps and rivers and habitat destruction are the major threats as well as hunting and collection of eggs and chicks for food or pets[392]. The White-winged duck (IUCN Globally Endangered and on Appendix I of CITES) is part of WCS[393] conservation programme. WCS reported that a female White-winged duck that was earlier rescued, cared for at the Angkor Centre for Conservation of Biodiversity (ACCB), and then re-released back into its natural habitat (Kulen Promtep Wildlife Sanctuary) in late 2015 was found in 2017. This is another success story among others reported by WCS in 2017.

Masked Finfoot

Masked Finfoot (*Heliopais personatus*) is listed on IUCN Red List as Globally Endangered, because its global population is declining at an alarming rate. In July 2017 Conservationists from the Ministry of Environment (MoE), Wildlife Conservation Society (WCS) and local communities found the first Globally Endangered Masked Finfoot nest for four years on the Memay River in the Kulen Promtep Wildlife Sanctuary (KPWS)

[390] Yav N., ParroĴ , M., Seng K & van Zalinge, R. (2015) Foraging preferences of eastern sarus cranes Antigone antigone sharpii in Cambodia. Cambodian Journal of Natural History, 2015, 165–171

[391] Yav *et al.* 2015 ditto

[392] https://en.wikipedia.org/wiki/White-winged_duck

[393] WCS Cambodia 2017 Activity Report

in Preah Vihear Province. This site is the only confirmed breeding location in Cambodia for this very rare species. Nest protection program and more efficient patrolling are the main measures taken to protect and recover this species.

Ibis, Peafowl, Stork
They all benefit from the ACCB ex situ conservation breeding programmes.

Bengal florican

Bengal florican *Houbaropsis bengalensis* is a very threatened bird. It occupies grassland environments, which are under intense pressure for human use. Its global population is less than 1,000 birds, some of which (i.e. a bit more than 2/3) occur in the Tonle Sap floodplain. Initially, hunting was the greatest threat, but this has been brought under control and it is rapid conversion of grassland and traditional agriculture that has led to the recent population decline. The Wildlife Conservation Society's Cambodia Program has been protecting Bengal floricans for more than 10 years. In the site where most conservation interventions are taking place, the population is stable[394].

Vulture

Cambodia supports important populations of three globally endangered vulture species: white-rumped vulture *Gyps bengalensis*, red-headed vulture *Sarcogyps calvus* and slender-billed vulture *Gyps tenuirostris*[395]. These were historically abundant in the region but have declined dramatically in recent decades and are now believed to be extinct in neighbouring countries. Threats to their survival in Cambodia include habitat loss, low breeding success, incidental poisoning and insufficient food availability due to declines in wild large ungulate populations.

The Cambodia Vulture Conservation Project was launched in 2004 to provide monthly supplementary food at seven vulture 'restaurant sites' across Cambodia, and to monitor vulture populations at those sites. The project also aimed to (i) ban the veterinary use of Diclofenac in Cambodia to avoid poisoning through consumption of carcasses that have previously been treated with the veterinary drug and (ii) develop ecotourism at one of the restaurant sites, in order to make the project more financially sustainable[396]. A recent study[397] presents evidence on the role of carbamate pesticides in causing the decline in Vulture populations in South East Asia.

Conservation actions include:

- Vulture restaurants continue to be used as ecotourism attractions in parts of the species' range to raise awareness and fund supplementary feeding programmes and research. The restaurants are run by The Cambodia Vulture Conservation Project in partnership with national and international conservation NGOs.
- Cambodia Vulture Action Plan 2016-2025 is available[398]. All three species are listed on CITES Appendix II and are (globally) Critically Endangered on the IUCN Red List. The populations of all three species

[394] Mahood, S. and V. Son, 2015 Conservation of Bengal florican *Houbaropsis bengalensis* in a farming landscape. *Cambodian Journal of Natural History* 2015 (1) 10
[395] Naiky, NY. 2018. Effectiveness of nest protection methods and nesting preferences of three Cambodian vulture species. Cambodian Journal of Natural History 2018 (1) 39
[396] https://cambodia.wcs.org/Saving-Wildlife/Vultures.aspx
[397] Loveridge, R., Ryan, G.E., Sum P., Grey-Read, O., Mahood, S.P., Mould, A., Harrison, S., Crouthers, R., Ko S., Clements, T., Eames, J.C. & Pruvot, M. (2018) Poisoning causing the decline in South-East Asia's largest vulture population. *Bird Conserva- tion International*. DOI 10.1017/S0959270918000126
[398] Sum, P., and Loveridge, R. (2016). Cambodia Vulture Action Plan 2016-2025. Phnom Penh, Cambodia: BirdLife International Cambodia Programme

have been declining throughout their range during the 20th century and have been at an extremely low level in Cambodia for more than 15 years. The main threats posed to vulture populations in Cambodia's dry forest landscape are believed to be: 1) Deliberate poisoning of domestic and wild animals leading to secondary poisoning of vultures 2) Limited food availability as a result of low wild ungulate populations. Other lower priority threats include loss of nesting sites and habitat loss, and direct persecution. Diclofenac is currently not available for veterinary purposes and there is no evidence that it is currently affecting Cambodia's vulture populations. Identified priority actions to mitigate these threats include: (i) education and awareness -raising to reduce the deliberate use of poisons; (ii) Improved management of protected areas and other conservation areas;(III) Supplementary feeding in the short to medium term to compensate for depressed wild ungulate populations; and (iv) Research to improve knowledge of key threats and impacts of conservation interventions.

Figure 45 shows that since 2010 there has been a decrease in two of these species: the White-rumped Vulture and Red-headed Vulture and a marked reduction in vulture numbers in the Eastern Plains of Cambodia. The conservation of these species requires an immediate and concerted effort to tackle the threat of poisoning through a high-profile awareness campaign. In the longer-term improved protected area management is required to maintain the large stretches of forest and ungulate populations required by these species.

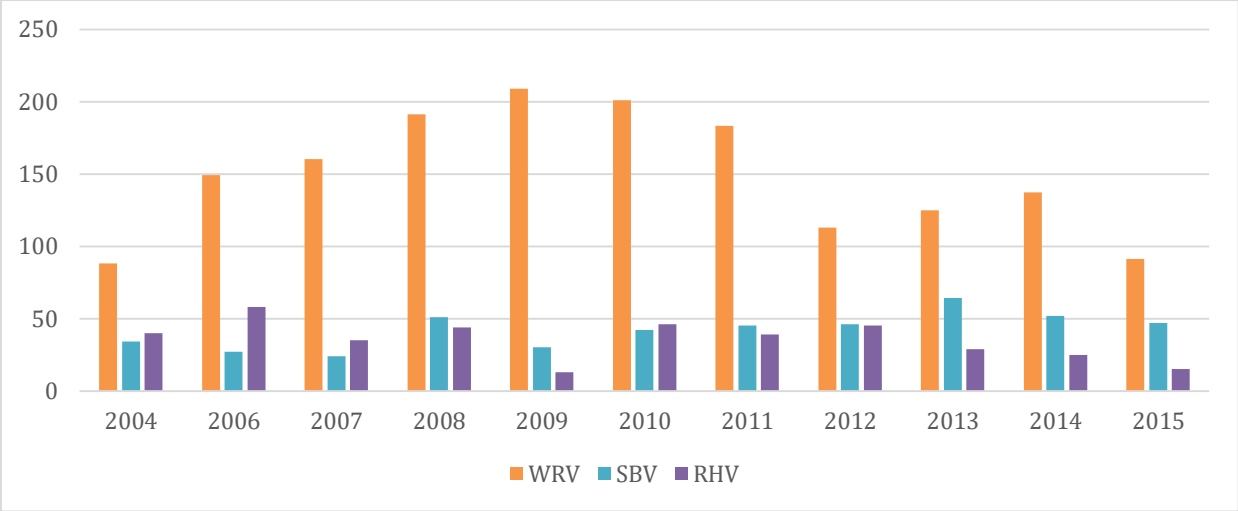


Figure 45: Number of vultures (White-rumped Vulture (WRV), Slender-billed Vulture (SBV) and Red-headed Vulture (RHV)) recorded from all restaurant sites between 2004 and 2015.

(**Source**: Data used are from Appendix II. Vulture census data between 2004 and 2015. Accessible at *https://www.researchgate.net/publication/321974628_Cambodia_Vulture_Action_Plan_2016-2025*)

Sterna aurantia

Following a consultation held in October 2017, the Department of Freshwater Wetlands Conservation/MoE in partnership with BirdLife International, NatureLife Cambodia, WWF-Cambodia and the Department of Natural Resource Management and Development of the Royal University of Phnom Penh, with support from the National Geographic Society, developed a 10-year action plan to protect river terns in Cambodia.

Threats posed to this fish-eating bird that nests on sandbars along the Mekong and 3S rivers in the Stung Treng and Kratie provinces include: human harvesting of eggs for food, predation of nest and chicks by wild and domestic animals (especially rats), trampling of nests by domestic water buffaloes, flooding of

nests by water releases from upstream hydropower dams, human and animal disturbance at breeding sites destruction of sandbar breeding habitat by human encroachment and agriculture, development of hydropower dams, gold and sand mining operations, declines in fish prey and climate change[399]. *Sterna aurantia* was once widespread throughout Southeast Asia. Its populations have declined in recent decades. In Cambodia, they have decreased by over 80% since the late 1990s, from ca. 300 to fewer than 70 adults. Thus *S. aurantia* qualifies as regionally Critically Endangered.

Elephants

Elephants (*Elephas maximus*), leopards, dholes, bantengs and Elds' deer are some of the endangered species that roam in the Srepok Wildlife Sanctuary and the Phnom Prich Wildlife Sanctuary at the core of Cambodia's Eastern Plains landscape. WWF and WCS are assisting the government in effectively protecting these areas. They contribute with awareness raising and capacity building programmes. They work in close coordination with government officials and forest rangers. They supply them with technical equipment and enhance their skills in patrolling the forests. WWF-Cambodia continued to train officials and communities in using the SMART tools in managing protected areas, as well as in patrol planning and intelligence gathering.

Positive events in 2017 include:

- Nine Community Protected Areas in the Srepok Wildlife Sanctuary were officially registered with the Government; five of the respective management plans were approved.
- The National Biodiversity Corridor that connects the Mekong Flooded Forests and the Eastern Plain landscapes was approved. These corridors are vital to the recovery of endangered wildlife including the Asian elephant, leopard, banteng and the giant ibis.
- Management and zoning plans for Phnom Prich Wildlife Sanctuary were approved. The Government further committed to increase the number of rangers to 300, with 20 additional rangers to be deployed in the Eastern Plains landscape.

Local communities with assistance from WCS rescued 11 Asian Elephants (*Elephas maximus*) from an irrigation pool inside Keo Seima Wildlife Sanctuary. The herd consisted of three adult females and eight juveniles of various ages, including a male that had almost reached maturity. These elephants represented an important part of the breeding population in Keo Seima Wildlife Sanctuary, and their loss would have been a major catastrophe[400].

FFI established the Cambodian Elephant Conservation Group in 2005 to ensure the survival of the Asian elephant in Cambodia by stabilising and increasing wild elephant populations throughout the country

The International Elephant Foundation is also working with the Ministry of Environment in zoning and demarcating the protected areas critical for elephant conservation[401]. The Foundation also assists the government and communities in mitigating human-elephant conflict in a strategic and coordinated manner. It is presently carrying out a project titled 'Reducing Threats and Mitigating Human-Elephant Conflict in Core Habitat, Cambodia.' They noted that Cambodia has two major elephant ranges, Mondulkiri and Southwest Cambodia forests, that are partially protected. The elephant populations are small, but stable at around 100 individuals each. As a result of measures taken in the past years, poaching pressure is presently low, but habitat fragmentation and conversion still present significant threats. Results of the project will include *inter alia* enhanced protection of forest in targeted locations, improved crop yields (by growing more "elephant-friendly" crops), increased capacity of the Cambodian Elephant Conservation Group created by FFI in 2005 for implementing conservation activities.

[399] Claassen, A. H. 2018 Cambodian Journal of Natural History 2018 (2) 56

[400] WCS Cambodia 2017 Activity Report

[401] https://elephantconservation.org/portfolio-items/reduce-threats-hec-cambodia/?portfolioCats=42%2C43%2C44

Black-shanked Douc Langurs

The largest known surviving population of the Black-shanked Douc Langurs (*Pygathrix nigripes*) is found in Koe Seima Wildlife Sanctuary[402] and, in smaller populations, in Phnom Prich Wildlife Sanctuary and Mondulkiri Protected Forest within the Eastern Plains Landscape. Koe Seima is a site for a REDD project.

Langurs are hunted for their stomachs believed to have medicinal value, for their meat or to take away their babies for the pet trade. *Pygathrix nigripes* is listed on the IUCN Red List as Globally Endangered. Poaching of endangered wildlife is prohibited under Cambodia's Protected Area Law.

In 2016, the Wildlife Rapid Rescue Team (WRRT) rescued 90 live primates, including a black-shanked douc langur. They provided care to rescued wildlife during transit to Phnom Tamao Wildlife Rescue Center. The Wildlife Conservation Society collaborating with MoE is working with local communities the enhance the protection of *Pygathrix nigripes,* other species of langur, and wildlife in general across Keo Seima Wildllife Sanctuary.

There has also been some work on the genetics and biogeography of the Black-shanked Douc Langur in Cambodia[403].

Eld's deer

Eld's deer (*Rucervus eldii siamensis*) was once widely distributed across lowland dry forests in tropical Southeast Asia. Following intensive hunting and habitat degradation through forest conversion to agriculture and human settlements, caused by climate change impacts, small and scattered populations are found in protected areas in Cambodia.

A study[404] was carried out from 2013 to 2015 to predict Siamese Eld's deer distribution and to determine potential shifts in its suitable habitat as the results of different land use and climate change scenarios in 2030. The study concluded that climate would impact substantially Siamese Eld's deer distribution, and the combination of land use with future climate change predicted severe impacts on Siamese Eld's deer, with the loss of more than 50% from the current suitable habitat. The predicted distribution maps are useful for parks rangers, decision-makers and local community for SMART enforcement patrols and for developing conservation partnership to cover the whole current and predicted range of the Siamese Eld's deer.

Conservationists from South-East Asia met in 2018 in Phnom Penh, Cambodia to share experiences and expertise, develop regional conservation strategies for the species, and agree on modalities to form an Eld's deer working group under the IUCN Deer Specialist Group[405]. Improved management of protected areas, including transboundary protected areas, that cover the present and future range of Eld's deer and enforcement of laws prohibiting illegal hunting are the essential strategies for this species conservation.

Bats

Knowledge of the biology and ecology of Cambodian bats has grown in recent years. Of the ≈74 bat species currently known to occur nationally, 37 species are frequently found in caves and other subterranean sites. A field assessment of their status in Battambang, Banteay Meanchey, and Kampot and Kep provinces in 2014–2016, indicated that half of all caves surveyed (45/98) were affected to varying degrees by development for tourism and domestic ritualistic activities. A study was carried out from 2014 to 2017 to assess the impact of human cave visitation on bat

[402] WCS Cambodia 2017 Activity Report

[403] Moody, J.E. (2018) Population genetics, biogeography, and conservation of the Indochinese silvered langur, *Trachypithecus germaini*, in Cambodia: is the Mekong River a taxonomic boundary? PhD thesis, Fordham University, New York, USA.

[404] Trisurat, Y. & Bhumpakphan, N. (2018) Effects of land use and climate change on Siamese eld's deer (*Rucervus eldii siamensis*) distribution in the transboundary conservation area in Thai- land, Cambodia, and Lao PDR. Frontiers in Environmental Science. DOI 10.3389/fenvs.2018.00035

[405] International workshop for Eld's deer conservation in Phnom Penh, 2018. Cambodian Journal of Natural History 2018 (2) 57

populations[406]. The study confirmed cave tourism as an important threat to bats for example with introduction of artificial lighting and physical alterations to the caves. There is therefore a need for increased sustainable cave management practices in Cambodia.

Ecological services provided by Southeast Asian cave bats include: (i) consumption of economically significant quantities of the plant-hoppers *Sogatella furcifera*, a major pest of rice crop; (ii) primary pollinator of durian, a high value fruit and commonly eaten tree beans; (iii) the guano produced by cave bats is sold and used as plant fertilizer or a source of energy in cave ecosystems and the survival of a considerable proportion of terrestrial invertebrate fauna in tropical caves[407]. Conscious about these ecosystem services, local communities have ensured the effective protection of bats for many years. It was then recommended that these communities be supported to continue doing so through the promotion of sustainable guano harvesting practices and population monitoring programs to ensure continued colony health. These efforts are considered in line with the effective management of protected areas and other conservation areas

Tiger

In April 2016, tigers were declared functionally extinct in Cambodia[408] with no breeding populations left in the country. Cambodia became the first country to acknowledge national extirpation of tigers in the 21st century. Cambodia developed clear steps for recovery in the 'Cambodia Tiger Action Plan' (CTAP). Working with other relevant government agencies and conservation partners, MOE developed a detailed planning[409]. Two potential tiger reintroduction locations have been identified: the Cardamom Rainforest Landscape, Koh Kong and the Eastern Plains Landscape, Mondulkiri. The country report that Cambodia submitted to the 65th CITES Standing Committee meeting reported a number of enforcement measures aimed at tackling illegal trade. The CITES Secretariat, in consultation with Cambodia analyzed our national legislation and placed it in Category 1 i.e. legislation that is believed to meet the requirements for implementation of CITES. Cambodia developed a Memorandum of Understanding (MoU) with the Vietnamese government to facilitate joint law enforcement and intelligence. That same year, the Founder of Bedari Foundation visited Cambodia to explore future support for the Tiger Reintroduction Program and the Global Tiger Day was celebrated to increase people's awareness of the benefits of protecting tigers and their habitat[410].

In 2018 Wildlife Alliance and WWF have been will be working with all stakeholders – government, communities, and global conservation experts – to move tiger reintroduction plans forward and ensure that Cambodia makes a contribution to the global goal of doubling wild tiger numbers.

Siamese crocodile

A 2017 report[411] indicates that the global population of the Siamese Crocodile (*Crocodylus siamensis*) is around 410 adults, with 100-300 wild adults living in Cambodia, particularly in the Cardamom Mountains. This situation makes Cambodia the most important country for the conservation of this species, which is

[406] Lim T, Cappelle J, Hoem T, Furey N (2018) Insectivorous bat reproduction and human cave visitation in Cambodia: A perfect conservation storm? PLoS ONE 13(4): e0196554. https://doi.org/10.1371/journal.pone.0196554

[407] Furey, Neil & Whitten, Tony & Cappelle, Julien & Racey, Paul. (2016). The conservation status of Cambodian cave bats. In: Laumanns (ed.) (2016): International speleological Project to Cambodia 2016 (Provinces of Stoeng Treng, Kampong Speu, Banteay Meanchey and Battambang). - Berliner Höhlenkundliche Berichte, 64, 97 p.; Berlin (Speleo Club Berlin)

[408] *https://www.traffic.org/site/assets/files/2350/reduced-to-skin-and-bones-re-examined-full-analysis.pdf* Stoner, S., Krishnasamy, K., Wittmann, T., Delean, S. and Cassey, P. (2016). Reduced to skin and bones re-examined: Full analysis. An analysis of Tiger seizures from 13 range countries from 2000-2015. TRAFFIC, Southeast Asia Regional Office, Petaling Jaya, Selangor, Malaysia

[409] *https://www.wildlifealliance.org/tiger-reintroduction/*

[410] WWF 2017 Annual Report accessible at http://d2ouvy59p0dg6k.cloudfront.net/downloads/annual_report_2017_sina15feb18.pdf

[411] WCS Cambodia 2017 Activity Report

a Critically Endangered species on the IUCN Red List. Siamese Crocodile faces many threats to their survival. In Cambodia, threats include illegal hunting of adults and hatchlings and collecting of eggs to supply crocodile farms in Cambodia and neighbouring countries, habitat degradation, declining availability/supply of natural food, limited chances of breeding in the wild due to low number of individuals.

Working with the Fisheries Administration, FFI reported in 2017 that community wardens patrolled the crocodile sanctuaries monthly, removing fishing gear, and acting as a deterrent for potential poachers[412]. Poaching and capturing of crocodiles have declined to no reported incidents since 2010.

The same year, conservationists from the Fisheries Administration (FiA), Wildlife Conservation Society (WCS) and local communities found a nest with 19 eggs of the Siamese Crocodile in Kean-to pond, near Preah Angkeo Village, Sre Ambel District, Koh Kong Province, while searching for tracks, signs, and dung of wild crocodiles in the area[413]. This was the first Siamese Crocodile nest recorded in six years of research and protection in the Sre Ambel River System. Earlier that year, the conservation group also found a nest of globally Endangered Asian Giant Softshell Turtle in this river system. This finding shows the global importance of the Sre Ambel River system for the conservation of these reptiles.

Turtles

Batagur affinis, known as Southern River Terrapin is one of the world's most endangered freshwater turtles and is listed on the IUCN Red List as Critically Endangered. The turtle was believed extinct in Cambodia until 2000 when a small population was re-discovered by the Fisheries Administration (FiA) and WCS in the Sre Ambel River. A community-based protection program was initiated in Sre Ambel and the turtle was designated as Cambodia's National Reptile by the Royal Decree in 2005 to raise awareness.

A recent increase in sand mining along the Sre Ambel River system is putting this species at great risk of extinction. Sre Ambel River is the only place in Cambodia where Royal Turtles can be found. The Fisheries Administration (FiA) and WCS have been working together for years to protect the species from extinction. Conservation activities carried out with other partners when needed include nest protection program (see sub-section on target 9 "Payment for ecosystem services"), head-starting, law enforcement, monitoring and outreaches. The work by the Fisheries Administration and WCS is achieving progress toward the recovery and long-term viability of the populations of our national reptile and other turtles such as the Asian Giant Softshell Turtle (*Pelochelys cantorii*)[414].

Examples of actions and successes during the reporting period are listed below:

(a) Over 150 Endangered Asian Giant Softshell Turtle (*Pelochelys cantorii*) hatchlings were released in 2017 into their natural habitat along the Mekong River in Kratie[415]. The hatchlings were part of a community protection program designed to increase the wild population of the species, and had been collected from nests that were guarded by local communities. All the turtles released in 2017 have been detected in 2018 around the release site. One had travelled to another river system nearly 100 km away from the release site. Another one was captured by a fisherman and handed over to the project. The released turtles are now dispersing over a wider area;

(b) After being protected for three months, nine new hatchlings of Royal Turtle successfully hatched and were taken to Koh Kong Reptile Conservation Centre, Koh Kong Province, for feeding, raising and possibly breeding in the future[416];

(c) The Ministry of Mines and Energy's (MME) decided in 2017 to stop all types of sand dredging activities in Sre Amble River system in Koh Kong Province and ban all exports. This decision reflected the strong commitment by the Government to ensure adequate conservation of the environment and its

[412] https://api.fauna-flora.org/wp-content/uploads/2018/08/FFI_2017_Conservation-Report.pdf
[413] WCS Cambodia 2017 Activity Report
[414] MAFF Annual Report 2016-2017
[415] WCS Cambodia 2017 Activity Report
[416] From doc 75 WCS 2017 report

biodiversity, fisheries as well as local communities' well-being[417]. Observations made on 2018 indicate that MME's decision as well as law enforcement against illegal clearance of flooded forest and illegal fishing led to the renewal of the nesting beaches and the protection of the flooded forests, which are the turtle's breeding ground[418].

Encouraged by this success, FiA drafted a Ministerial Proclamation (Prakas) to put most sections of the Sre Ambel River system into a management zone for the Royal Turtle and the Siamese Crocodile sharing the same habitat.

The *ex-situ* conservation breeding programmes at the Angkor Centre for Conservation of Biodiversity (ACCB) has also been very successful with the Elongated Tortoise (*Indotestudo elongata*) and Southeast Asian Box Turtle (*Cuora amboinensis kamaroma*). The number of offspring between Jan 2014 and Nov 2018 was 232 for the Elongated Tortoise (endangered / IUCN Red List), 162 for the South-east Asian Box Turtle (vulnerable/IUCN Red List) and 2 for the Yellow-headed Temple Turtle (endangered / IUCN Red List). ACCB has already a number of founding animals in its care and intends to establish further ex situ conservation breeding programmes for following threatened turtle species: Southern River Terrapin (*Batagur affinis edwardmolli*), Yellow-headed Temple Turtle (*Heosemys annandalii*), Giant Asian Pond Turtle (*Heosemys grandis*) and Black-marsh Turtle (*Siebenrockiella crassicollis*). ACCB plans to establish further ex situ conservation breeding programmes also for following threatened bird species: Giant Ibis, White-shouldered Ibis, Greater Adjutant Stork and Indochinese Green Peafowl. They have also rescued and take care of rescued Burmese Pythons (*Python bivittatus*).

Corals: See subsection on National Target 12 on coral reefs.

Plants

In 2017, FFI planted 97,000 tree seedlings of threatened species. The 2017 edition of the Mabberley's Plant-book[419] contains names of vascular plant genera found exclusively in Cambodia (e.g., *Khmeriosicyos* spp. (Cucurbitaceae)).

The Conference of the Parties to the Convention on Biological Diversity adopted a consolidated update of the Global Strategy for Plant Conservation 2011-2020 in 2010. The Strategy contains 16 targets organized under 5 objectives: (i) plant diversity is well understood, documented and recognized; (ii) plant diversity is urgently and effectively conserved; (iii) plant diversity is used in a sustainable and equitable manner; (iv) education and awareness about plant diversity, its role in sustainable livelihoods and importance to all life on earth is promoted; (v) the capacities and public engagement necessary to implement the Strategy have been developed. Cambodia did not develop a distinct strategy for plant conservation but implemented activities in line with the strategy (Annex T10.1).

Seagrass

Seagrasses constitute important nursery habitats and feeding grounds for many marine species such as seahorses, sea turtles and dugongs. They are also home to commercially important fish and invertebrates which in turn support the livelihoods of five fishing communities across the Koh Rong Archipelago. Seagrasses also act as a carbon store.

A first comprehensive assessment of seagrass in the Koh Rong Archipelago was completed in 2014[420]. The study was conducted to evaluate seagrass distribution, abundance, percentage cover and diversity around

[417] WCS Cambodia 2017 Activity Report

[418] https://cambodia.wcs.org/About-Us/Latest-News/articleType/ArticleView/articleId/11715/The-fight-against-the-sand-mining-brings-hope-for-Royal-Turtles.aspx

[419] Mabberley, D.J. (2017) *Mabberley's Plant-book*. Fourth Edition. Cambridge University Press, Cambridge.

[420] Phalla, Leng & Benbow, Sophie & Mulligan, Berry. (2014). Seagrass diversity and distribution in the Koh Rong Archipelago, Preah Sihanouk Province, Cambodia. Cambodian Journal of Natural History. 2014. 37-46. Accessible at

the islands and thus provide baselines for future monitoring. The study found an estimated 18 hectares of seagrass habitat and recorded four species of seagrass (*Halodule pinifolia*, *Thalassia hemprichii*, *Enhalus acoroides* and *Halophila minor*).

The ecosystem is under threat from habitat destruction, infrastructure development, illegal and destructive fishing and pollution. In 2015, as part of the celebrations for the World Oceans Day, the Fisheries Administration (FiA), Fauna and Flora International, and Song Saa Foundation (SSF) organized awareness-raising activities in on Koh Rong Island. With the designation of the Marine Fisheries Management Area in the Koh Rong Archipelago, re-designed in 2018 as Koh Rong Marine National Park, there has been in 2017 an increase in seagrass cover compared to previous survey years in three of four seagrass sites monitored by Fauna and Flora International[421]. In 2016, Fauna & Flora International (FFI) and partners used a drone and discovered a previously undocumented seagrass bed on the east coast of Koh Rong Island.

Hairy-nosed otter (*Lutra sumatrana*)

Otters, in particular the hairy-nosed otter (*Lutra sumatrana*), have undergone significant declines in Cambodia. Threats include hunting for the skin, traditional medicine and exotic pet trade as well as opportunistic hunting using dogs, large-scale habitat conversion for agro-industries, agricultural encroachment, overharvesting of prey animals, accidental/secondary poisoning, and hydro-dam development. Hairy-nosed Otter is listed as Endangered on the *IUCN Red List of Threatened Species. Some international non-governmental organizations such as CI, WCS and IUCN have been conducting* surveys throughout Cambodia to improve knowledge on distribution and status of otter species. They also provide awareness raising training to local communities as part of environmental education, and train rangers to strengthen legal protection of otters. They also support MoE in the management of otters in protected areas, including by providing technology for monitoring and for rangers. A recent study reports that otters were spotted in Prek Toal Core Area, Tonle Sap Lake[422]. The Phnom Tamao Wildlife Rescue Center has rescued some otters[423].

https://www.researchgate.net/publication/271473096_Seagrass_diversity_and_distribution_in_the_Koh_Rong_Archipelago_Preah_Sihanouk_Province_Cambodia

[421] https://api.fauna-flora.org/wp-content/uploads/2018/08/FFI_2017_Conservation-Report.pdf

[422] Wilcox, D, Visal, S and Mahood, SP (2016). The Conservation Status of Otters in Prek Toal Core Area, Tonle Sap Lake, Cambodia. *IUCN Otter Spec. Group Bull.* **33** (1): 18 – 31. Accessible at http://www.otterspecialistgroup.org/Bulletin/Volume33/Wilcox_et_al_2016.html

[423] https://www.wildlifealliance.org/?s=otter

Annex T10.1: Indicative actions taken in line with the Global Strategy for Plant Conservation (GSPC)

Selected GSPC targets	Indicative actions taken between 2014 and 2018
Target 1: An online flora of all known plants.	See National Target 20, in particular Table 15: Examples of actions taken in line with the achievement of Cambodia Biodiversity Target 20 regarding the protection and conservation of the genetic diversity of cultivated plants. The specimens kept at the National Herbarium/RUPP are being databased and will be made available online. The herbarium continues to receive plant materials and does not yet represent all known plants of Cambodia. The orchid's database is being maintained electronically
Target 2: An assessment of the conservation status of all known plant species, as far as possible, to guide conservation action.	Cambodia has not carried out an assessment of the conservation status of all known plant species. Work undertaken to develop and update the IUCN Red List gathers information on all the 706 plants[424] under consideration.
Target 3: Information, research and associated outputs, and methods necessary to implement the Strategy developed and shared	There are a lot of ongoing research of relevance to plant conservation, but they were not undertaken to implement the GSPC
Target 4: At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration.	Cambodia has a remarkable system of protected areas that represent well all the ecoregions in the country (see implementation of national objective 8) and ongoing initiatives on ecosystem restoration (see implementation of national objective 6).
Target 5: At least 75 per cent of the most important areas for plant diversity of each ecological region protected with effective management in place for conserving plants and their genetic diversity	Cambodia has a remarkable system of protected areas that represent well all the ecoregions in the country (see implementation of national objective 8). Establishment of Cardamom Genetic Conservation Area to protect some of the rare genetic materials in the world is particularly significant.
Target 7: At least 75 per cent of known threatened plant species conserved in situ.	See implementation of National Biodiversity Target 20

[424] *https://www.iucnredlist.org/search?landRegions=KH&searchType=species* accessed on 22 May 2019

Selected GSPC targets	Indicative actions taken between 2014 and 2018
Target 9: 70 per cent of the genetic diversity of crops including their wild relatives and other socio-economically valuable plant species conserved, while respecting, preserving and maintaining associated indigenous and local knowledge.	See implementation of National Biodiversity Target 20
Target 10: Effective management plans in place to prevent new biological invasions and to manage important areas for plant diversity that are invaded.	See Implementation of National Biodiversity Target 18 and laws and guidelines provided in the Environment and Natural Resources Code of Cambodia
Target 14: The importance of plant diversity and the need for its conservation incorporated into communication, education and public awareness programmes.	Plants are integrated but not their diversity
Target 15: The number of trained people working with appropriate facilities sufficient according to national needs, to achieve the targets of this Strategy.	Scientists are being trained for university degrees and also through collaborative projects (e.g. in-vitro technology through a collaborative project with Korea). Number of trained people needs to be increased to satisfy the needs at the national level
Target 16: Institutions, networks and partnerships for plant conservation established or strengthened at national, regional and international levels to achieve the targets of this Strategy.	The RUPP herbarium is cooperating with the French Musee d'Histoire Naturelle The National Herbarium of Cambodia established in 2011 at the Center for Biodiversity Conservation at the Royal University of Phnom Penh (RUPP) is cooperating with the 'Muséum National d'Histoire Naturelle' of Paris. CARDI has also ongoing collaborative research with institutions in Japan (e.g., on genetics of rice with Hyogo University of Agriculture or on leguminous crops with the National Agriculture and Food Research Organization, Ibaraki) and Korea (e.g. the Korea Project on International Agriculture (KOPIA)) or with the International Rice Research Institute through Australia support.

NATIONAL TARGET 11 ON ENHANCING RESILIENCE, CARBON STOCKS OF FORESTS, PROTECTED AREAS AND OTHER CONSERVATION AREAS AND THEIR CONTRIBUTION TO CLIMATE CHANGE MITIGATION AND ADAPTATION

Target 11:
By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks have been enhanced, through conservation and restoration of degraded ecosystems, focusing in particular on degraded forests, protected areas and conservation areas, thereby contributing to climate change mitigation and adaptation and to combating desertification.

1. Introduction

1.1 Scope of the subsection

The scope of this subsection is to assess how much resilience of forests, protected areas and conservation areas have been enhanced as well as their contribution to carbon stocks and more generally to climate change mitigation and adaptation. These elements have been considered under targets 5 and 9 regarding forests and target 8 regarding protected areas and other conservation areas. We present here only an overview of the achievement and details can be found in the subsections on those targets.

1.2 Main findings from the 5th National Report)

The target in the Fifth National Report did not address resilience directly but focused on the need to assess, protect and improve ecosystems and their services. The report concluded that work had only be partly implemented. The conclusion was made on the basis of (i) the number of restoration and rehabilitation programs and area (ha), (ii) the quantity of natural carbon stocks (forest cover, and reforestation have been prevented), and (iii) the number of legislations on natural resources protection has been established, adopted and practiced.

2. Overview of progress on enhancing resilience, carbon stocks of forests, protected areas and other conservation areas and their contribution to climate change mitigation and adaptation

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Regarding Cambodia's protected area system, its expansion by more than 23% of the territory between 2016 and 2018 as well as the ongoing efforts to ensure that the country's protected area system guarantee the resilience of the ecosystems and landscapes it covers and represents, - in other words, the resilience of the ecosystems / ecoregions found in the country as well as the resilience of human communities and biodiversity, - reflect the Government will to set solid foundations for the country's socioeconomic development as described in the Rectangular Strategy (Phase IV) and translated in the National Development Strategic Plan 2019-2023. More than 40% of the country is now classified as protected areas in different categories with zones ranging from strict conservation areas to multiple use areas and

	corridors for connectivity. Measures to ensure effective management such as development and implementation of management plans or more effective patrolling using tools like SMART are being used in some protected areas and being extended to other protected areas. In addition, protected areas cover a large portion of forests and thus areas containing large amounts of aboveground biomass carbon as well as belowground carbon. Protected areas contribute to storing carbon and reducing deforestation, forest degradation and, as a result, greenhouse gas emission from biomass (climate change mitigation) while conserving biodiversity (a requirement for adaptation). The rate of forest cover loss is decreasing, and some forest ecosystem restoration projects are under way. Application of sustainable forest management is expanding, particularly with the increase in the number of community forests and community protected areas supported by the Government and a number of non-governmental organizations.

NATIONAL TARGET 12 ON HALVING THE LOSS OF CORAL REEFS BY CONTROLLING THEIR THREATS

Target 12:
By 2020, the rate of loss of natural forests, coral reefs and other natural habitats is at least halved; and habitat degradation and fragmentation, pollution, overharvesting, introduction of invasive alien species and their impacts are significantly reduced.

1. Introduction

This subsection reviews the measures taken to control the threats posed to coral reefs in Cambodia and assess the resulting decline in the loss of coral reefs. This national target 12 is to be considered together with target 15 on reduction of pressure on corals and ecosystems impacted by climate change. The loss of natural forest and mangroves is part of the subsection on forests (target 5).

2. Overview of progress towards having the loss of coral reefs

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Cambodia with partners, including the national universities and national and international non-governmental organizations, gathered a lot of information and data on the country's reef ecosystems, on their status, past trends and some projections in the future. The information allowed decision-makers to design the Koh Rong Marine National Park using spatial conservation prioritization, and the "ridge-to-reef" approach, involving stakeholders from various sectors and the different layers of the society. Establishment of the Marine National Park with the different zones provided for in the Protected Area Law, the various educational awareness-raising seminars, workshops and capacity-building sessions for local communities, students, tourists and workers, implementation of the Strategic Planning Framework for Fisheries 2010 – 2019 (having among its objectives that 840 ha of coral reef should be under an appropriate form of sustainable management), and effective application of the Environment and Natural Resources Code of Cambodia are the key strategic measures that are allowing to stop coral reefs decline and promote their recovery. There is a need to further strengthen national research capacities; identify sources of funding and mobilize financial resources; acquire the techniques and technologies in particular for monitoring the status and trends of coral reefs and the related pressures, including by disseminating tools like Spatial Monitoring and Reporting Tools (SMART); and build capacities to enforce legislation and policies

3. Status and trends of coral reefs in Cambodia

Cambodia's coastline is 435 kilometres long. It includes 69 islands within the Gulf of Thailand. Coral reefs, seagrass beds, mangroves and other marine habitats can be found along these islands, making the coasts a unique environment that shelters a rich marine biodiversity. Figure 46 gives the list and frequency of corals observed between 2011 and 2014 in the Koh Rong Archipelago.

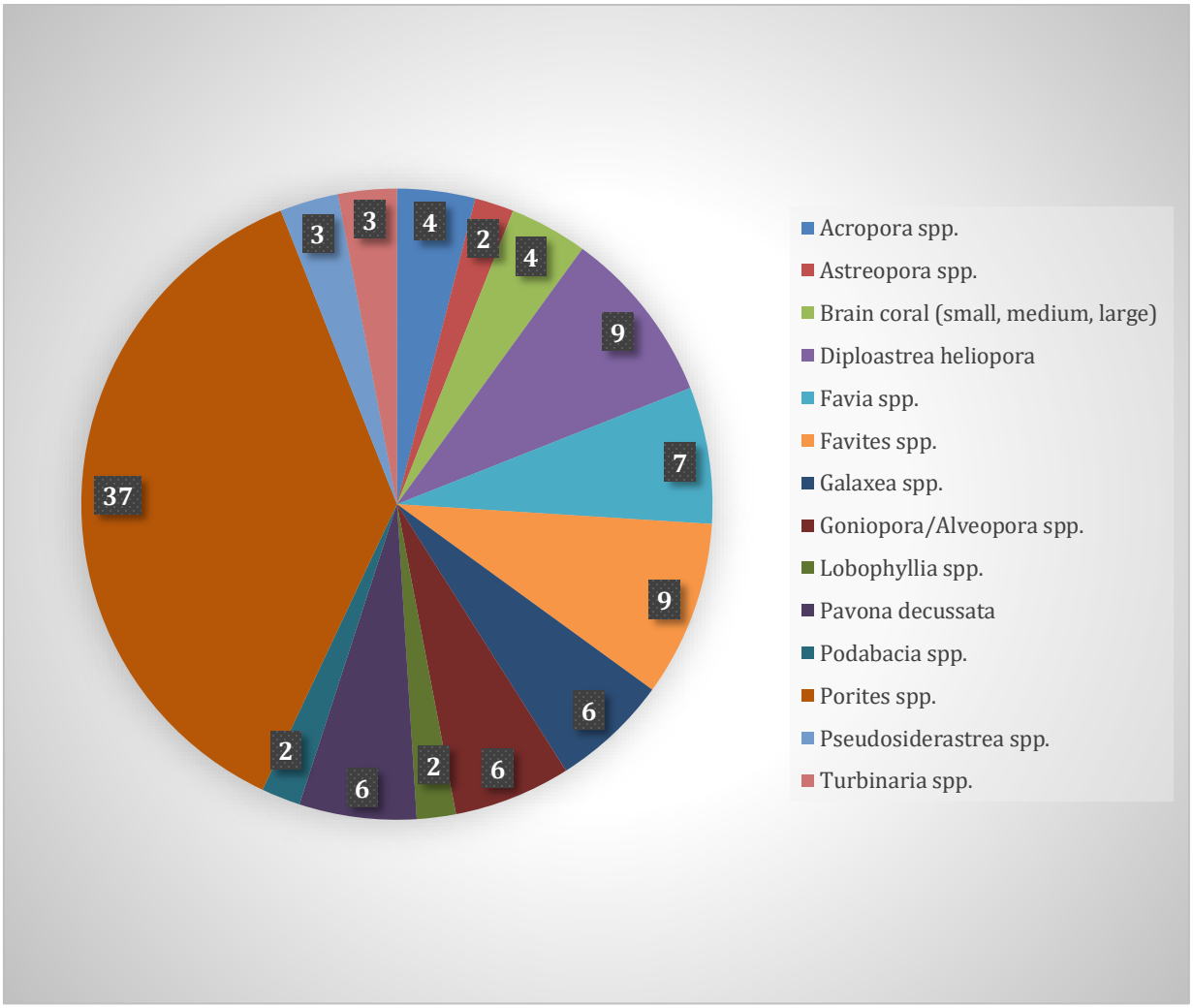


Figure 46: Corals observed between 2011 and 2014 in the Koh Rong Archipelago, with their relative numbers in percent

Source: Thorne *et al*., 2015)[425]

Coral reefs provide habitats to many fish, promote eco-tourism and provide a variety of goods and services including coastal protection, food, raw materials, ornamental resources, climate regulation, moderation of extreme events, waste treatment, biological control, cultural services and maintenance of genetic diversity. Thus, they support local economies. The Economics of Ecosystems and Biodiversity (TEEB) estimated that the value of a hectare of healthy coral reef was between US $ 130,000 and US $ 1.2 million/year[426]. This would mean that the total value of the coral reefs around Koh Rong and Koh Rong

[425] Thorne, B.V., Mulligan, B., Mag Aoidh, R. & Longhurst, K. (2015) Current status of coral reef health around the Koh Rong Archipelago, Cambodia. Cambodian Journal of Natural History, 2015, 98–113

[426] http://coral.unep.ch/Coral_Reefs.html

Samloem would be between US $ 117 - 500 million per year, assuming that effective protection is in place and the reefs do not suffer from further decline in the following years.

The Royal Government of Cambodia with partners, including the national universities and national and international non-governmental organizations, gathered a lot of needed information and data on the country's reef ecosystems, but there is insufficient capacity to continue carrying out such scientific studies on a regular basis.

There is evidence that Cambodia's coral reefs are under pressure and that they can cope with local anthropogenic pressures (e.g., the use of unsustainable and destructive fishing methods) and recover from regional ones (such as climate change). If however, coral reefs are not properly managed, there are chances they disappear within the next few decades.

Regarding the trends in the status of Cambodia's coral reefs, Coral Cay Conservation (CCC), a UK-based conservation NGO invited by the Fisheries Administration (FiA) of the Ministry of Agriculture, Forestry and Fisheries (MAFF) conducted detailed baseline marine assessments of the coastal resources around Koh Rong and Koh Rong Samloem Islands. The survey showed that there was a slight decrease in coral cover from 23% to 20% from 2009 to 2011. Coral species diversity was low, and the area was dominated mainly by massive coral species. There was a decrease in the abundance of branching and foliose coral lifeforms. The 2010 mass-bleaching event that occurred in the Gulf of Thailand in summer resulted in a high prevalence of bleached coral colonies between May and October. In May of that year, 90-100% of coral colonies observed were bleached with no discrimination between coral species, depths or sites.

The decline in coral reefs seems to have been accompanied with declines in the population of some fish. Commercially valuable species of invertebrates that included lobsters and sea cucumbers were found to be very low to non-existent on most reef sites. These results highlight the vulnerability of these key reef fish and invertebrate families to climate change.

4. Threats to coral reefs

The pressures on coral reefs along Cambodia's coast line are from:

(a) Global and regional changes, in particular climate change, which is considered as one of the major threats to the future of coral reefs. Coral reefs can recover from acute stress (e.g. bleaching events) and also tolerate chronic (e.g. sedimentation) stresses to a certain degree. However, chronically stressed reefs are far less likely to recover from an acute stress. Climate change induced phenomena include: (i) coral bleaching (loss of symbiotic algae). During May of 2010, sea surface temperatures in Cambodia rose by 2°C above the average temperatures, causing significant stress to the corals and inducing mass bleaching in the area; (ii) ocean acidification from dissolved CO_2; coral diseases; and precipitation and storm damage;

(b) Local sources: (i) coastal development projects; (ii) pollution and nitrification; (iii) sedimentation from land run-off; and (iv) pressure from overfishing, unsustainable fishing or overharvesting of marine resources.

These pressures are exacerbated by limited awareness among the population of the values of coral reefs and their functioning as well as limited awareness about the best ways and means to manage coral reefs. There is a need to further strengthen national research capacities; identify sources of funding and mobilize financial resources; acquire the techniques and technologies in particular for monitoring the status and trends of coral reefs and the related pressures, including by disseminating tools like Spatial Monitoring and Reporting Tools (SMART); and build capacities to enforce legislation and policies.

Projections made by the Global Coral Reef Monitoring Network (GCRMN) indicate that the level of risks in Cambodia's reefs range from "high" (90% of reefs) to "very high" (10% of reefs). Anthropogenic impacts

are expected to increase across the coastal areas of Cambodia, including the islands of Koh Rong and Koh Rong Samloem off the coastal Phrash Sihanouk Province of Cambodia. Koh Rong Island has been designated for extensive tourism-related development over the next two decades with the construction of an airport, a golf course, a coastal road around the island, several resorts and a casino. Therefore, there is a need for long term scientific monitoring programmes to assess the current status of coral reefs and consider the future of coral reefs under different scenarios. This information has already started helping in mitigating anthropogenic impacts and allowing for the development of effective conservation management strategies that make sense today and take int consideration possible futures. The establishment of the National Marine Park for the Koh Rong in February 2018 is an example of the appropriate measures the country is taking to reduce and prevent the loss of coral reefs.

5. Strategies and management plans to address the threats posed to coral reefs and reduce the loss of coral reefs

The observed threats and challenges described in the previous section highlight the vulnerability of coral reefs and the reef fish families. Establishment of an MPA with the different zones provided for in the Protected Area Law i.e. core/no-take zone, conservation zone, sustainable use zone and community zone (i.e. an MPA that tries to provide in an equitable way to the needs of all stakeholders) is an appropriate action.

In addition to the extensive survey work that supported the establishment of the National Marine Park, staff of the Coral Cay Conservation and volunteers promoted educational awareness through seminars and workshops to local communities on Koh Rong Island. Several lectures were also presented at the University of Phnom Penh and Coral Cay Conservation took on Cambodian scholars over 2011 to support in-country capacity building.

The capacity of coral reefs to bounce back from regional events is inhibited by local stressors such as over-fishing, sedimentation and pollution, which need to be minimised and/or removed through proper coastal management and marine conservation. Underlying factors also need to be addressed.

Progress has been made by both the FiA and NGOs such as Flora and Fauna International and DANIDA as well as local dive centres and resorts (e.g. Song Saa and Dive Shop Cambodia) who have actively been conducting capacity building and community awareness programs. Encouragingly, there is a lot of support for the implementation of the multiple-zone marine park around the island of Koh Rong. Establishment of this park is supported by sound scientific guidance and additional information is being collected to fine-tune the measures taken as needed.

One of the objectives in the Strategic Planning Framework for Fisheries: 2010 – 2019 is that the area of critical fisheries habitats should be under sustainable management, and more specifically that by the end of 2019, at least 7,000 ha of seagrass and 840 ha of coral reefs are under an appropriate form of sustainable management and 1000 ha of flooded forest and mangrove are replanted.

The implementation of a holistic management approach to the successful preservation of the marine habitats of Koh Rong and Koh Rong Samloem in the face of considerable coastal development and human-induced climate change is essential and good progress has been made to this end (see spatial conservation planning in Box 12). Coastal development, deforestation, land-based pollution and agricultural development must be managed if reefs are to retain their resilience and ability to absorb impacts of global/regional stressors. It is only through a complete "ridge to reef" approach, involving stakeholders from all sectors and the different layers of the society that the coral reefs of the islands can be secured for the future benefit and well-being of all in Cambodia.

Box 12: Spatial conservation prioritisation in Koh Rong Archipelago

When the Royal Government of Cambodia needed to plan for the establishment of a multiple-use marine protected area, that will be known locally as a Marine Fisheries Management Area, they used zoning methods that took into account the multiple uses of people but also the value of coral reefs and the full range of biodiversity around the islands.

Spatial conservation prioritisation, which considers comprehensiveness and complementarity was used. That spatial conservation prioritisation followed the classic process of : (i) setting overall conservation objectives (e.g. biodiversity conservation, threat management); (ii) determining conservation features, which are the habitat types and/or species to be conserved; (iii) setting targets for each of these conservation features by, for example, following national or international targets; (iv) dividing the planning of the region into a series of planning units; (v) calculating the amount of each feature found in each planning unit; (vi) assigning a cost value to each planning unit; and (vii) identifying sets of priority areas for conserving biodiversity that meet the targets, while avoiding fragmentation of these areas.

Cambodia is gathering data that will allow a determination of the rate of loss of coral reefs and of efforts needed to halve the loss. In the meantime, Cambodia established marine protected areas that are protecting coral reefs as well as other components of biodiversity along the coast line and around the islands. Enforcement of laws (e.g., the 2008 Protected Area Law) and effective application of the Environment and Natural Resources Code of Cambodia will ensure that anthropogenic pressures impacting coral reefs are controlled and their impacts reduced.

NATIONAL TARGET 13 ON THE NAGOYA PROTOCOL ON ACCESS TO GENETIC RESOURCES AND THE FAIR AND EQUITABLE SHARING OF BENEFITS ARISING FROM THEIR UTILIZATION

Target 13:
By 2015, Cambodia has designated a national focal point and one or more competent national authorities for the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS), and established a functional ABS Clearing-House as part of the clearing-house mechanism;

By 2020, Cambodia has developed and is enforcing a legislation and national policies on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization.

1. Introduction

Cambodia ratified the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) on 19 January 2015. The country became a Party on 19 April 2015 and has already designated the National Focal Point and the General Secretariat of the National Council for Sustainable Development as the Competent National Authority. The ABS Clearing-House is under construction.

This section reports on progress made towards the development and enforcement of a legislation and national policies on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization.

2 Overview of progress towards the achievement of Cambodia Biodiversity Target 13 on legislation for access and benefit sharing

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Cambodia ratified the Protocol in 2015. Since then, the country made significant progress on the strategic objectives identified in the 2016 National Strategy and Action Plan. Many training workshops were organized to empower indigenous ethnic minorities and local communities. As result, they participated effectively in many processes for the conservation and sustainable management of biodiversity and associated ecosystem services, particularly in the framework of the REDD+ programme. Conscious about the unique value of Cambodia's natural assets, in particular the many endemic species and the new species that are regularly identified, scientists have increased their work on valuation of Cambodia's biodiversity, partnering with other scientists in the subregion and the Asia Pacific region. Cambodia is now developing a Comprehensive Framework for Practical Implementation of the Nagoya Protocol with GEF-6 funds. Analysis of existing relevant legislation and policies as well as discussions for the development of a new comprehensive legislation on access and benefit sharing are under way. The Ministry of Environment is in the process of finalizing the Environment and Natural Resources Code that will include

	provisions related to ABS while the Code contains already many provisions on benefit sharing that could be applicable to ABS. In the meantime, Cambodia is considering the possibility of adopting a temporary procedure for granting permission for accessing genetic materials and sharing benefits from their utilization, in the spirit of the Nagoya Protocol, while waiting for the finalisation of the national ABS legislation. Enabling initiatives include the establishment of the Technical Working Group on ABS, and participation in the project titled 'Promoting biodiversity-based products to improve livelihoods and protect biodiversity, 2015-2019', supported by GIZ and the intergovernmental ASEAN Centre for Biodiversity[427], through which Cambodia is gaining relevant experiences and strengthening its capacities to promote biodiversity-based value chains.

3. Development and enforcement of a legislation and national policies on ABS

Cambodia was one of the 65 Parties eligible to funds for the project "Support to Preparation of the Interim National Report on the Implementation of the Nagoya Protocol" for 2017 - 2018. The objective of the project was to assist GEF-Eligible Parties to the Nagoya Protocol on Access and Benefit Sharing to prepare and make timely submission of their Interim National Reports on measures that each party has taken to implement the Protocol in line with Article 29 of the Protocol.

Cambodia made progress on each of the three strategic objectives identified in its 2016 National Strategy and Action Plan. For example,

(a) Under Strategic objective 1 (Strengthen Communication, Education and Public Awareness (CEPA) on access and benefits-sharing (ABS)), MoE and various partners organized many training workshops to empower indigenous ethnic minorities and local communities particularly in the framework of the REDD+ programme so that they can share, with prior informed consent, their knowledge and know-how for the conservation and sustainable management of biodiversity. In turn, indigenous ethnic minorities and local communities need to be informed about legal aspects.

Many scientists are familiarizing themselves with the concepts behind the Nagoya Protocol and looking forward to the national legislation being developed, bearing in mind the many endemic species found in Cambodia and the socioeconomic potential they represent. Scientists and partners in other countries have increased their work on valuation of Cambodia's biodiversity. A good knowledge of biodiversity value is essential in developing agreements under the Protocol.

(b) Under Strategic objective 2 (Develop and implement a national ABS policy and legislation), it is important to note that 'Developing a Comprehensive Framework for Practical Implementation of the Nagoya Protocol' was identified in 2015 as one of Cambodia's priorities for GEF-6. The project concept was approved in February 2018. Once the national legislation on access and benefit-sharing (ABS) is developed under this GEF-6 project, it will be posted on the ABS clearing-house mechanism. Discussions and

[427] https://www.giz.de/en/worldwide/57349.html

consultations regarding the development of a national legislation are well advanced. They include an analysis of existing laws and policies of relevance to ABS.

The Ministry of Environment is in the process of finalizing the Environment and Natural Resources Code that will hopefully include provisions related to ABS. The Code contains already many provisions on benefit sharing that could be applicable to ABS. The process for integrating ABS provisions in the Code may take long. Thus, the country is considering the possibility of adopting a temporary procedure that government agencies could use for granting permission for accessing genetic materials and sharing benefits from their utilization, in the spirit of the Nagoya Protocol, while waiting for the finalisation of the national ABS legislation.

(c) Under Strategic objective 3 (Enhance the enabling environment for the development of ABS legislation and the implementation of the Nagoya Protocol on ABS and related legislation), it should be noted that the Technical Working Group on ABS has been established to provide technical support to the NCSD and report on any update of ABS. This group includes experts from various ministries and organizations such as MAFF, MOC, MOH and CARDI.

Cambodia is one of the ASEAN countries participating in the project titled 'Promoting biodiversity-based products to improve livelihoods and protect biodiversity, 2015-2019', supported by GIZ and the intergovernmental ASEAN Centre for Biodiversity[428]. The project focuses on (i) the development and implementation of a strategy to promote biodiversity-based value chains and policies; (ii) collecting and exchanging information on biodiversity-based products and value chains in buffer zones of protected areas ; (iii) test and gather good practices from pilot projects on biodiversity-based value chains that would improve livelihoods and promote biodiversity conservation; and (iv) develop capacities to promote biodiversity-based value chains among relevant target groups. Cambodia undertook a pilot project consisting of documenting the ecology and value chain of two species *Kaempferia parviflora*, a medicinal plant, and *Lygodium salicifolium*, a fern used for handicraft.

The concept of ABS is new in Cambodia. There is a need to inform and build expertise in the country. More specifically, community participation in the development and implementation of any ABS legislation is essential. Many government institutions have been assigned to work closely with indigenous peoples and local communities because these communities play an important role in decision-making for the conservation and management of natural resources.

[428] https://www.giz.de/en/worldwide/57349.html

NATIONAL TARGET 14 ON THE UPDATING AND IMPLEMENTATION OF THE NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

Target 14:
By 2015, the National Biodiversity Strategy and Action Plan (NBSAP) have been updated and adopted, and have commenced to be implemented effectively.

1. Introduction

This subsection summarizes the process towards the updating and approval of the National Biodiversity Strategy and Action Plan (NBSAP) with some information on its implementation.

2. Overview of progress towards the updating, approval and implementation of the NBSAP

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Cambodia's National Biodiversity Strategy and Action Plan (NBSAP) was updated in 2014 and 2015, under the overall coordination the General Secretariat of the National Council for Sustainable Development, with financial and technical support from UNDP/GEF and HARVEST/USAID. The Strategy was approved and launched by the Prime Minister on 5 February 2016 as a reflection of the political will and firm commitment of the Government to safeguard biodiversity for the benefit of the people of Cambodia and the world. The updated NBSAP consists of 498 key actions identified to achieve 78 strategic objectives under 24 themes. The Strategy includes also 20 national targets. Since its approval, the strategy has been central to the implementation of measures taken in the country to effectively conserve and use biodiversity and its components sustainably and ensure the best contribution to the country's socioeconomic development. This 6th National Report presents some highlights of the achievements with the overall conclusion that Cambodia is on track to achieve most of the targets with an outstanding achievement in the establishment of well-connected protected areas (40.9 % of the territory).

3. Update of the 2002 NBSAP

3.1 Updating of the NBSAP and its adoption

The original biodiversity strategy was adopted in 2002 with the intention to promote the rational use, the protection and best management of biodiversity, an essential part of our natural capital. In the past decade and half, the country made significant progress toward theses goals. The 2016 National Biodiversity Strategy and Action Plan (NBSAP), called for by the 10th meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD), is the result of intense and wide consultations, coordinated by the General Secretariat of the National Council for Sustainable Development (NCSD), among various

government institutions at the national and provincial levels, conservation partner organisations, the academia and many other stakeholders including the private sector. Some of the government representatives were also members the National Biodiversity Steering Committee. Participants in the consultations contributed to the drafting of all the objectives, key actions and targets, thus expressing their ownership and commitment to the implementation of the NBSAP. This update paves the way to the wide participation and strong collaboration that are so essential to the success in implementing the strategy and action plan. The process of updating the NBSAP benefitted from a financial support from the Global Environment Facility (GEF) through the United Nations Environment Programme (UNEP) and Harvest Program funded by the US Agency for International Development (USAID).

The updated National Biodiversity Strategy and Action Plan (NBSAP) was approved and launched by the Prime Minister of the Kingdom of Cambodia on 5 February 2016. He noted that the revised NBSAP reflected the political will and firm commitment of the Government to safeguard biodiversity, the mainstay of Cambodia's economy, poverty reduction and sustainable development. The time of the approval was opportune because the country was fully engaged in the implementation of its National Green Growth Roadmap 2013 -2030, the Climate Change Strategic Plan 2013 -2023, Phase III of the Rectangular Strategy for Growth, Employment, Equity and Efficiency and other strategic plans for national development. The world community has just adopted the 2030 Sustainable Development Goals at the end of 2015. All these strategic plans, roadmaps and goals strongly emphasize the importance to conserve, manage wisely and, where needed, restore the natural assets to continue the socioeconomic growth within the environmental carrying capacity. The Prime Minister indicated that the NBSAP would guide line ministries and assist non-governmental organizations and development partners in developing and applying concrete and appropriate measures to ensure that conservation of biodiversity and the sustainable use of its components and services are effectively mainstreamed, as appropriate, in the implementation of all the strategic plans, roadmaps or goals adopted by Cambodia in recent years.

3.2 NBSAP contents

Cambodia's updated NBSAP consists of 498 key actions identified to achieve 78 strategic objectives under 24 themes. The thematic approach was used in the 2002 NBSAP (17 themes at the time) and the number of themes was adjusted with a few more identified in the country's Rectangular Strategy and other strategic plans. Each theme is introduced with an account of the issues taken into consideration in the 2002 NBSAP, a brief overview of the results of the actions identified in that NBSAP, followed by a list of current key issues based essentially on the findings in the Fifth National Report, the assessment of the implementation of the 2002 NBSAP, and the Biodiversity Status Report. Additional sources of issues include national reports and communications prepared under the other Rio conventions and other biodiversity-related multilateral environmental agreements (MEAs), and various reports on the implementation of relevant national strategies and plans, such as the report on the Cambodia Millennium Development Goals and reports submitted to funding agencies. Strategic objectives were then identified together with key actions and coordinating and participating ministries and agencies.

The Cambodia Biodiversity 2015-2020 Targets presented at the end of the document can therefore be seen as a platform that will promote coherence, coordination, cooperation, co-evolution and synergy while maximizing resource use and efficiency in implementing the key actions. The targets are facilitating, in particular, cooperation and creation of concrete collaborative programmes between different Ministries and their Departments, different actors within and across economic sectors, and among organizations at the national, regional and international levels. The Cambodia Biodiversity 2015-2020 Targets mirror the

Aichi Biodiversity Targets in general, but their sequence indicates the country's priorities. Most of the indicators identified for Aichi Biodiversity targets are also applicable to Cambodia biodiversity targets.

The strategic objectives, key actions and national biodiversity targets support the development goals adopted by the Royal Government of Cambodia in the Rectangular Strategy for Growth, Employment, Equity and Efficiency in Cambodia. They are also in line with the provisions in the National Strategic Development Plan 2009-2013 and the National Green Growth Roadmap 2013-2030. Their implementation is expected to meet most of the environmental quality objectives proposed in the National Sustainable Development Strategy (2009) and respond to the biodiversity needs identified in the country's Land Degradation Neutrality targets under the UNCCD, in the Nationally Determined Contributions to UNFCCC and in the commitments made in the second National Communication to UNFCCC.

3.3 Integration in the synergistic implementation of the Rio Conventions

Many provisions of the NBSAP are being implemented, in particular the ones that reflected the work of MOE and MAFF and the initiatives undertaken or supported by partner organisations. There is more and more coordination and strengthening of partnership in the way biodiversity work is being carried out in the country. Various actions identified in the NBSAP require strong collaboration and efficient coordination. This is exemplified by the efforts between MOE and MAFF to enhance the synergistic implementation of the Convention on Biological Diversity (CBD), the United Nations Convention to Combat Desertification (UNCCD) and the United Nations Framework Convention on Climate Change (UNFCCC), the so-called Rio Conventions because they all derive from the United Nations Conference on Environment and Development held in 1992 in Rio de Janeiro, Brazil. Building on the findings of the National Capacity Self Assessment completed in 2006 and the 2015 – 2018 GEF/UNDP-funded project on "Generating, Accessing and Using Information and Knowledge Related to the Three Rio Conventions," Cambodia took the following measures:

(a) Establish a Liaison Group to oversee and steer the synergy;

(b) Agree on common themes around which to develop and strengthen synergy

(c) Establish a national web portal that is common for national activities under the three Rio Conventions;

(d) Appoint a dedicated manager of the web portal who works in close collaboration with the Liaison Group and National Focal Points of each of the three conventions.

Cambodia has a 5-year capacity development plan aimed at enhancing synergy among people working on biodiversity, land degradation or climate change. The Plan targets MOE staff (those who are dealing primarily with biodiversity and those who are dealing primarily with climate change) and MAFF staff (those who are dealing primarily with land degradation) when they are developing or implementing their programmes and reporting on their work to their respective conventions. It is also addressed to all the other policy and decision-makers in the government at the national and sub-national levels, and to local communities and indigenous ethnic minorities, the private sector and the civil society with all the practitioners dealing with land management, protected areas and ecosystem restoration, themes that are common to the three Rio Conventions.

Synergistic implementation of the Rio Conventions is expected to enhance efficiency in the use of limited human and financial resources; help avoid unnecessary duplication of efforts; help implement the provisions of the three Rio Conventions in a more effective, integrated, coherent and efficient manner; and probably attract more funding. Implementing one convention can bring about benefits under the other conventions.

3.4 Integration in the "Code of Environmental and Natural Resources of Cambodia"

(a) The Ministry of the Environment with the Vishnu Law Group is compiling all the laws and legal instruments related to environment and natural resources into an overarching "Code of Environmental and Natural Resources of Cambodia." The document is still going through a process of review with comments received from national and sub-national authorities. Book 4 of the draft Code is on Sustainable Management of Natural Resources. Titles 1 and 3 in that Book are on establishment and management of corridors for providing connectivity between key biodiversity areas and thus "secure for perpetuity the Kingdom of Cambodia's biological diversity, ecosystem services, natural and cultural resources, and sustainable local livelihoods." This is in line with some elements of Cambodia Biodiversity Target 8 and key action 2.5 (Ensure connectivity among protected areas through corridors and/or stepping stones, bearing in mind the ecosystem approach) of strategic objective 2 under theme 1 of the NBSAP.
The Code would gain more by considering other perspectives presented in the NBSAP such as the question of "equity in decision-making processes and benefit-sharing with special attention to the most vulnerable groups"; encroachment and degradation of protected areas and other conservation areas with the need to mobilize funds to restore or rehabilitate degraded areas, and the provisions of the Nagoya Protocol on access and benefit sharing, bearing in mind the role and knowledge of indigenous ethnic minorities and local communities;

(b) The other titles covered in the Code, including in particular titles 1 to 7 in Book 3 (e.g., climate change, sustainable tourism or responsible extractive industries), titles 4 to 9 in Book 4 (e.g., sustainable forest management, protection of threatened plants and ecosystems, coastal zone management, and sustainable fisheries) will gain a lot if the strategic objectives and recommendations contained in the NBSAP under the corresponding themes can be mainstreamed in some of the Code's articles. Sustainable agriculture, issues around the use of genetically modified organisms, and the precautions to take for ecosystem restoration (e.g., use of native vs exotic species) could be considered for integration in the Code.

3.5 Progress in the implementation of the NBSAP

During the consultation organised to consider the elements of the 6th National Report, participants considered that implementation of the NBSAP was satisfactory. It had only been two years since the adoption of the NBSAP. Some actions were ongoing at the time of the adoption, others had just been initiated or encouraged. The most important achievements in the NBSAP implementation to date are: (i) the expansion of Cambodia's protected area system, particularly with the establishment of corridors and the creation of the new marine national park, which exceeds by far elements of Aichi Biodiversity Target 11; (ii) the progress being made in promoting synergy among the Rio Conventions with the common web portal, and (iii) the successes in protecting and recovering threatened species, most of which are endemic. The pilot testing of payment for ecosystem services (PES) including Reduced Emission from Deforestation and Forest Degradation (REDD+) is bearing successes and promising to bring about opportunities for scaling up and mobilize funds for other conservation activities. There is a need to raise more awareness about the NBSAP among policy-makers but also those who are supposed to be involved in the implementation, beyond MOE and MAFF. Students and the youth in general should be targeted because NBSAP can guide them in the choices they have to make for and in their future. Awareness raising programmes should also reach people in economic sectors that exert a lot of pressure on biodiversity and ecosystem services, and also people in provinces and at the local level. Regional organisations, such as organisations built around the Mekong River or transboundary ecosystems protected areas, should be more informed about useful details in the NBSAP. Cambodia is also pursuing efforts to mobilize financial resources needed for many activities planned in the NBSAP, including through PES and REDD+.

NATIONAL TARGET 15 ON REDUCTION OF PRESSURE ON CORAL REEFS AND ECOSYSTEMS IMPACTED BY CLIMATE CHANGE

Target 15:
By 2020, anthropogenic pressures (pollution, exploitation, sedimentation…) on coral reefs and vulnerable ecosystems impacted by climate change have been significantly reduced.

1. Introduction

1.1 Scope of the subsection

Cambodia is ranked among the most climate-vulnerable countries in the world. Its economy and the livelihoods of its people depend greatly on rainfed agriculture and ecosystems exposed to flood, drought and sea level rise. The report on the "Modelling of Climate Change Impacts on Growth" launched by the Ministry of Economy and Finance (MEF) and the National Council for Sustainable Development (NCSD) in 2018 indicates that, if improved policies and additional investments are not made, climate change could reduce Cambodia's GDP by 2.5% in 2030 and by almost 10% in 2050. Coral reefs are particularly sensitive to global warming and in Cambodia they are exposed to increasing threats from development projects that can be exacerbated by climate change.

This subsection reviews the activities that took place in the period from 2014 to 2018 to address the threats to coral reefs. Other vulnerable ecosystems such as mangroves, were considered in relevant subsections.

1.2 Main findings from the 5th National Report on restoration of ecosystems under a lot of pressure

The Fourth and Fifth National Reports noted 10 species of soft corals and 24 species of hard corals In Cambodia's sea. The fifth National Report also noted that even though coral reefs were under some protection within National Parks, Wildlife Sanctuaries and Community Fisheries established in 1993, they were "in trouble, threatened by an increasing array of impacts from unsustainable and destructive fishing practices; sedimentation and waste dumping; and increasing population and development in coastal areas". The report noted that the Ministry of Agriculture, Forestry and Fisheries was planning to establish a marine fishery management area covering Rong islands and Kampong Smach estuaries for the protection of coral reefs, sea grasses, mangroves and other marine fishery resources. In addition to this plan and the promotion of Community Fisheries for the conservation of coral reefs, the Government included marine species in the sub-decree No.23 (12 August 2009) on aquatic endangered species.

The Fifth National Report considered the following indicators to assess progress toward the achievement of the target on coral reefs: "(i) report of coral reef status and its ecosystems by 2015; (ii) location of coral reef and its vulnerable ecosystem has been determined and updated by 2015; (iii) number of coral reef locations and its vulnerable ecosystems has been protected by 2015; (v) number reduction programs of the anthropogenic activities on coral reef and its vulnerable ecosystems have been implemented; (vi) laws on exploitation, pollutions, ecosystems damaging and vulnerable species have been recorded and established; (vii) number of vulnerable fishers have received education and awareness on coral reef and environmental protection law; (viii) assessment report on public awareness on coral reef protection." The report concluded that by the time the report was finalised, implementation of the plan to reduce to minimum level anthropogenic activities (pollution, exploitation, sedimentation…) impacting coral reefs and vulnerable ecosystems had not started.

2 Overview of progress towards the reduction of anthropogenic pressures on coral reefs vulnerable to climate change

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	The establishment of the Multiple Use Marine Protected Area, known locally as a Marine Fisheries Management Area, around the Koh Rong Archipelago in 2016 and its expansion and designation as Koh Rong Marine National Park constitute important steps in the protection of coral reefs along the country's coastline from anthropogenic pressures (unsustainable fishing practices and overfishing, illegal collection of corals for sale, siltation / sedimentation from development projects, water pollution particularly from solid wastes, and global warming/climate change). Processes leading to the designation of the Marine National Park, was an opportunity to gather a lot of baseline information on the taxonomy, ecology and value of coral reefs, and to confirm the importance of consulting and engaging local communities and other stakeholders. The legal framework has been reaffirmed with the development of the Environment and Natural Resources Code of Cambodia (draft under review for finalization). The Code reminds about the need for a strategic environmental assessment, environmental impact assessment, and polluter-pays principle. In addition, Cambodia Climate Change Strategy and related national communication and Nationally Determined Contribution to UNFCCC contain objectives and guidance on best ways to address the identified threats to coral reefs in Cambodia. There is, however, a need to ensure enforcement of policies and legislation, and to carry out further research to better understand the threats and effectiveness of measures taken. In any case, the measures taken are bearing fruits: (e) Using SMART, patrolling in the MPA has become very efficient and reports indicate a decline in incidences of direct human threats to biodiversity and its contribution to the well-being of Cambodians and the country's economy; (f) Waste treatment is high on the land planning agendas of the islands within the MPA while, with assistance from many non-governmental organisations, islands inhabitants and visitors are being informed on best ways and means to manage all types of wastes; (g) Occurrence of sedimentation as a threat needs to be assessed quantitatively in order to design informed measures to address the threat. Qualitative information has been and continues to be gathered by scientists; (h) Measures taken to reduce pollution are considered in the next sub-section of this report; (i) There is a need to continue documenting the ecological and socioeconomic impact of the establishment of the Marine National Park and related activities. Finalization and implementation of the Park management plan will further strengthen the protection of coral reefs.

3. Measures taken to reduce anthropogenic pressures on coral reefs including climate change

Coral reef coverage along the Cambodian coastline is estimated at 2,700 ha. They consist of approximately 70 coral species. With estimates of live corals low at between 23% and 58%, coral reefs along the

Cambodian coastline are generally considered to be in poor health[429]. Together with the seagrass beds and mangroves, these coral reefs have been for the past decade under increasing pressure from unsustainable fishing practices, sedimentation[430], coastal development and marine-based pollution although coral reefs are somehow protected by the 2006 Law on Fisheries (e.g. Article 52). About ten years ago, ninety percent of the coral reefs were estimated to be under high level of risk due to the increasing overexploitation of the coastal zone[431]. The Strategic Planning Framework for Fisheries set a national target of at least 8.4 km^2 of coral reefs to be under an appropriate form of sustainable management. The National Action Plan for Coral Reef and Seagrass Management in Cambodia 2006–2016 confirmed this target. Establishment of the multiple-use marine protected area, known locally as a Marine Fisheries Management Area (MFMA), around the Koh Rong Archipelago in 2016 was a powerful strategy to address the threats posed to the coral reefs. MFMA was expanded to cover 7 islands (Koh Rong, Koh Rong Samloem, Koh Koun, Koh Touch, Koh Tatiem, Koh Mnoas Krav and Koh Mnoas Knong; a total of 52,448 ha) and declared as Koh Rong Marine National Park in early 2018.

For the design of the MPA as well as the delimitation and demarcation of the conservation zones, ecological and biological data on coral reefs had been collected by Coral Cay Conservation, Marine Conservation Cambodia and Song Saa Foundation. Additional data were collected including on threats to coral reefs such as siltation/sedimentation, unsustainable fishing practices. Using a scoring method followed by a more complex analysis with 'Marxan and Zonation' tool as well as consultations with local stakeholders and communities, conservation areas were identified and prioritized[432].

While marine PA design work was going on, the Fisheries Administration (FiA) and conservation organizations were supporting community fishery patrols with innovative techniques such as the use of drones for habitat monitoring and the introduction of the Spatial Monitoring and Reporting Tool (SMART)[433]. Patrols began their work in 2014 in a rather non-structured way within the community fisheries. Information they collected was very basic and of little use for the protection of the marine area. In 2015, following a request from the government, Fauna and Flora International (FFI) started collecting data using the SMART logbooks and formalized the process after a series of training workshops that introduced SMART in full to the patrols. After the proclamation of the MPA, patrols used SMART on the whole area.

These efforts and the designation of the Marine National Park are bearing fruits:

(a) Reefs begin to grow again in a healthy way. Sea grass is re-growing offering important shelter to crabs and other marine organisms, and seahorses are also starting to make a slow comeback[434];

(b) The patrolling scheme using innovative techniques has significantly curtailed illegal activities, but more rangers are needed.

429 http://eeas.europa.eu/archives/delegations/cambodia/documents/publications/country_env_profile_cam_april_2012_en.pdf

430 Yim R. (2014) Determining the significance of sedimentation on coral reef health around Koh Rong, Cambodia. MSc thesis, Royal University of Phnom Penh, Cambodia.

431 Boon, Pei Ya & , Ya & Mulligan, Berry & Benbow, Sophie & Thorne, Ben & Phalla, Leng & Longhurst, Kate. (2014). Zoning Cambodia's first Marine Fisheries Management Area. Cambodian Journal of Natural History. 2014. 55-65. Also accessible at *https://www.researchgate.net/publication/271473396_Zoning_Cambodia's_fi_rst_Marine_Fisheries_Management_Area*

432 M. Reed, D. Duplain, A. Haïssoune and P. Ferber 2015 Strategic environmental assessment of the proposed marine protected area, Kep Archipelago, Cambodia. Marine Conservation Cambodia; and Benjamin V. THORNE1,2,*, Berry MULLIGAN3 , Ronan MAG AOIDH1 and Kate LONGHURST1 2015. Current status of coral reef health around the Koh Rong Archipelago, Cambodia. Cambodian Journal of Natural History 2015 (1) 98–113

433 *https://www.fauna-flora.org/news/cambodias-first-large-scale-marine-protected-area-declared-for-koh-rong-archipelago*

434 *https://www.marineconservationcambodia.org/aboutus/marine-conservation-cambodia*

(c) Given the fact that the stress placed on corals from temperature increases cannot be managed at site and will likely continue as global warming advances, the recommended focus has been on mitigating the stresses from waste/pollution and siltation.

(d) The strategic environmental assessment[435] carried out for the proposed marine protected area at Kep Archipelago recommended the following:

(i) The development of an integrated management plan for the MPA. IUCN and Mangroves for the Future (MFF), in collaboration with Fauna and Flora International and other conservation partners, are working together to support the Department of Marine and Coastal Conservation to prepare the management plan and zoning scheme for the park. In addition, the Ministry of Environment plans to establish community-protected areas with legally recognised committees within the park to engage local communities in the management and protection process[436];

(ii) Marine monitoring should be carried out to provide insight into the effectiveness of marine management actions, help indicate what ecosystem components require more protection, and determine anthropogenic influences that are continuing to negatively impact the marine environment;

(iii) Implementing a crab bank system around the island in the framework of community fisheries while promoting local knowledge, which will empower communities, enabling them to participate in reef conservation and contribute to reef health;

(iv) Promoting aquaculture to help reduce overfishing and prevent the use of unsustainable fishing practices in face of the increasing demands of a growing tourism industry. Pilot aquaculture projects are yielding positive results and promising more reliable sources of income to fishers and reduced pressures on the marine environment;

(v) Introducing or upgrading existing waste management systems, with awareness raising programmes. The large amounts of domestic wastes on the islands pose a huge threat to the marine environment and human health; and

(vi) Mitigating siltation e.g., through improved management of coastal erosion, increased conservation of stabilizing seagrass meadows, and enforcement against trawlers and other destructive fishing practices. Siltation is a major threat to the recovery and rehabilitation of marine areas. It can smother corals by depriving them of light and nutrients. Blankets of sediments can also encourage the growth and spread of microbial pathogens.

[435] M. Reed, D. Duplain, A. Haïssoune and P. Ferber 2015 Strategic environmental assessment of the proposed marine protected area, Kep Archipelago, Cambodia. Marine Conservation Cambodia

[436] *https://www.iucn.org/news/cambodia/201805/koh-rong-national-marine-park-first-cambodia*

NATIONAL TARGET 16 ON REDUCTION OF POLLUTION PRESSURE ON TERRESTRIAL AND AQUATIC ECOSYSTEMS

Target 16:
By 2020, pollutant pressures on terrestrial and aquatic ecosystems are substantially reduced to levels that are not detrimental to ecosystem function and biodiversity

1. Introduction

1.1 Scope of the subsection

Cambodia is undergoing rapid development and industrial growth. As a result, soils and waters are polluted by chemicals used in agriculture and mining and various types of wastes when they are not properly disposed of; and marine and coastal area are being degraded from land-based activities as well as from ships. However, air quality is still in good condition, although some pollution is taking place from industrial and handicraft processes as well as fossil fuel combustion.

This subsection reviews the major pollutants impacting terrestrial and aquatic ecosystems in Cambodia and describes examples of measures taken between 2014 and 2018 to control them. This consideration has become particularly timely considering the launching of the country's Industrial Development Policy in 2015 in the trajectory towards its vision to become an upper-middle income country by 2030 and a high-income country by 2050. While industrial development is expected to yield high economic growth and alleviate poverty, it may also challenge the availability and quality of the country's natural resources and ecosystem services through various types of air, water and soil pollutions.

1.2 Main findings from the 5th National Report on restoration of ecosystems under a lot of pressure

The Fifth National Report indicated that activities toward the achievement of target 15 ('By 2020, anthropogenic activities (pollution, exploitation, sedimentation…) on coral reefs and vulnerable ecosystems have been reduced to minimum level') had not started in 2015 while measures for reducing pollutant pressures on terrestrial and freshwater ecosystems by 2020 were only partially being implemented (Target 16). For the latter target, the following indicators were considered: "(i) water quality standards such as Total Suspended Solids (physical), Oxygen levels (chemical); (ii) educational programs on water pollutant; (iii) assessment report on changing behavior of people in usage, storage and management of solid waste and waste water; and (iv) pollution monitoring reports and EIA practices.

Regarding the control of pollution and their impacts on ecosystems, the Fifth National Report noted that (i) pollution prevention was one of the Kingdom's commitment to environmental protection; (ii) Cambodia ratified, among other agreements, the International Convention for the Prevention of Pollution from Ships (MARPOL); (iii) adopted the Natural Resource and Environmental Protection Law and Biosafety Law "to prevent any cause and damage to genetic resources, biodiversity and introduction of living modified organisms (LMOs) to pollute environment and impact to human health"; and (iv) MoE was "responsible for environment pollution control with equipping one Lab for water polluted analysis" including analysis of polluting substances such as arsenic that can deteriorate the quality of water or endanger human, animal and plant health in water, on land or in the sub-soil. Reference was made to existing laws that regulate pollutants.

2. Overview of progress towards the achievement of Cambodia Biodiversity Target 16 on reduction of pollutant pressures on terrestrial and aquatic ecosystems

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Cambodia compiled all the relevant regulations and sub-decrees in the Environment and Natural Resources Code of Cambodia. Altogether, the relevant articles in the Code constitute a detailed guideline on how to address different types of pollutants that can impact natural resources. Many actions have been carried out in various parts of the country and for different types of pollutants. They provide a rich set of experiences, some of which have been organised as guidelines and in the form of materials for awareness raising activities and capacity building, already in use in the country and elsewhere. Success stories (e.g., the use of biodigesters) have been replicated within provinces and in other provinces. Research institutions are also participating in addressing gaps in knowledge and providing insights on the way pollutants are produced and how they can be avoided or controlled. While significant efforts are devoted to the reduction of pollutant pressures, Cambodia initiated a programme on the 3R (Reduce, Re-use, Recycle) particularly in the context of the context of the Industrial Development Policy and in line with some of the country's key strategies and plans e.g. the Green Growth Roadmap and the *National* Environment *Strategy* and Action Plan, 2016–2023

3. Measures taken to reduce pollutant pressures on terrestrial and aquatic ecosystems

3.1 Pollutants harmful to humans and/or environment

The rapid economic growth of Cambodia is yielding significant poverty reduction in the country and generating a lot of human well-being. However, development activities are also generating undesirable environmental consequences, including air pollution, water pollution, noise pollution and solid wastes[437]. Pollutants are hazardous substances or hazardous products and their derivatives. Some of them such as the persistent organic pollutants are totally banned by the Stockholm Convention, to which Cambodia is a Party; others, whether solid, liquid or gas, are prohibited unless authorized in accordance with national legislation or the provisions of the Environment and Natural Resources Code of Cambodia (draft under review for finalisation). In addition, in 2015, MoE created the General Directorate of Environmental Protection consisting of 7 departments (Department of Administration, Planning and Fincance; Department of Sound and Air Quality Management; Department of Water Quality Management; Department of Solid Waste Management; Department of Hazardous Substances Management; Department of Environmental Impact Assessment; and Department of Inspection and Law Enforcement)

[437] MOE and pollution (https://opendevelopmentcambodia.net/topics/pollution-and-waste/)

and one laboratory to control any harm to the environment in Cambodia In this report, the focus is mainly on solid and liquid pollutants, on land and in waters; in other words, pollution from domestic sources, agroecosystems, livestock, aquaculture, soil erosion and sedimentation, and the main industries present in the country.

Cambodia's industrial sector has experienced significant growth in recent decades. Since 1993, the sector's share of gross domestic product (GDP) increased from approximately 12.5% to 32.8% in 2017 (Figure 47[438]). The industrial sector also represents an increasing share of employment in Cambodia. In March 2015, Cambodia's Council of Ministers adopted Cambodia's Industrial Development Policy (IDP) 2015–2025 to transform and modernise Cambodia's industrial structure from a labour-intensive industry to a skill-driven industry by 2025. Most manufacturing plants in Phnom Penh are located along the embankment of the Tonle Sap River and only a limited number of them have the capacity to treat industrial effluents before discharging in the environment. In a recent survey of pollution hot spots, the United Nations Industrial Development Organization estimated that only 7% of surveyed industrial and manufacturing facilities had installed wastewater treatment facilities[439].

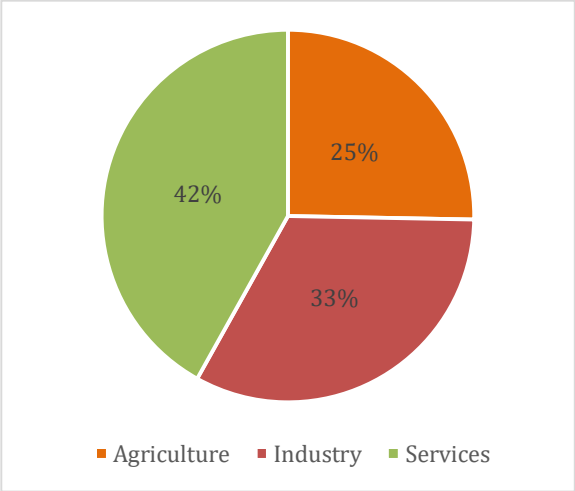


Figure 47: GDP composition by sector (2017 estimates)

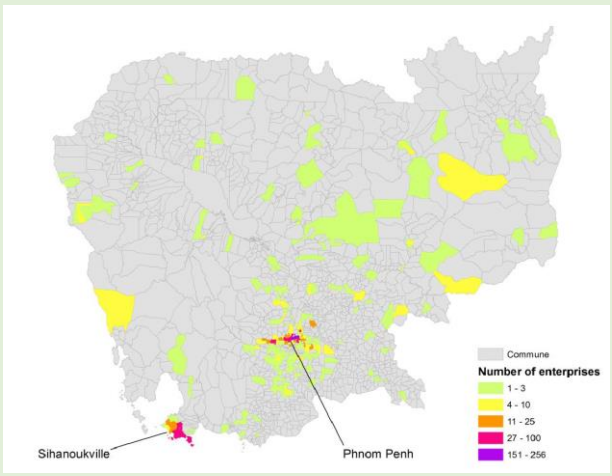
In 2016, GMS Core Environment Program[440] completed its assessment of the industrial pollution in the Kingdom of Cambodia. Figure 48 has a map displaying the sites of enterprises per communes in Cambodia. Approximately 75.9% of enterprises (based on enterprises listed in the Program database[441]) are located in three provinces: Phnom Penh, Kandal, and Kampong Speu. Phnom Penh alone accounts for 61.2% of enterprises in the dataset and for the largest share of enterprises for most industrial sectors, followed by the provinces of Kandal (for wearing apparel, spinning, weaving, and finishing textiles, and printing and publishing), Kampong Speu (for footwear), Kampong Cham (for malt liquors and malt), and Kampong Thom (for food products).

[438] **Source**: *https://www.indexmundi.com/cambodia/gdp_composition_by_sector.html*

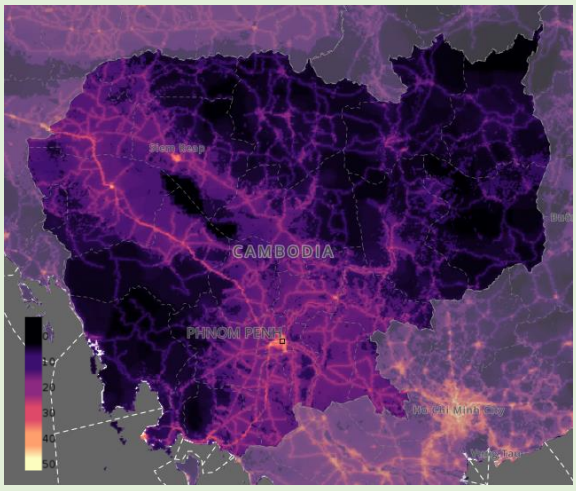
[439] Government of Cambodia and UNIDO, 2012 cited in GMS Core Environment Program 2016. Estimating Industrial Pollution in the Kingdom of Cambodia. Final Report accessible at *http://www.gms-eoc.org/uploads/resources/453/attachment/Estimating%20Industrial%20Pollution%20in%20the%20Kingdom%20of%20Cambodia%20Report.pdf*

[440] Facilitated by the Asian Development Bank, the Greater Mekong Sub-region Core Environment Program seeks to create a region where economic growth and environmental protection are approached in parallel, and in a way that benefits all who live there. The six countries of the Subregion – Cambodia, People's Republic of China, Lao PDR, Myanmar, Thailand and Viet Nam – commit to work towards this ambitious goal through the mainstreaming of environmental and biodiversity protection. *http://www.gms-eoc.org/the-program*

[441] It is important to note that a large number of enterprises in Cambodia operate in the informal sector. They were not included in the study.



Number of enterprises in the communes.
(**Source**: GMS Core Environment Program, 2016)



Terrestrial human footprint in 2009.
(**Source**: UN Biodiversity Lab. Accessed on 22 Feb 2019)

Figure 48: Number of enterprises per commune and human footprint

If the presence of large numbers of enterprises (in Phnom Penh and Sihanoukville areas) can be correlated to human footprint in Cambodia[442], there are certainly other factors such as tourism that explain high footprint in Siem Reap.

The GMS Core Environment Program compared the more than 50 types of industries for their emission of air pollutants[443], emission of water pollutants[444] and toxic discharges in waters. The following were generally the most important polluters: (i) cement, lime and plaster industries; (ii) spinning, weaving and finishing textiles industries; (iii) synthetic resins, plastic materials, and manmade fibers; (iv) iron and steel (v) sporting and athletic goods (vi) and drugs and medicines (vii) motorcycles and bicycles (viii) jewelry (ix) malt liquors and malt (x) sugar factories and refineries. The cement, lime and plaster industries (32 % of total emissions), the spinning, weaving and finishing textiles industries (27 %) and the synthetic resins, plastic materials, and manmade fibers industries (13 %) are the largest emitters of air pollutants in Cambodia. Together, these three categories of industries account for only 16.5% of enterprises (i.e. 289 out of 1,744 establishments in the dataset) and 10.6% of employment (i.e. 86,674 employees) in the dataset. As for the conventional water pollution, the iron and steel industries alone (consisting of only 40 enterprises in the dataset i.e. 2.3% of all enterprises) produced 68.8% of water pollutants. Factories manufacturing sporting and athletic goods as well as drug/medicine industries contribute together 13 % of water pollutants. The spinning, weaving and finishing textiles industries, followed by industries for synthetic resins, plastic materials and manmade fibers release most of the toxic matters found in waters.

Mining in Cambodia is still at an exploration phase. There are currently in early 2019 about 139 exploration projects, of which 20 were confirmed positive[445]. There are also a large number of artisanal miners running small operations recovering gold and gemstones, often on a seasonal or part-time basis. There have been

[442] Cambodia has a relatively small ecological footprint of 1.21 global hectares per capita (gha/person), but it has a biocapacity deficit of – 0.11 gha/person (https://en.wikipedia.org/wiki/List_of_countries_by_ecological_footprint)
[443] Essentially sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), volatile organic compounds (VOC), total suspended particulates (TSP), and particulate matter of size less than 10 microns (PM10)
[444] Measured as biological oxygen demand (BOD) and total suspended solids (TSS)
[445] http://sesprofessionals.com/overview-of-cambodias-mining-industry/

concerns about the mercury and cyanide contamination of ponds, water streams and paddy fields close to artisanal gold mines. Both mercury and cyanide are health hazards[446].

The GMS Core Environment Program study showed that (i) a large percentage of industrial pollution is generated by a limited number of types of industries and by a limited number of industrial facilities within those types; (ii) a large proportion of industrial pollution originates from a very limited number of provinces (Figure 49). These observations suggest that significant reductions in the discharges of industrial pollution in Cambodia could be achieved by concentrating resources on a relatively small number of industrial facilities and areas. In this context, the Government is putting a lot of effort in managing all types of wastes and pollutants produced in Phnom Penh.

A Waste Management Strategy for Phnom Penh 2018-2035[447] has been developed with technical assistance from Cambodia's Waste Management Division of Phnom Penh Capital Hall (PPCH) and IGES Centre Collaborating with *UNEP* on Environmental Technologies (*CCET*). The strategy is based on a holistic waste management approach, taking into account all types of wastes (solid and liquid wastes, wastewaters, and gaseous emissions) but with some focus on solid wastes. An assessment of the wastes in Phnom Penh had been carried out prior to that to inform the development of the Waste Management Strategy. The study provided a picture that reflects fairly well the waste situation in the whole country, with some useful recommendations on needed actions.

Degradation of the waters in the Mekong Basin is a responsibility of and a matter of concern for all the riparian countries. The basin serves for a variety of water-related activities—watershed management, agriculture, fisheries, navigation and transport, hydropower development, tourism and recreation, which support the livelihood of more than 60 million people living in the basin. Water quality is becoming dramatically degraded from upstream to downstream in many parts of the basin and evidence indicates that the diversity and productivity of freshwater species and ecosystems is also adversely affected[448]. This is of serious concern to all riparian countries since their livelihood depend mainly on the environment health and ecosystem services provided by the Mekong River and its tributaries. In Cambodia, some concerns have been raised regarding the degradation of water quality in Tonle Sap lake and the 3S river system (Sesan, Sekong, Sraepork) and the lake is considered as one of Mekong Basin's pollution hotspots.

[446] Mercury is a neurotoxin and also bio---accumulates in fish which is an important part of the diet in Cambodia. Cyanide is a potent fast---acting toxin but degrades with sunlight exposure and through natural processes within a relatively short period of time. However, cyanide spillage in waterways can cause sudden fish kills and pose harm to water supplies (Saleem"H."Ali 2010. Developing Cambodia's Mining Sector: An Environmental Perspective. Accessible at *https://www.researchgate.net/publication/265031373_Developing_Cambodia's_Mining_Sector_An_Environmental_Perspective*).

[447] Singh, Rajeev & Dickella, Premakumara & Yagasa, Ran & ONOGAWA, Kazunobu. (2018). State of Waste Management in Phnom Penh, Cambodia. 10.13140/RG.2.2.35708.03208. Accessible at https://www.researchgate.net/publication/329771406_Phnom_Penh_Waste_management_strategy_and_action_plan_2018-2035_web

[448] Chea R, Grenouillet G, Lek S. Evidence of water quality degradation in lower Mekong Basin revealed by self-organizing map. PLoS One. 2016;11(1):e0145527. doi: 10.1371/journal.pone.0145527 *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4701190/*

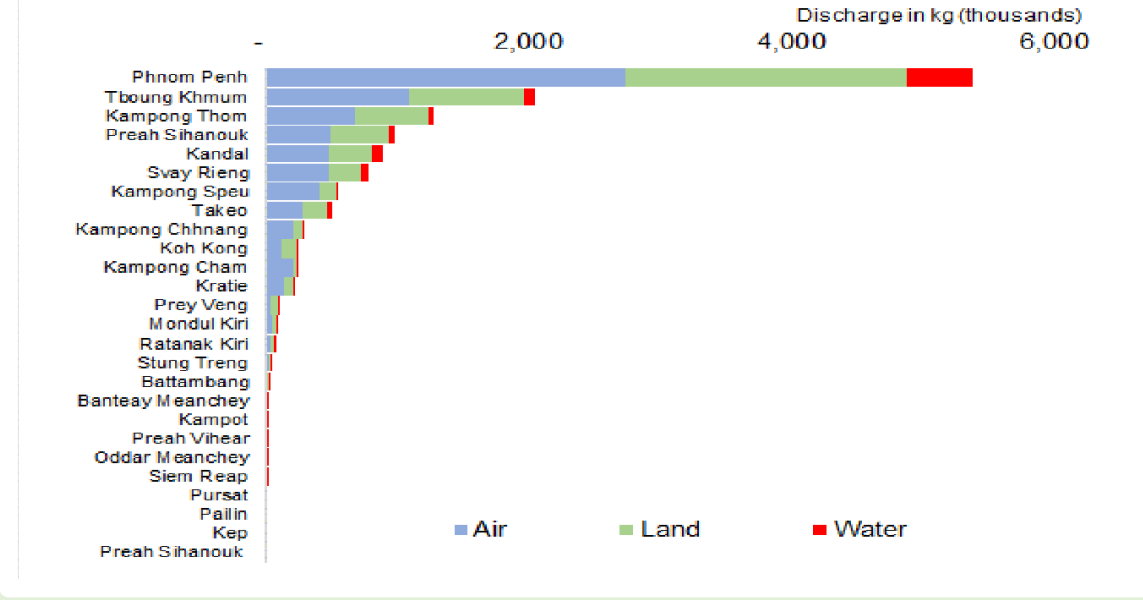


Figure 49: Provincial Shares of Industrial Toxic Pollutants

Source: GMS Environment Operations Center accessed at *https://development.asia/summary/helping-countries-manage-growing-industrial-pollution-problems* on 30 December 2018

3.2 Measures taken to avoid the use and production of pollutants

Policies and legislation

The Environment and Natural Resources Code of Cambodia is the legal framework for the management of the environment and natural resources. Its purpose is "to enable the sustainable development of the Kingdom of Cambodia, by protecting the environment and conserving, managing, and restoring natural and cultural resources". The Code has integrated laws and sub-decrees of relevance to pollutants[449]. Prevention of negative impacts to the environment[450] is one of the principles constituting the foundation of the Code.

The Code contains a wide range of provisions prohibiting all types of pollutions and covering every aspect of the types of pollutions from terrestrial, marine and other aquatic sources impacting natural resources with recommendations such as for the development of (i) environmental quality standards and effluent standards, including standards for sustainable production and consumption; (ii) national strategic waste management plan focusing on reducing, reusing, and recycling waste; and (iii) procedures for the restoration of contaminated sites, for the treatment and reuse of wastewater, while specifying the types of punishable offences, in line with the polluters-pay principle[451]. The Code also calls for the use of the best

[449] For example, Law on Environment Protection and Natural Resource Management, 1996; Sub-Decree on Management of Solid Waste, Water Pollution Control, and EIA Process, 1999; Sub-Decree on Control of Air Pollution and Noise Disturbance, 2000

[450] The Prevention Principle, that negative impacts to the environment should be stopped before they occur. In applying this principle, action should be taken at an early stage to reduce or prevent environmental damage rather than wait for potentially irreversible effects to occur. The Prevention Principle is based on the idea that it is better and often more cost effective to prevent harm than employ measures to restore the environment after harm has occurred (Article 15 in Book 1, Title 1).

[451] All natural persons, private legal entities, and public legal entities who cause harm to the environment and society shall bear the cost for repairing the harm and for measures to prevent,

available technologies to avoid pollution, awareness raising and research programmes, and application of environmental impact assessment and strategic environmental assessment.

Avoidance of environmental problems through the application of strategic environmental assessment has been emphasized in many forums including training workshops held during the reporting period regarding ecosystem protection. This is also fully in line with the three guiding principles for *Cambodia* National Environment Strategy and Action Plan (NESAP) 2016-2023[452]. These principles are: (i) greater efficiency in resource use and more effective efforts to prevent environmental degradation, rather than relying on costly "restorative" measures; (ii) the right balance among command-and-control environmental management instruments, such as polluter- and user-pay schemes, green investment incentives, and environmentally friendly certification initiatives, to "internalize" costs and actions; (iii) participatory implementation and broad-based ownership through NESAP programs and projects that are aligned with development priorities, built upon the collective knowledge and experience of stakeholders, and socially and culturally sensitive. It is important to note that one of the two large investments identified under the Greater Mekong Subregion Core Environment Program's Strategic Framework and Action Plan 2018–2022 to directly support the NESAP's implementation aims to improve the quality of the rural environment, focusing on pollution control and waste management. The other one will support integrated and sustainable land use management[453].

Cambodia developed additional guidance for addressing pollution at the national and also sub-national levels. Some examples at the national level include the Rectangular Strategy for Growth, Employment, Equity, and Efficiency, the National Strategic Development Plan, the National Strategy Plan on Green Growth 2013-2030, the Cambodia Climate Change Strategic Plan 2014-2023 (CCCSP), the 2016 , the NAP 2017-202xx , the NBSAP, the Waste Management Strategy and Action Plan of Cambodia (Under development as of March 2018) and the Sub - Decree on Urban Solid Waste Management, No. 113 (2015). The sub-national policy framework includes for example the Phnom Penh Land Use Basic Master Plan 2035, and Phnom Penh Green City Strategic Plan 2017-2026.

3.3 Examples of specific measures taken on the ground

Organic waste management and production of organic fertilizer

Cambodia's National Biodigester Programme is a success story that illustrates the ways and means used by Cambodia to address pollutions/wastes while contributing to sustainable development. Coordinated by the Ministry of Agriculture, Forestry and Fisheries (MAFF), the Programme developed a biodigester market in 2006 and has since been providing micro-loans to families interested in installing the biodigester. Owing to its success in terms of being a reliable, cheap and sustainable energy source; and providing relief from indoor smoke by replacing stoves that burn wood or biomass, as well as organic fertiliser for increased crop production, the Programme was operating in 14 provinces in 2017[454]. Figure 50 shows the positive trend in the installation of biodigesters in the country.

avoid, and mitigate the harm to the environment and society (Article 8 in Book 1 Title 1)

[452] NESAP 2016-2023 (accessible at *https://www.greatermekong.org/sites/default/files/cambodia-environment-strategy-action-plan.pdf*) is considered as Cambodia's roadmap for achieving many of its Sustainable Development Goals.

[453] *https://www.greatermekong.org/sites/default/files/cambodia-environment-strategy-action-plan.pdf*

[454] *https://www.scidev.net/asia-pacific/innovation/news/cambodian-biodigester-finds-success-attracts-investors.html*

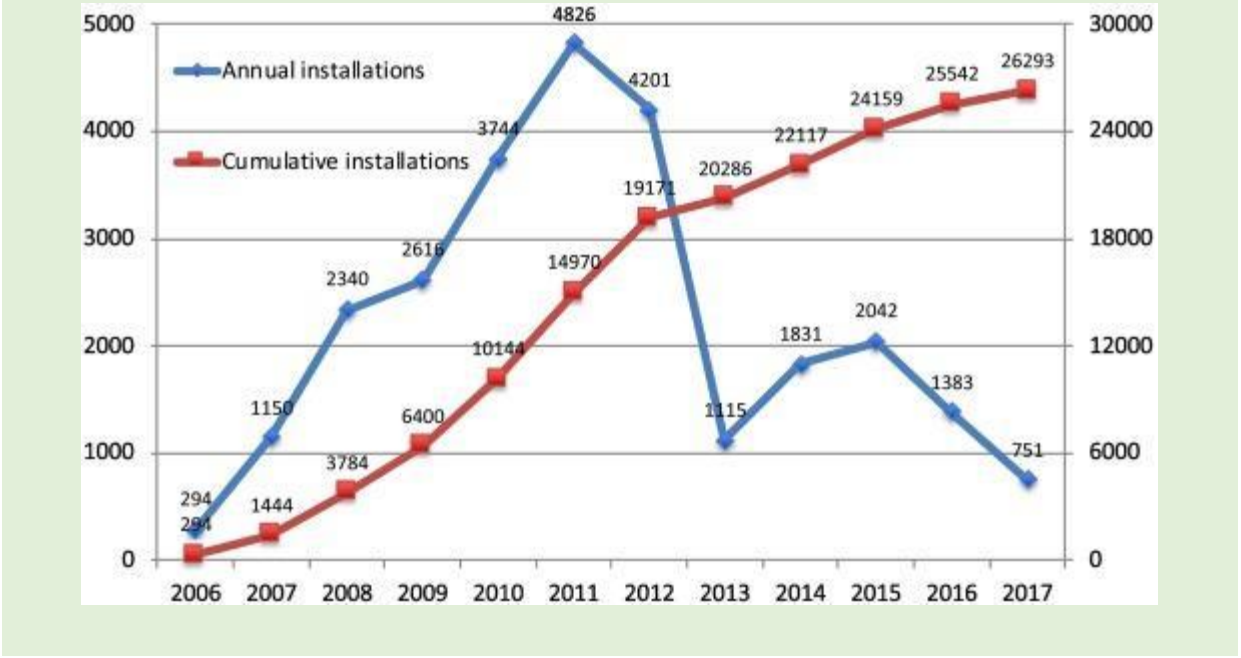


Figure 50: Annual and cumulative biodigester installations from 2006 to August 2017
Source: NBP, 2017 cited at *https://www.sciencedirect.com/science/article/pii/S0973082618302588*
Note: Numbers of total installations are not exactly same as from NBP 2016 website (*http://nbp.org.kh/Result.aspx*), although very close.

In its first 6-year phase, the Program[455] installed almost 20,000 biodigesters with a peak in 2011. It established an in-country network of local financiers, construction companies, skilled masons, bio-slurry specialists and after-sale-service technicians accessible to rural users in 14 of 24 provinces. After 2011, the Program's adoption rates stalled despite increasing government support and high rates of user satisfaction who considered the development of rural household biogas systems as an important strategy to promote agricultural structural adjustment because it was simultaneously reducing greenhouse gas emissions, increasing rural incomes, improving sanitation, enhancing ecology in rural areas, optimizing rural energy consumption structure, and improving the quality of both rural life and agricultural products[456].

An assessment[457] of the Cambodian National Biodigester Program in 2018 identified multiple changes in the Program, including deteriorating supply side services (access to construction agents, masons, repair services) and reduced access to credit for farmers. However, the study concluded that the future of the biodigester program was still bright because the installed biodigesters continue to perform according to expectation and to be maintained and valued by their users. That is in line with MAFF projections as presented in Table 13. For the Program's phase III, which runs from 2017 to 2025, NBP benefits through

[455] *https://www.sciencedirect.com/science/article/pii/S0973082618302588* Hyman, J. and R. Bailis 2018. Assessment of the Cambodian National Biodigester Program. Energy for Sustainable Development 46: 11-22
[456] Shikun Cheng, Zifu Li, Heinz-Peter Mang, Elisabeth-Maria Huba, Ruiling Gao, Xuemei Wang 2014. Development and application of prefabricated biogas digesters in developing countries. Renewable and Sustainable Energy Reviews 34 (2014) 387–400388)
(*https://www.researchgate.net/publication/290106103_Biogas_Production_developing_country_biogas_production_Developing_Countries_biogas_production_developing_countries*
[457] *https://www.sciencedirect.com/science/article/pii/S0973082618302588*

the "Policy on Biodigester Development in Cambodia 2016–2025" from a government-supported National Advisory Committee established to ensure increased support and expansion of the NBP (MAFF, 2016) and from complete integration into MAFF's regular programme of work.

Table 13: Recent and projected National Biodigester Programme indicators from 2016 to 2025

Indicators	2016	2020	2025
Cumulative household biodigesters installed (up to 100 kg dung daily)	25,000	33,000	43,000
Cumulative medium-scale biodigesters constructed (1500–12,000 kg dung daily)	100	200	500
Cumulative slaughter house and other large- scale biodigesters (over 12,000 kg dung daily)	6	30	60
Cumulative GHGs reductions (in thousand tons of CO_2 equivalent)[a]	470	951	1689
Cumulative firewood consumption reduced (thousand tons)	276	489	818
Natural fertilizer produced from effluent (thousand tons)	207	367	613

Source: MAFF, 2016 cited by J. Hyman and R. Bailis, 2018[458]

Table 13 includes also some benefits from the use of the biodigesters in terms of (i) reduction in amounts of firewood used for cooking and resulting reduced deforestation; (ii) organic fertilizer produced and resulting reduction in the use of inorganic fertilizers prone to being washed away into the aquatic systems and causing eutrophication.

Figure 51 shows the increase in the use of biodigesters and a decrease in the use of wood to produce energy for domestic use. A list of additional reported benefits is presented in Box 13

[458] Source: J. Hyman and R. Bailis. 2018. Assessment of the Cambodian National Biodigester Program. Energy for Sustainable Development. Volume 46: 11-22

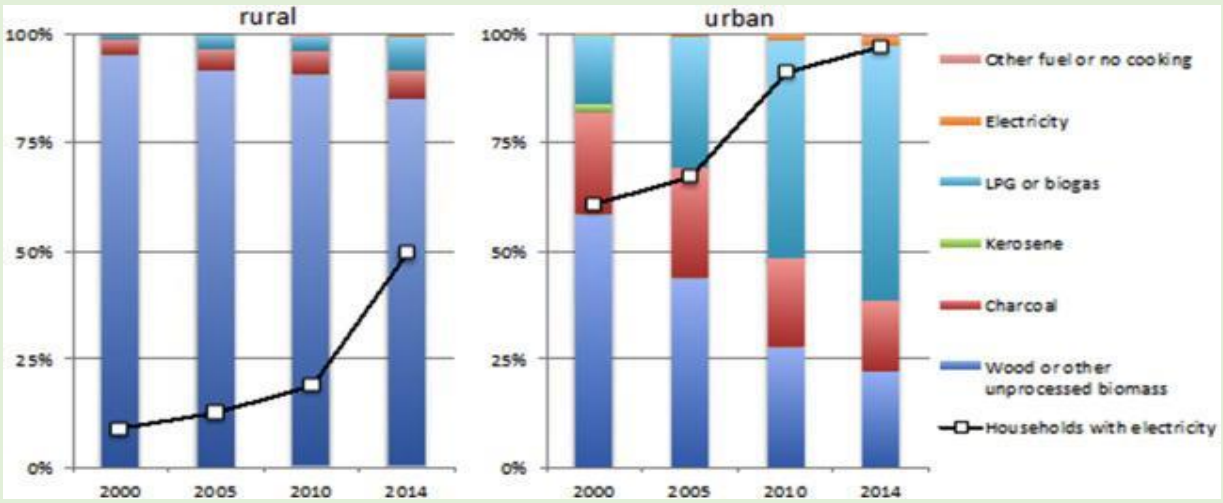


Figure 51: Primary household cooking fuel and electricity access nationwide

Source: J. Hyman and R. Bailis. 2018. Assessment of the Cambodian National Biodigester Program. Energy for Sustainable Development. Volume 46: 11-22 *https://www.sciencedirect.com/science/article/pii/S0973082618302588*

Waste disposal and treatment systems

Waste in Cambodia can be categorized into the following main types[459]: (i) municipal solid waste: household, urban parks/gardens, construction & demolition, and street dusts; (ii) hazardous wastes: e-wastes (electric and electronic equipment), medical wastes, and others; and (iii) Industrial wastes.

Cambodian citizens dispose of waste in a number of ways: (i) burning (66 %), (ii) burying near or behind houses (11 %), disposal in rice fields, along public roads and in open spaces (9 %), (iii) disposal in water (5 %), and (iv) other ways (9 %)[460], after separating solid waste at source on a voluntarily basis into recyclable and tradable; or after dividing sellable waste from waste bins and at disposal sites (waste pickers); or in bulk.

Government institutions/local authorities:

(a) dump the wastes in landfills: There are approximately 60 dumpsites operating across Cambodia, but the majority are of poor quality with limited technical design;

(b) recycle wastes besides landfills, e.g., through composting as is the case in major cities and provinces;

(c) Incinerate, particularly in the case of medical/hospital wastes.

[459] PPCA, IGES, Nexus, UN Environment, CCCA. (2018). Phnom Penh Waste Management Strategy and Action Plan 2018-2035. Phnom Penh, Cambodia.

[460] *https://www.pic.org.kh/images/2015Research/20160429_Waste%20Management%20Challenges%20in%20Cambodia_EN.pdf*

Box 13: Impact of the National Biodigester Program and benefits from using domestic biodigesters

Livelihood and health improvement:

- 25.000 biodigesters constructed from March 2006 to August 2016 / 122.500 direct beneficiaries
- 90% of constructed biodigesters still operational; i.e. 21,760 smoke-free kitchens (February 2016)
- Biogas kitchen air pollution reduced with 88% (Particulate Matter 2.5)
- 29,5 averted deaths and 1,442 averted Disability Adjusted Life Years (ADALYs) realized from 2006 to 2014 with projection of 51 averted deaths and 2,519 ADALYs up to 2020
- 2,886 biodigester connected toilets
- 120 USD saving in expenditures on fuelwood and chemical fertilizer per household per year

Employment creation:

- 69 active private enterprises consolidated
- 604 trained masons; of whom 185 active
- 162 trained supervisors

Environmental benefits:

- On average 4,9 t CO_2 reduced per digester per year
- 457,791 t CO_2 reduced between May 2009 and December 2015
- 173,900 tonnes of wood saved

(**Source**: *https://www.goldstandard.org/projects/cambodia-national-biodigester-programme*)

Gas and energy produced at incineration sites or in landfills are collected and used in some cases. Guidelines and related policies can be found in the Environment and Natural Resources Code of Cambodia.

In 2008, the Ministry of Environment (MOE), with assistance from the United Nations Environment Programme (UNEP), drafted a *strategy on the 3Rs (reduce, reuse, recycle)* for sustainable solid waste management in Cambodia. The objective of the strategy was to establish an efficient solid waste management system through increased waste collection service, promote waste separation for recycling, enhance organic waste composting, and improve disposal sites. At the time, the government planned to compost, by 2015, 20% of organic waste from all sectors and by 2020, to increase composting of organic waste from households by 40% and from business centres by 50%. The strategy is also applicable to industries that are producing wastes and other pollutants, such as the textile and garment industries

In view of reducing wastes and avoid producing *plastic bags* because they have negative impacts on the environment and wildlife, the Government issued in 2017 Sub-Decree No. 168 GNKR.BK on the Management of Plastic Bags[461] aiming to reduce wastage and protect the environment as well as the country's landscape. The Sub-Decree also encourages citizens to replace plastic bags with more nature-friendly alternatives.

In 2018, H&M and the United Nations Development Programme (UNDP) co-organized a kick-off meeting to identify sustainable waste management solutions for the *garment sector*[462]. Representatives of the Government and the garment industry as well as waste and energy management experts.

Optimisation of fertilizer use

Soil fertility in Cambodia is generally low. Due to increased food demand locally and for export, many farmers in Cambodia integrated the use of inorganic fertilizers and pesticides in their farming systems and

[461] *http://zico.group/blog/legal-alert-cambodia-new-sub-decree-on-management-of-plastic-bags/*

[462] *http://www.kh.undp.org/content/cambodia/en/home/presscenter/pressreleases/2018/innovating-solid-waste-management-in-cambodias-garment-industry.html*

many moved from traditional mixed cropping systems, often relying on long fallow periods to let the soil recover its fertility, to monoculture. The use of agrochemicals helped increase crop yields and that encouraged those who could afford it to use more than the quantities of chemicals needed. Past studies conducted in Cambodia and many other countries showed that excessive use of agrochemicals has negative impacts on soils (e.g., acidification), waters (e.g., nitrate contamination and eutrophication), air (pollution from pesticides) and the crops (pesticide residues, arsenic contents).

There are currently many studies in Cambodian universities and research centers on optimization of fertilizer uses. At the University of Battambang for example, scientists published in 2016 that foliar fertilization of rice was an efficient way to enhance rice growth and production, as compared to the common application of fertilizers to Cambodian soils that are low in available nitrogen (N), phosphorus (P) and potassium (K), and have low organic matter content and low cation-exchange capacity[463]. Other studies at that university indicated that a better management of agrochemicals, particularly efficiency in using the right doses for rice, could significantly enhance the profitability of rice farming in northwest Cambodia[464]. At the Royal University of Agriculture, there have been studies comparing and combining the uses of manure, biodigester sludges and organic nitrogen on rice and other crops. A 2017 report by the International Atomic Energy Agency[465] indicated that Cambodian Researchers were using isotopic techniques to measure fertilizer and water uptake by rice and other crops and make recommendations that would help farmers increase yields and revenues.

Handling of pesticides

Cases have been reported in Cambodia where pesticide residues have exceeded the maximum (allowable) residue limits (MRLs), raising food safety concerns and jeopardizing exports potential[466]. Integrated Pest Management (IPM) has been put forward has a way to reduce the amount of pesticides used in Cambodia. The efficacy of Integrated Pest Management (IPM) has been successfully demonstrated, but its dissemination and sustained adoption among farmers have not met similar success[467]. Various studies concluded that there was a need to better inform the potential users beyond the simple extension methods for IPM[468].

The National Forum on 'Regulation, Trade and Use of Biocontrol Agents (BCA) in Cambodian Agriculture' held in April 2015 in Battambang was an opportunity to exchange success stories on the use of biological

[463] Srean, Pao & Soun, Saory & Yong, Tylong & Montague, Ann. (2016). Effects of Foliar and Soil Applied Fertilizers on Cambodian Rice. The International Journal of Science and Technoledge. 4. 32 - 38.

[464] E.g., SREAN, P., B. EANG, R. RIEN and R. J. MARTIN 2018. Paddy rice farming practices and profitability in northwest Cambodia. Asian Journal of Agricultural and Environmental Safety 1: 1–5

[465] Miklos Gaspar 2017. Cambodian Researchers Use Isotopic Technique to Help Farmers Increase Yields and Revenues. Accessible at *https://www.iaea.org/newscenter/news/cambodian-researchers-use-isotopic-technique-to-help-farmers-increase-yields-and-revenues*

[466] E.g., The audit carried out in 2014 concluded that the residue levels in imported foods of plant origin (FPO) exceeded the EU limits and as a result they suspended the export of those products to the EU (ref. EC document accessible at ec.europa.eu/food/fvo/act_getPDF.cfm?PDF_ID=11720); and Jose MANUEL Ramos Sánchez 2015. Effects of pesticides on Cambodia farming and food production: Alternatives to regulatory policies. Chapter 3 *https://www.researchgate.net/publication/298075656_Effects_of_pesticides_on_cambodia_farming_and_food_production_Alternatives_to_regulatory_policies*

[467] Chhay, Kry & Sorn, Vichet & Maat, Harro & Asmara Ratna Hadi, Buyung & Flor, Rica Joy. (2018). Technological trajectory for rice IPM in Cambodia. Sustainability. 10. 10.3390/su10061732

[468] E.g., Chhay, Kry & Sorn, Vichet & Maat, Harro & Asmara Ratna Hadi, Buyung & Flor, Rica Joy. (2018). Technological trajectory for rice IPM in Cambodia. Sustainability. 10. 10.3390/su10061732; and Khun, Kimkhuy. (2014). Does Cambodia need integrated pest management? Past experience, present knowledge and future prospects. Technical report *https://www.researchgate.net/publication/321758661_DOES_CAMBODIA_NEED_INTEGRATED_PEST_MANAGEMENT_PAST_EXPERIENCE_PRESENT_KNOWLEDGE_AND_FUTURE_PROSPECTS*

control and reduce the use of potentially harmful pesticides[469]. The workshop was co-organized by the GIZ ASEAN Sustainable Agrifood Systems project (ASEAN-SAS) in collaboration with the USAID Cambodia HARVEST funded program and the Ministry of Agriculture, Forestry and Fisheries (MAFF). The meeting endorsed the 2014 ASEAN Guidelines on the Regulation, Use, and Trade of Biological Control Agents (BCA) and visited two farmlands where Trichoderma was used to control successfully pathogenic fungi attacking food crops[470].

Some ten years ago, the Feed the Future Integrated Pest Management Innovation Lab identified several potential biological pesticides for protecting crops from fungal pathogens in place of chemical pesticides. Among these *biological pesticides, Trichoderma* was outstanding and could be produced locally to control pests and diseases that affect high-value vegetable crops. A Trichoderma application produced by a local entrepreneur who was working with the lab, led to the first officially registered and locally produced biological control agent in Cambodia. It was in December 2017 that Cambodia launched a registry for companies that wish to import biological control agents (BCA)[471].

In 2016, ASEAN-Sustainable Agrifood Systems organised, in collaboration with the Cambodia Horticulture Advancing Income and Nutrition (CHAIN) project[472], a Training of Trainers course on the use of Biological Control Agents that involved 131 trainers including agricultural extension and NGO staff, key farmers, the Provincial Department of Agriculture (PDA) and Provincial Department of Women Affair (PDoWA)'s representatives in four provinces: Kratie, Stung Treng, Preas Vihear and Oddor Meanchey.

469 *https://www.asean-agrifood.org/chemical-is-out-cambodia-agriculture-pushes-hard-towards-biological-control-agents-for-sustainability/*

470 *http://giz-cambodia.com/rural-development/*

471 *https://iapps2010.me/2017/12/26/cambodia-new-registry-for-biological-control-agents-bcas/*

472 This project was mandated by the Swiss Agency for Development and Cooperation (SDC) and the private sector companies Eco-Agri Center and Angkor Green.

NATIONAL TARGET 17 ON RESPECT AND INTEGRATION OF THE KNOWLEDGE AND PRACTICES OF INDIGENOUS ETHNIC MINORITIES AND LOCAL COMMUNITIES

Target 17:
By 2020, the traditional knowledge, innovations and practices of indigenous ethnic minorities and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are

(a) **respected, subject to national legislation and relevant international obligations, and**

(b) **fully integrated and reflected in the implementation of the Convention and the NBSAP with the full and effective participation of these communities, at all relevant levels.**

1. Introduction

1.1 Scope of the subsection

This subsection describes initiatives and actions taken to ensure that traditional knowledge, innovations and practices of indigenous ethnic minorities and local communities relevant to the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected and integrated in strategies, plans and programmes that deal with the conservation of biodiversity and the sustainable use and management of its components. Although there is no official definition of local community, it is known that more than 60% of Cambodians live in rural area and depend directly on natural resources. Records compiled by the Ministry of Rural Development (MRD) indicate that there are at least 24 indigenous groups in Cambodia (including: Bunong, Kui, Tompourn, Kroeung, Brov, Karvèt, Stieng, Kroal, Mil, Karchak, Por, Khoan, Chorng, Sui, Thmoun, Loun, Soauch, Rodè, Khe,Ro Orng, Spong, Loeun, Charay and Samrè) living in small groups over about 20% of the territory, mostly in the northeast provinces of Mondulkiri, Ratanakkiri, Kratie, Stung Treng, Preah Vihear and Kampong Thom[473]. Decades ago, they have been practicing mainly slash-and-burn agriculture with long fallow periods.

1.2 Main findings from the 5th National Report on indigenous and local knowledge and practices

In the Fifth National Report, Cambodia noted that implementation of national target 17 had not started yet. The following indicators were assessed to reach this conclusion:

- Rights, traditional knowledge and customary usage have been written in national policy on Indigenous People Development.
- Education and strengthening law enforcement both at national and sub- national levels.
- Number of local communities and indigenous people have been involved in planning processes.
- Number of traditional products certified has been recognized.
- The indigenous children have been provided at least primary and secondary education.
- Indigenous people will receive relevant professional training according to their needs and locations.
- Culture of the indigenous people has been better protected and conserved.
- Identification of the different indigenous cultural groups has been conducted.
- The indigenous people have been provided legal rights to own and use their lands.

[473] Ratana Pen, Mane Yun, Try Thy 2017. Contribution of open data to the protection of indigenous people's livelihood, land security and natural resource sustainability. Paper prepared for presentation at the 2017 World Bank Conference on Land and Poverty The World Bank - Washington DC, March 20-24, 2017

2. Overview of progress towards the achievement of Cambodia Biodiversity Target 17 on respect and integration of indigenous and local knowledge

Status of progress	Comments
☐On track to exceed target ☐On track to achieve target ☒Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Local communities and indigenous ethnic minorities have been involved and continue to be involved in several consultations for payment for ecosystem services including REDD, the zoning of protected areas, mapping and valuing ecosystem services. Their perceptions of some of the measures taken to protect biodiversity and ecosystem services are being studies by many university researchers to inform policy and decision-makers. However, there is still a need to document and learn more about indigenous and local knowledge, practices and innovations and to find ways to integrate them into strategies, plans and programmes for natural resources management. Being a member of the Intergovernmental Science-policy Platform for Biodiversity and Ecosystem Services (IPBES), Cambodia gained experience in the best ways for integrating indigenous and local knowledge (ILK) into policy- and decision-making.

3. Measures taken to ensure the respect of indigenous and local knowledge and integration in the conservation and sustainable use of biodiversity and ecosystem services

3.1 Background on indigenous and local knowledge (ILK) and practices

There are many groups of indigenous ethnic minorities in Cambodia making a population estimated at around 200,000 (about 1.2% of the population in the country) that have traditionally managed significant areas of remote evergreen and dry deciduous forests. The indigenous lifestyle is strongly linked to their land use systems and access to forest resources. They practice shifting-cultivation and animal husbandry; harvest rattan, resin, cardamom and honey; and practice weaving for livelihoods. Economic land concessions, land grabbing, mining, construction of hydropower dams, deforestation and illegal logging have severely impacted on their livelihoods. About 60% of the population in Cambodia live in rural areas and depend directly on natural resources for their well-being.

The livelihoods of indigenous groups from south-western and north-eastern provinces are reportedly[474] based on animal husbandry and rotational/shifting cultivation. Apart from rice cultivation, they collect non-timber forest products from the natural forest (i.e. chopping rattan and plucking vine, tapping resin, picking cardamom, searching for quintessence of the Kreusna tree), and weaving, which are the main sources of their families' income. Their customary law and practices have been respected, including taboos on certain animals, trees, secret areas and cemetery sites. They also know how to talk to wind, tree and water spirits to bring blessings of good health and high-yielding crops. Indigenous groups in North-eastern

[474] Seng Sovathana 2004 cited by Phath, M. and S. Sovathana 2012. Country Technical Note on Indigenous Peoples' Issues: Kingdom of Cambodia. IFAD-AIPP https://www.ifad.org/documents/38714170/40224860/cambodia_ctn.pdf/02148186-48e9-4c08-bc09-b3565da70afb (Accessed on 13 February 2019)

Cambodia are revitalizing their management and use of non-timber forest products (NTFP) for sustainable development. They also get technical and financial support from a number of NGOs, such as Non-Timber Forest Products Organisation (NTFP), Indigenous Community Support Organisation (ICSO), Sesan- Sekong-Srepok Protection Network (3SPN), Organisation to Promote Kui Culture (OPKC), Highlander Association (HA), Development and Partnership in Action (DPA), My Village Organisation (MVI), World Wildlife Fund (WWF), and Wildlife Conservation Society (WCS). Some indigenous communities have been successful in forming groups for honey collection, resin harvesting, and Sleng Seed collection in Mondulkiri and Preah Vihear provinces. Good practices of community land-use planning and forest management in Yak Poi Commune, Ratanakiri province have also been noted. It is worth noting that indigenous peoples' livelihoods that are dependent on forest products do not destroy the forest. This is because the land and forest that have been preserved by their ancestors are their lives, and they believe in Neakta, the spirit of old people.

3.2 Measures taken to ensure respect and integration of ILK

There is not yet a comprehensive study on traditional knowledge, innovations and practices of indigenous ethnic minorities and local communities relevant to the conservation and sustainable use of biodiversity, and their customary use of biological resources in Cambodia. However, in line with (i) the Constitution that guarantees the respect for human rights and dignity for all citizens, (ii) the National Policy on the Development of Indigenous Peoples approved in 2009 to promote the livelihoods of indigenous peoples and to improve their quality of life, and (iii) the 2018 Rectangular Strategy Phase IV that promotes inclusive and sustainable development as well as sustainable management of culture, it is generally accepted that the views of indigenous ethnic minorities and local communities about management of natural resources and development projects that are proposed in areas where they live and areas that can affect their livelihoods need to be sought and taken into account.

The Environment and Natural Resources Code of Cambodia, under review for finalisation, contains details on ways to operationalize the respect of indigenous and local knowledge and its integration in plans and implementation of sustainable natural resources management. The following are selected highlights from the Code extracted from Book 1 on General Provisions:

(a) It is recognized that while information needed for environmental policy and natural resource decision-making can be scientific and technical, it "can also be gathered from community and indigenous knowledge"[475];

(b) In line with the Principle of Free, Prior, and Informed Consent, "the Royal Government of Cambodia and all government entities shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project or activity or decision affecting their lands or territories and other resources, particularly in connection with the development, utilization, or exploitation of mineral, water, or other resources"[476]. In the same line, "where indigenous peoples may be impacted by a decision in an environment or natural resource matter, the project proponent or relevant government entity shall provide the opportunity for the full and effective participation of indigenous peoples that may be impacted by such a decision in order to obtain their free and informed consent prior to the decision being made. Such opportunity for participation shall be free of intimidation, manipulation, and coercion. The

[475] Article 19 in Chapter 4 Principles of the Environment and Natural Resources Code, Book 1 Title 1 General provisions
[476] Article 25 in Chapter 4 Principles of the Environment and Natural Resources Code, Book 1 Title 1 General provisions

opportunity to participate shall be provided in a timely manner, and participants shall be fully informed of all relevant information in an appropriate language and format"[477];

(c) Chapter 2 under Title 3 on Public participation, which is about criteria and procedures for participation, recognizes that criteria for selecting participants should include holders of indigenous and local knowledge. The provision regarding 'shared knowledge' in Article 5 is that the proponent or relevant government entity shall develop any project, plan, activity, or decision, including the development of law, policy, and regulation, on the basis of both technical and scientific knowledge, and community and indigenous traditional knowledge;

(d) The Code contains a provision for the establishment of a national environmental mapping centre that would (i) define standards and compile, analyse, and distribute geospatial information essentially on biodiversity, natural resources (e.g., lands, water and forests), the environment (e.g., water, soil and air qualities), development activities (e.g., agriculture, mining, Economic Land Concessions, hydropower, other infrastructures) and communities (e.g., locations of indigenous peoples and local communities tenure); and (ii) function as a clearing house for geospatial data and mapping information held outside of the Cambodian Environmental Mapping Centre by other government entities by maintaining a data catalogue, contact information, and procedures for submitting information requests[478]. Information provided by local communities and indigenous ethnic minorities will have to be treated in accordance with the provisions of the Code;

(e) The Code recommends the consultation and effective participation of local communities and indigenous ethnic minority groups, in accordance with the public participation provisions in Book 1 General Provisions Title 3 Public Participation of this Code, in environmental impact assessments; strategic environmental assessments; REDD+ activities; environmental land use planning; establishment and management of biodiversity conservation corridors and protected areas including the designation of management zones; collaborative management of natural resources; and wildlife protection, conservation, and management. The Code also call for "due recognition of the customary rights to non-commercial traditional use of natural resources and occupancy of local and indigenous communities, and in consideration of the sustainable livelihood requirements of the local and indigenous communities whose livelihoods are linked to and dependent on these areas and their natural resources, so as to maintain and improve their customary rights and livelihoods in a manner consistent with the long term sustainability of the conservation and ecosystem service values of the areas"[479].

Many reports[480] by MoE, MAFF and partners illustrate well the application of the provisions regarding the importance of indigenous and local knowledge, consultations requirements and the effective participation of local communities and indigenous ethnic minorities as outlined in the Environment and Natural Resources Code of Cambodia. As reported in the National Protected Areas Strategic Management Plan

[477] Article 9 on Effective Participation in Book 1 Title 3 on Public Participation

[478] Article 22 Book 1 Title 4 on Access to Environmental Information

[479] Article 2 "Objectives of Biodiversity Conservation Corridors" in Chapter 1 "General Provisions" of Title 2 (Management of Biodiversity Conservation Corridors and Protected Areas)

[480] Indicative examples: Annual Report for Agriculture, Forestry and Fisheries 2016 – 2017 and Direction 2017 – 2018; WWF Annual report ; WCS Annual Report, FFI; A.S.M.G. Kibria et al. / Ecosystem Services 26 (2017) 27–36; *https://theredddesk.org/sites/default/files/8_redd_roadmap_cambodia_v4_0_official_222_5.pdf and in another REDD project http://aippnet.org/wp-content/uploads/2014/10/www.ccmin.aippnet.org_attachments_article_1266_Final_Case%20Study_For%20web.pdf*; and Watkins, K., C. Sovann, L. Brander, B. Neth, P. Chou, V. Spoann, S. Hoy, K. Choeun, and C. Aing. 2016. Mapping and Valuing Ecosystem Services in Mondulkiri: Outcomes and Recommendations for Sustainable and Inclusive Land Use Planning in Cambodia. WWF Cambodia. Phnom Penh.

2017-2031, the Government created the General Directorate for Local Community (GDLC) that will be working with the Ministry of Environment (MoE) to manage and coordinate local development and protected areas, and thus contribute to the protection and conservation of natural resources, biodiversity and ecosystems in protected areas. The GDLC comprises four departments as divisions: (i) Department of Administration, Planning and Finance; (ii) Department of Community Livelihood; (iii) Department of Heritage Sites; and (iv) Department of Eco-Tourism. Many NGOs have been assisting indigenous and local communities with capacity building programmes including training and awareness raising events, to help them master skills and enable them to participate in policy- and decision-making activities related for example to community forestry, community fisheries, community protected areas and payment for ecosystem services.

The inauguration in 2018 of the Museum near the Preah Vihear world heritage site in Preah Vihear province is an additional example of Government action in support of the respect of ILK and indigenous people in Cambodia. The Museum serves as an ethnologic center for studying and researching on cultures, traditions, customs, languages, arts, religious beliefs, and daily lives including traditional medicines of Kuay ethnic minority group and other ethnic minority groups. While promoting cooperation in culture and tourism with neighboring Thailand, Laos and Vietnam, the Museum is also a place where rare flora and fauna are conserved.

NATIONAL TARGET 18 ON CONTROL OF INVASIVE ALIEN SPECIES

Target 18:
By 2020, major invasive alien species (IAS) and their pathways have been identified and prioritized, and prioritized IAS and pathways are controlled.

1. Introduction

1.1 Scope of the subsection

This subsection presents the progress made in listing invasive alien species found in Cambodia and some measures undertaken to control some of the most important ones, including training and raising awareness among the communities

1.2 Main findings from the 5th National Report on

The fifth National Report noted that as of 2014 there had not been any documented cases of detrimental effects of invasive alien species in Cambodia. However, several known aggressive invaders such as *Mimosa* had been reported and many activities in agriculture, forestry, fisheries, horticulture, and rural development involved intentional introduction of alien species that could become invasive. Fish Base listed 13 fish species introduced into the country.

On the basis of the fact that (i) invasive alien species (IAS) and the areas they affected were identified; (ii) laws, policy frameworks and programmes for the control of IAS were developed; and (iii) measures to protect species and habitats, and eradicate IAS after they have established, the fifth National Report concluded that implementation of actions designed for achieving this target 18 were well under way.

2. Overview of progress towards the achievement of Cambodia Biodiversity Target 18 on invasive alien species

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Between 2014 and 2018, databases of invasive alien species (IAS) present in Cambodia were updated. *Mimosa pigra* continued to be a threat but other plants such as *Eichornia crassipes* (water hyacinth) and *Imperata cylindrica* or *Brontispa longissimi,* the coconut beetle, continued spreading. Training workshops were organized with training materials. The main ways through which IAS enter and are spread within Cambodia (trade, transport and travel) as well as the main factors catalyzing their spread and establishment are known. Measures to control and eradicate IAS, and restore ecosystems are being implemented, in addition to the laws and guidelines provided in the Environment and Natural Resources Code of Cambodia. Chances of success are high now that the challenge is still manageable.

3. Overview of recent activities to address invasive alien species

3.1 Invasive alien species

According to the Global Invasive Species Database[481], 34 invasive alien species can be found in Cambodia, among which 19 (such as *Striga asiatica*, *Mimosa pigra*, *Chromolaena odorata* , *Lantana camara* and *Imperata cylindrica*) can be found in agricultural areas[482], 7 in natural and planted forests, 3 in marine areas and 16 in other aquatic areas (including the tilapia (*Oreochromis spp.*) and water hyacinth (*Eichhornia crassipes*)). The Country Environment Profile of Cambodia published by a European Union delegation to Cambodia in 2012 indicated that the most important invasive alien species included Snakehead fish (*Channa argus*), Coconut beetle (*Brontispa longissima*), Rhinoceros beetle (*Oryctes rhinoceros* L.), *Acacia farnesiana* and the Giant mimosa (*Mimosa pigra*). The report emphasized the coconut beetle in particular.

The Training Module[483] submitted in 2015 to CABI under the UNEP/GEF Project "Removing Barriers to Invasive Species Management in Production and Protection of Forests in SE Asia" (FORIS Cambodia UNEP/GEF Project No. 0515) indicates that at least eleven invasive species have been found in the Stung Sen core area, Tonle Sap Biosphere Reserve. Exotic fishes like *Cyprinus carpio*, *Hypophthalmichthys molitrix* and *Labeo rohita* are regularly caught in small quantities in Tonle Sap Lake and in the Mekong River, while some of the exotic plant species such as *Mimosa pigra*, *Eichhornia crassipes*, *Panicum repens* and *Chromolaena odorata* have spread into different ecological zones. The strategic document developed among the outputs of the FORIS Cambodia UNEP/GEF Project contains a table listing invasive alien species that can be found in Cambodia (Table 14).

In the national report submitted to the 13th meeting of the Ramsar Convention Conference of the Parties, Cambodia noted that a national inventory of invasive alien species that currently or potentially impact the ecological character of wetlands had been conducted and that only *Mimosa pigra* and *Eichornia crassipes* and a few other invasive alien species were being controlled through management actions.

3.2 Addressing invasive alien species

To combat the coconut beetle, which was reported as a pest in Cambodia in late 2001, the Department of Agronomy and Agricultural Land Improvement (DAALI) of the Ministry of Agriculture Forestry and Fisheries took phytosanitary measures, pest outbreak intervention with insecticide and extension on control measures to control and reduce the pest's spread. These measures have proved inefficient and uneconomic. The beetle is established and inflicting damages that are affecting Cambodian farmers significantly[484]. Biological control was also envisaged with support from FAO.

It is in 2009 that attention was particularly drawn to *Mimosa pigra*, a thorny plant originally from the Amazon that is believed to have floated down the rivers from Thailand in the 1980s. The plant can survive fire, flood and droughts, conditions that became particularly prevalent between 2011 and 2015 (Figure 52). A 2015 article indicates that *Mimosa pigra* now covers vast floodplain areas (>2100 km^2) in virtual monocultures in the Mekong River Basin, including paddy fields. To combat mimosa, farmers used the following weeding techniques: recurrently pulling out young sprouts, cutting or burning sprouts, cutting stems to the ground immediately prior to commencement of the wet season or as water levels are rising, and digging out entire plants. On average, farmers were reported to spend 11 days per hectare annually clearing mimosa, which represents a major cost to subsistence farmers.

[481] http://issg.org/database/species/search.asp?sts=sss&st=sss&fr=1&x=17&y=15&sn=&rn=Cambodia&hci=-1&ei=-1&lang=EN

[482] E.g., in abandoned agricultural lands inside deciduous forest: This area in O Soam CF is dominated with invasive species, *Imperata cylindrica* (Sbove), that mix with pioneer tree species, such as *Pinus merkusii*, *Irvingia* sp. and *Peltophorum ferrugineum*. (http://www.irdfa.org/wp-content/uploads/2017/11/Technical-Notes-on-forest-restoration-in-community-forests.pdf)

[483] http://www.chm.gdancp-moe.org/publications/training-module.html

[484] http://www.fao.org/docrep/010/ag117e/AG117E06.htm

Table 14: List of invasive alien species that can be found in Cambodia

	Scientific name	Common names
1	*Mimosa pigra*	Giant mimosa / Catclaw mimosa
2	*Mimosa diplotricha*	Giant Sensitive Mimosa
3	*Chromolaena odorata*	Siam Weed
4	*Eichhornia crassipes*	Water hyacinth
5	*Mikania micrantha*	Mile-a-minute weed
6	*Mimosa pudica*	Sensitive Mimosa / Touch-Me-Not
7	*Lantana camara*	Lantana
8	*Jatropha curcas*	Purging Nut
9	*Brachiaria mutica*	Para grass
10	*Cassia alata*	Candlebush / Ringworm cassia
11	*Arundo donax*	Arundo grass
12	*Pennisetum polystachion*	Mission Grass
13	*Ludwigia peruviana*	Peruvian Primrose
14	*Piaracus brachypomus*	Red-bellied Pacu
15	*Oreochromis aureus*	Blue Tilapia
16	*Oreochromis mossambicus*	Mozambique tilapia or Java Tilapia
17	*Tilapia nilotica*	Tilapia
18	*Cirrhinus mrigala*	Mrigal carp
19	*Oreochromis mossambicus*	Red tilapia
20	*Oreochromis niloticus*	Nile Tilapia
21	*Ctenopharyngodon idella*	Grass Carp
22	*Hypophthalmichthys molitrix*	Silver Carp
23	*Catla catla*	Catla
24	*Clarias gariepinus*	African Catfish
25	*Labeo rohita*	Rohu
26	*Anguilla japonica*	Japanese Eel
27	*Procambarus clarkii*	Louisiana crawfish
28	*Brontispa longissima*	Coconut leaf beetle
29	*Apis mellifera*	European Honeybee
30	*Trachemys scripta elegans*	Red-eared Slider
31	*Pomacea gigas*	Apple Snail
32	*Pomacea canaliculata*	Apple Snail
33	*Achatina fulica*	Giant African snail
34	*Rana catesbiana*	North American Bullfrog

2016 List. Source*: http://www.chm.gdancp-moe.org/publications/national-biodiversity-strategy-and-action-plan.html* ("National Invasive Species Strategy and Action Plan-NISSAP" that was agreed in May 2016 (only in Khmer))

Water hyacinth is usually removed by hand. This method, which is widely used, has been shown to reduce the water hyacinth cover effectively if repeated regularly. The non-governmental organization Osmose established in 2009 a cooperative of women that weaves mats, hammocks, bags and other items out of dried water hyacinth collected in the Tonle Sap area[485]. The products are successfully sold in the village, in nearby Siem Reap and in Phnom Penh. As of today, about thirty women mainly head of households from poor families generate significant household revenue from the project. For some of the families, water

[485] *https://www.khmertimeskh.com/news/26219/a-watery-problem-and-solution/*

hyacinth, an abundant and free resource, has now replaced fish, which is an overexploited resource, as their main livelihood.

As stated in the 2015 Training Module, invasive alien species are being introduced in the country at an increasing rate, through trade, travel and transport. They are threatening Cambodia's biodiversity,

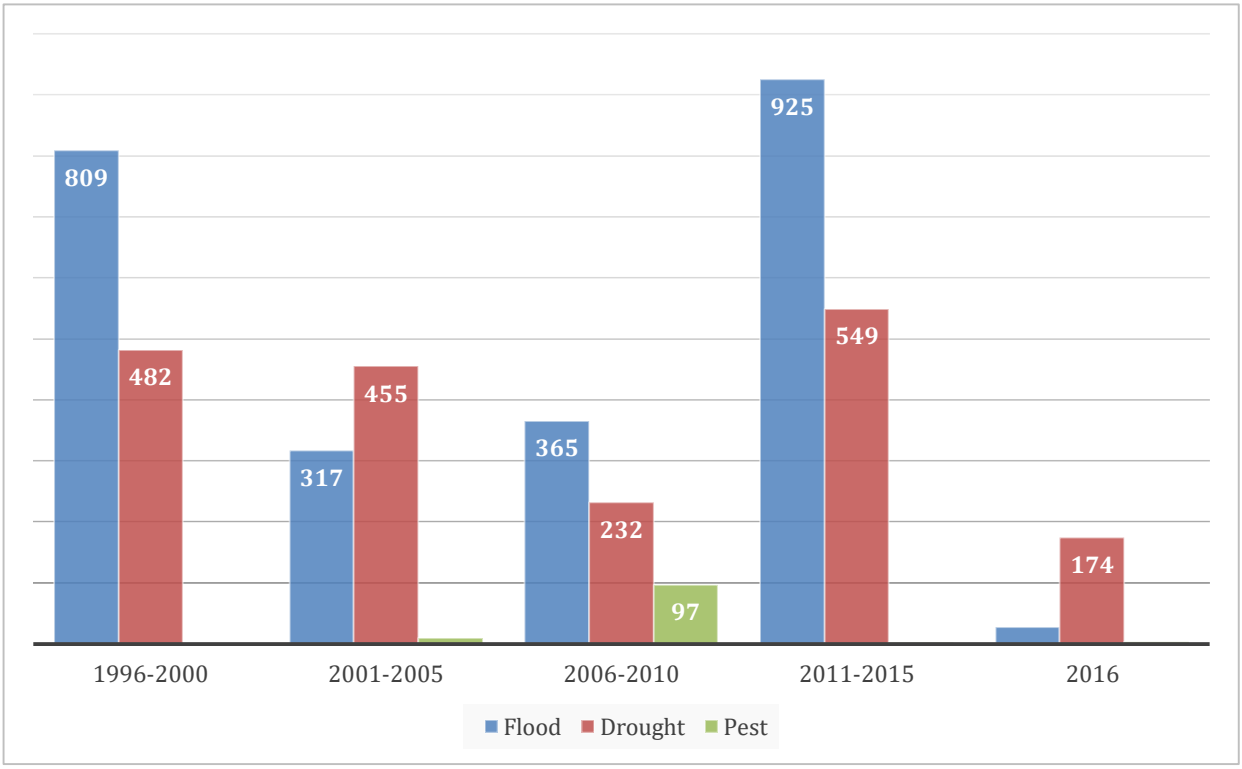


Figure 52: Area affected by flood, drought and pest between 1996 and 2016

Source: MAFF, 2016 cited as Figure 8.6 by Li, X. and K.H.M. Siddique 2018 Future Smart – Rediscovering hidden treasures of neglected and underutilized species for Zero Hunger in Asia. Bangkok. 242 pp.

particularly in agro-ecosystems and aquaculture. Conversion of forest ecosystems to other uses is considered as an important factor contributing to the establishment and spread of invasive alien species. According to the 2018 UNCCD NAP, forest cover in Cambodia decreased by 24.87% between 1965 and 2016. The loss of forest cover resulted in the destruction and degradation of the forest ecosystem endangering many plants and animal species. It also results in the loss of use value of forest resources, and an increase in soil erosion due to rains and winds. A report from the Global Mechanism of the United Nations Convention to Combat Desertification indicates that 6.3 million people were living on degrading agricultural land in 2010 in Cambodia with an annual cost to the country estimated at US$ 677 million equivalent to 8% of the country's Gross Domestic Product. Land degradation facilitates the proliferation of invasive alien species, especially when the impacts of climate change (e.g., drought) are superimposed.

Cambodia, through the Department of Administration for Nature Conservation and Protection (GDANCP), Ministry of Environment, was one of the countries that participated in the 2011-2016 GEF-funded pilot project developed by CABI, UNEP and partners and titled "Managing invasive species in selected forest ecosystems of South East Asia." The overall project goal was to conserve globally important forests, species and genetic diversity in the region, with the initial aim of enhancing the capacity of the four pilot countries

- Cambodia, Indonesia, Philippines and Vietnam - to manage their invasive alien species. Cambodia gained a lot from the project through the following:

(a) Development of the "National Invasive Species Strategy and Action Plan-NISSAP" that was agreed in May 2016. The NISSAP describes (i) the factors leading to the introduction and spread of the invasive species; (ii) the vision and mission; (iii) the legal framework for the control of invasive species, (iv) the strategic management options and action plan for the prevention of their introduction, the control of their spread and their eradication in case they have already invaded; (v) the roles and responsibilities of national and sub-national bodies, the civil society and the private sector; (vi) the possible sources of funding; and (vii) the tools and procedures for monitoring and evaluation. In addition, the plan contains a list of invasive alien species that can be found in Cambodia (Table 14);

(b) Establishment of a subnational steering committee for cross-sectoral invasive species management;

(c) Initiation in 2015 of habitat restoration activities inside the Stung Sen Core Area by the Cambodian Project members in collaboration with the MoE Department of Biodiversity. A total of 1300 seedlings of native tree species (*Barringtonia acutangula*) were planted on about 4 ha of the flooded and degraded forest land inside the Stung Sen Core Area with a purpose of increasing the native biodiversity and minimising the invasion of *Mimosa pigra*. A total of 129 participants from the MoE, the Project, rangers and staff from the Kampong Thom Environmental Department, local communities, local authorities, secondary school teachers and students participated in the event;

(d) Training and public awareness-raising:

(i) National Project Coordinators were given training on the identification and recording of invasive alien plant species present in Cambodia. The training was an opportunity to identify a number of invasive plants at the project sites. In addition, a lecture on "Introduction to Invasive Alien Species in Cambodia" was given to MSc degree students and a booklet was produced in Khmer on the *Mimosa pigra*;

(ii) Members of the FORIS Cambodia Project team participated in a training course on 'Motivating Behavior Change' in 2014;

(iii) The FORIS Cambodia Project team provided successive trainings at private universities in provinces surrounding the Tonle Sap Lake comprising Kampong Chhnang, Pursat, Kampong Thom and Siem Reap in 2016. The 4-province training sessions gathered 389 participants (with 200 females). The purpose of the training was to increase and promote public awareness about various aspects of IAS management with some focus on *Mimosa pigra*, particularly among university students and teachers, and government staff at the provincial level[486];

During the life of the project the estimated number of staffs/participants trained or made aware through national seminars, campaigns and public lectures on the National IAS program were: Cambodia: 878; Indonesia: > 1200; Philippines: 230 (+850 made aware through various symposia/seminars) and Viet Nam: 776.

(iv) Although tertiary institutions were identified in all countries and IAS courses/ modules (in various stages of development) produced, only Cambodia had an IAS course incorporated into the curriculum, as part of the Master's of Science in Biodiversity Conservation at the Royal University of Phnom Penh (RUPP).

(v) In addition, Cambodia had two completed studies on *Mimosa pigra* and one under review (on biological control). In Cambodia, two students successfully completed their theses and

[486] https://www.cabi.org/Uploads/projectsdb/documents/33069/Newsletter%205.pdf

another one who had studied *M. pigra* at the pilot site was being reviewed by the university committee.

(vi) A report on best practices and lessons learned was produced. A national IAS database based on surveys to document the presence and impacts of selected forest IAS had been developed.

(vii) Cambodia had completed its survey and mapping of 19 IAS found along roadsides surrounding the Tonle Sap Lake and in the coastal area.

(viii) A National Communication Strategy (NCS) was developed with the help of the Regional Communication Expert and was implemented. Cambodia's key message on IAS was to "Plant Native Trees to Prevent IAS and Protect Biodiversity." A number of awareness materials on IAS had been produced and distributed to various stakeholders and IAS had been mainstreamed via training, workshops, radio talk shows and spot broadcasting, and guest lectures.

At present, there is no systematic study of invasive alien species found in Cambodia and of the way they were introduced in the country. There is also no study that assesses fully their ecological and socioeconomic impacts in Cambodia so as to provide scientific arguments that will allow some prioritization in the actions to be taken to control them and their impact effectively and efficiently, and to prevent their future introduction. Information on invasive alien species (IAS) is also directly needed under the following targets: 4 (IAS being a threat to fisheries), 6 (IAS exerting pressure on protected areas and other conservation areas), 9 (Payment for ecosystem services can support measures to be put in place to control IAS and prevent their introduction and spread), 10 (IAS being a threat to fauna and flora), 12 (IAS being a threat to natural ecosystems), 15 (IAS being among the anthropogenic pressures on vulnerable ecosystems impacted by climate change) and 19 (IAS data for posting in a user-friendly information system/clearing-house mechanism).

"Management of invasive species, particularly in inland wetlands" is one of the 5 priorities in the implementation of the Ramsar Convention. Target 4 requires that invasive alien species and pathways of introduction and expansion are identified and prioritized; that priority invasive alien species are controlled or eradicated; and that management responses are prepared and implemented to prevent their introduction and establishment.

Most importantly is that "The Environment and Natural Resources Code of Cambodia[487]" (2017 Draft 9.1) calls for (i) the creation and maintenance of a "National List of Invasive Species that either currently occur in the Kingdom of Cambodia or would pose a threat if introduced in the Kingdom of Cambodia." The list would be regularly reviewed by the Biodiversity Technical Working Group of the ministry or institution responsible for sustainable development; and (ii) the development of "an Invasive Species Management Plan to address all invasive species currently known to occur in the Kingdom of Cambodia. The Invasive Species Management Plan shall seek to eradicate and/or minimise the impacts of invasive species on the environment, economy, and human health."

[487] https://data.opendevelopmentmekong.net/dataset/eedccd06-df86-45d2-8e96-72afe074284b/resource/adbd2e13-ffbb-43d9-8b73-00bbe837e8e5/download/enr-code-draft-9.1-in-english-25.07.2017.pdf , in particular article 485 and the whole chapter 8 i.e. articles 507 and 508

NATIONAL TARGET 19 ON ENHANCING THE EFFECTIVENESS OF THE NATIONAL CLEARING HOUSE MECHANISM

Target 19:
By 2020, an interoperable and user-friendly information system containing data and information on biodiversity (including its associated ecosystem services) values, functions, status and trends, and threats, and the consequences of its loss has been established and maintained in the responsible institutions for wide sharing among stakeholders.

1. Introduction

1.1 Scope of the subsection

This subsection describes the process used by Cambodia to achieve an interoperable and user-friendly clearing-house mechanism containing data and information on biodiversity.

Main findings from the 5th National Report on clearing house mechanisms

The 5th National Report noted that a biodiversity database including its values and functions has been partially established and maintained in the responsible institutions for wide sharing among stakeholders. The following indicators were used to reach the conclusion:

(a) National biodiversity information/database system has been established and operated;

(b) Coordination mechanisms have been established for information gathering and sharing among relevant institutions;

(c) Biodiversity status reports have been developed and shared through Clearing House Mechanism (CHM) including threats to biodiversity and ecosystems;

(d) Educational programs, workshops and training activities on use of informational technology for biodiversity management.

2 Overview of progress towards the achievement of Cambodia Biodiversity Target 19 on the effectiveness of the clearing house mechanism

Status of progress	Comments
☐On track to exceed target ☒On track to achieve target ☐Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	Taking advantage of progress made and experience gained in developing a web portal that is common to the Rio conventions, with support from UNDP and GEF, Cambodia will transfer the know how to the national clearing house mechanism. The web portal is made to be user-friendly and be useful to those who are interested in each of the Rio conventions. Data gathered through the web portal as well as messages and data/information from this annual report, will be used to populate the national clearing house. By hosting the common web portal, the CHM will be exchanging and gathering information from the 3 Rio conventions as a starting point toward interoperability

3. Establishment of an interoperable and user-friendly information system

In 2018, Cambodia established a web portal that is common to the Rio Conventions. The portal houses available data and information of relevant to the three conventions. The set of data and information is built around key indicators of relevance to themes that were agreed upon as priorities by the national focal points / representatives of the three conventions. The thematic priorities for this first phase are (i) sustainable land management, also taking into account biosafety and benefit sharing issues, in the framework of the Cartagena Protocol on Biosafety to the Convention on Biological Diversity and the Nagoya Protocol, respectively; (ii) protected area management; (iii) ecosystem restoration; and (iv) human, institutional and financial capacity for the Rio conventions. The portal is having features making it easy to use and attractive to a wide range of users, with linkages to related websites. Cambodia is looking for ways to make the common web portal permanently active including through the appointment of dedicated staff for the web portal. Experience being gained with the common web portal will be transferred to improve the national CBD clearing house mechanism that hosts the biosafety clearing house as well as the ABS clearing house.

Development of the web portal represents two of the outputs of the GEF-funded project on "Generating, Accessing and Using Information and Knowledge Related to the Three Rio Conventions" that the Royal Government of Cambodia conducted from 2015 to 2018 through the General Secretariat of the National Council for Sustainable Development (GSSD) in close partnership with the UNDP Country Office and with various project counterparts. The project has been undertaken to improve (i) access and generation of information related to the three Rio Conventions (the Convention on Biological Diversity - CBD, the United Nations Convention to Combat Desertification - UNCCD and the United Nations Framework Convention on Climate change-UNFCCC); and (ii) the use of information and knowledge related to the Rio Conventions. Several activities were conducted between 2015 and 2017 to lead to these outputs. They included the following:

(a) Conduct an inventory of existing information/information management systems of relevance to the three Rio Conventions in Cambodia;

(b) Assess these information/systems to identify overlaps and gaps in fulfilling the coherent and integrated implementation and reporting needs of the three Rio Conventions, and evaluate the complementarity and synergies of these systems as well as their effectiveness and efficiency in generating and facilitating access and use of information of relevance to the three Rio Conventions in Cambodia;

(c) Assess the strengths and weaknesses of the CBD, UNCCD and UNFCCC clearing-house mechanisms (CHMs) or similar set-ups in fulfilling the needs of the three Rio Conventions as well as the opportunities and constraints that they experience; and

(d) Design an information management system with the desired characteristics, building on the most appropriate systems, and test it.

Some of the results from these activities were published in 2017 by the Department of Biodiversity (DBD) of the GSSD as documents titled: (i) SWOT Analysis Report of Existing Websites Related to the Three Rio Conventions in Cambodia[488]; SWOT Analysis on Effectiveness and Efficiency of Existing Environmental Information Management System (IMS) in Cambodia; (iii) 2017: Report on Organs/Bodies/Agencies That

[488] Pichdaro Pen 2017. SWOT Analysis Report of Existing Websites Related to the Three Rio Conventions in Cambodia. For MoE, Cambodia

Generate Data/Information Concerning the Three Rio Conventions in Cambodia, and SWOT Analysis and Recommendations on The Best Agency for The Project to Follow; and (iv) 2017. Final Draft Report on Inventory of Existing Information/Information Management Systems of Relevance to The Three Rio Conventions in Cambodia[489].

Cambodia is now monitoring the performance of the 'common' web portal and will be adjusting its effectiveness and efficiency as experience is gained. Cambodia is also enhancing awareness about this web portal and its usefulness. In addition, as part of (i) its 5-years capacity development plan to enhance synergy among the 3 Rio conventions and its implementation, and (ii) its strategy to bring in synergy among the 3 Rio conventions in its implementation, Cambodia is putting in place means and ways that will strengthen the effectiveness of the web portal and ensure its wide use.

Data collected for the common web portal as well as data and information gathered for this 6th national report, covering biodiversity values, status and trends, and threats, and the consequences of its loss, will be used to populate the clearing house.

[489] Prepared by HENG Chan Thoeun

NATIONAL TARGET 20 ON ENHANCING *IN-SITU* AND *EX-SITU* CONSERVATION OF PLANT AND ANIMAL GENETIC DIVERSITY

Target 20:
By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals, as well as the genetic diversity of their wild relatives is protected and conserved *in-situ* and *ex-situ*.

1. Introduction

1.1 Scope of the subsection

This subsection presents progress towards the protection and in-situ as well as ex-situ conservation of the genetic diversity of cultivated plants and farmed and domesticated animals, and the genetic diversity of their wild relatives. Plant and animal genetic resources are the basis for food security and an important part of our cultural heritage and national identity. The genetic diversity of these resources and their wild relatives represents the options we and nature have to adapt to environmental changes, including changes in climate, markets, management or husbandry practices, as well as changes in disease prevalence. Current practices tend to focus only on a few cultivars and breeds. There is thus an urgent need to inventory the genetic diversity of useful plants and animals found in Cambodia and conserve the diversity in situ and ex situ.

1.2 Main findings from the 5th National Report on

The 5th National Report noted that in-situ conservation had been addressed by the RGC with technical and financial support from development partners and NGOs. Local communities had been involved. But the work was limited to species and did not include in situ conservation of genetic diversity. Similarly, ex situ conservation described in the report was limited to wildlife management centers and private and government zoological gardens.

The 5th National Report concluded that activities identified in the country's biodiversity strategy and action plan had only been partially implemented between 2010 and 2014. The conclusion was based on the following indicators: (i) plant nurseries and zoos for researching protection, conservation, germination, breeding and local genetic pools established; (ii) laws on Genetic Resources (standard) for internal and external investments developed; (iii) vulnerable fauna and flora species conserved; (iv) local genetic pools established; (v) relevant national legislations and policy frameworks established; (vi) at least 30% of local genetic pools have been preserved in-situ and 5% ex-situ.

2. Overview of progress towards the achievement of Cambodia Biodiversity Target 20 on *in-situ* and *ex-situ* conservation of genetic diversity

Status of progress	Comments
☐On track to exceed target ☐On track to achieve target ☒Progress but at an insufficient rate ☐No significant change ☐Moving away from target ☐Unknown	The extensive protected area system that characterize Cambodia is the best guarantee that plant and animal genetic diversity is well conserved in situ. The designation of Cardamom Genetic Conservation Area is in itself extraordinary. In addition, the "ex-situ" collections of crops and their wild relatives at certain research institutions provide an opportunity for various ecological and genetic analysis and breeding work. Equivalent institutions for animal resources are needed. Through partnership, Cambodia acquired the necessary expertise and technology. The work needs to be upscaled to better cover the wide range of diversity found in the country (beyond rice, banana, elephants and crocodiles)



***Dendrobium intricatum* from Bokor National Park**
(Photo by Chhin, 2019)

3. Overview of recent activities to conserve genetic resources *in-situ* and *ex-situ*

3.1 Context

Rice is the main food crop in Cambodia. The main secondary crops include maize, cassava, sweet potatoes, groundnuts, soybeans, beans and sesame seeds. Commercial crops include rubber, cotton, sugarcane and tobacco. Cambodian's diet comprises a lot of vegetables, many of which are native. The country has also a tradition for ornamental and medicinal plants. Farm and domesticated animals include essentially draft animals, such as water buffalo and oxen used in the preparation of agricultural land, poultry (chicken and duck), pigs and cows. Aquaculture types of fish used in Cambodia include both indigenous and exotic species. Cultured species include *Pangasius* spp. and the giant snake head (*Channa micropeltes*) as well as, to a lesser extent, *Puntius* sp., catfish (*Clarias batrachus*) and Hoven's carp (*Leptobarbus hoeveni*)[490]. Pet animals include dogs, cats, monkeys and a variety of fish.

These resources are under various threats that, in studies conducted in the subregion, FAO[491] classified into the following categories: socioeconomic and market drivers (e.g., preference of few cultivars or breed for commercial purposes at the expense of traditional ones), socio-political instability, poor conservation strategies, lack of appropriate conservation infrastructure and technologies, ecosystem/habitat degradation caused by various anthropogenic factors and climate change as well as natural disasters. The use of exotic germplasm, changes in production systems, changes in producer preference because of socio-economic factors, poor awareness of the economic and biological value or merit of some traditional cultivated plant and farmed animal species, and disasters (drought, disease epidemics, civil strife/war and pollution) have been particularly emphasized in the case of Cambodia as the major causes of genetic erosion. Genetic resources are usually exposed to more than one threats.

The special case of neglected and underutilized species (NUS) is worth noting. They represent a rich portfolio of genetic resources that were once widely grown but have now fallen into disuse for a variety of reasons particularly agronomic, economic and cultural. They show significant potential to enhance food security and healthcare, improve nutrition, diversify income options and recover marginal lands into food production, which strengthen social well-being and economic growth. Interest in their role is now increasing as their value in poverty reduction and sustainable development is more and more recognized. A list of priority NUS for Cambodia was developed and agreed upon at the "FAO Regional Initiative on Zero Hunger Challenge - Regional Expert Consultation on Scoping, Prioritizing and Mapping of Neglected and Underutilized Crop Species in Asia[492]" held in 2016.

Protection of the genetic diversity of cultivated plants and farmed animals, including NUS, as well as the conservation of the genetic diversity of their wild relatives is a contribution to the implementation of the sustainable development goals, in particular the goal of eradicating extreme hunger and poverty, and the goal of ensuring environmental sustainability. Implementation of Cambodia Biodiversity Target 20 represents the set of actions that Cambodia identified to implement Sustainable Development Goal 2.5 "By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and ensure access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed." The following table 1 summarizes the progress made towards the achievement of Cambodia Biodiversity Target 20.

[490] http://www.fao.org/fishery/countrysector/naso_cambodia/en#tcN70085
[491] https://www.researchgate.net/publication/267981910_Threats_to_animal_genetic_resources_-_Their_relevance_importance_and_opportunities_to_decrease_their_impact
[492] http://www.fao.org/fileadmin/templates/rap/files/meetings/2016/161203_Final_report_01.pdf

3.2 Examples of initiatives undertaken to conserve the genetic diversity of plants and animals and their wild relatives

Table 15 presents selected examples of actions taken in line with the achievement of Cambodia Biodiversity Target 20 regarding the protection and conservation of the genetic diversity of cultivated plants

3.3 Particular case of neglected and underutilized species (NUS)

Based on nutritional value, cultural relevance, agricultural importance, and economic value, 16 NUS were selected for 'Future Smart Food[493]' development in Cambodia. They include: Grain crops (wild vigna, mung bean, sorghum and foxy millet), roots and tubers (sweet potato, taro and yam), nuts (cashew and peanut), horticulture (bitter gourd) and others (banana, mango, milk fruit, *Coccinia grandis (*Sleuk Bah*)*, *Acacia pennata*, avocado and papaya). Of these 16 crops, the following six crops have been prioritized as 'Future Smart Food' for testing across the country: (i) pulses – wild vigna (*Vigna umbellata*); (ii) roots and tubers – sweet potato (*Ipomoea batatas*); (iii) roots and tubers – taro (*Colocasia esculenta*); (iv) nuts – peanut (*Arachis hypogaea*); and others (v) Sleuk Bah/ivy gourd (*Coccinia grandis);* and (vi) drumstick (*Moringa oleifera*). Promotional efforts in favor of these NUS require germplasm collection, documentation of collected materials, development of diversified cropping systems that include NUS, improved public awareness of the importance of NUS for nutritional value, health and livelihoods.

Not only Cambodia is a Party to the Convention on Biological Diversity, which calls for the conservation of biological diversity and the sustainable use of its components and the services deriving from them, the country has also signed the International Treaty on Plant Genetic Resources for Food and Agriculture and subscribed to the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for food and Agriculture and the Global Plan of Action for Animal Genetic Resources, which are internationally agreed frameworks for the management of plant and animal genetic resources for food and agriculture and for their utilization without compromising genetic diversity.

Regarding the implementation of the Global Plan of Action for Animal Genetic Resources, Cambodia was among the countries that received support

(a) for building capacity for phenotypic and molecular characterization of locally adapted breeds;

(b) for in-country research on the characterization of breeds or populations of cattle, sheep, goat and guinea fowl through the Technical Cooperation Project "Supporting Sustainable Livestock Production" (TCP/KAM5003) between 2016 and 2018;

(c) for molecular genetic characterization of domesticated animals through a Training Workshop held in Korea in 2017 sponsored and organized by the Asian Food and Agriculture Cooperation Initiative (AFACI));

[493] These foods are called smart because they can bolster dietary diversification, improve micronutrient intake, enhance soil health, require fewer inputs such as chemical fertilizers, and often prove resilient to climate change and adverse farming conditions (*http://www.fao.org/3/I8907EN/i8907en.pdf*)

Table 15: Examples of actions taken in line with the achievement of Cambodia Biodiversity Target 20 regarding the protection and conservation of the genetic diversity of cultivated plants

	Indicator	Examples of actions with focus on most recent actions
1	Lists of (i) plant genetic resources for food and agriculture and genetic varieties of other cultivated plants (e.g. ornamental and medicinal plants); and (ii) animal genetic resources for food and agriculture found in Cambodia	Inventories of cultivated plants can be found on internet (e.g., https://commons.wikimedia.org/wiki/Category:Cultivated_plants_of_Cambodia), in scientific as well as popular literature in Khmer, English or French (e.g., "Medicinal Plants around our Houses" or the series "Cambodia Medicinal Plants" published by the Department of Health, Ministry of Health, or "Flore Photographique du Cambodge; the 2004 Medicinal Plants of Cambodia by Lavit Kham"; Useful Plants of Sandan - A brief guide for visitors to Sandan Community Ecotourism Site Cambodia by Winrock (https://www.winrock.org/wp-content/uploads/2017/10/Plant-Guide-Book-spreading.pdf). CARDI Researchers[494] published lists of wild root and tuber food plants, wild vegetable species used for food, nuts and pulses found in upland areas and wild fruit species. A list of priority neglected and underutilised species for Cambodia was published after a review of a list submitted by a researcher from CARDI at the "FAO Regional Initiative on Zero Hunger Challenge Regional Expert Consultation on Scoping, Prioritizing and Mapping of Neglected and Underutilized Crop Species in Asia[495]" held in 2016
2	Herbarium and collections of seeds or other planting materials of wild relatives of plant genetic resources	The National Herbarium of Cambodia[496] was established in 2011. It is located at the Center for Biodiversity Conservation in the Department of Biology, Faculty of Science at the Royal University of Phnom Penh (RUPP). It currently has approximately 12 500 specimens collected in Cambodia over the last 15 years and some donated by the 'Muséum National d'Histoire Naturelle' of Paris. The specimens kept at the National Herbarium are being databased and will be made available online. The MAFF Annual Report 2016-2017 and a FAO 2018 publication indicate that by the end of 2016 the Cambodian Agriculture Research and Development Institute (CARDI)'s facilities consisting of a gene bank (for cereals, legumes and vegetables), on-field conservation area (for fruit trees and root crops) and an *in-vitro* culture facility (for ornamental plants, bananas and potatoes) maintained a total of 8 261 accessions/samples of 38 crops for research, distribution and future safety (See Table 16 below). Some of these crops (e.g., eggplant, maize, melon, mung bean, rice, sorghum, soybean, sweet potato, taro, tomato and wild vegetables including *sleuk bah* and *saom moav*) have high genetic variation that has long been utilized by local farmers and in various ecosystems.

[494] Chhourn Orn and Kynet Kong. Cambodia, pp. 123 - 135. *In* Li, X. and Siddique, K.H.M. 2018. Future Smart Food - Rediscovering hidden treasures of neglected and underutilized species for Zero Hunger in Asia, Bangkok, 242 pp (*http://www.fao.org/3/I9136EN/i9136en.pdf*)

[495] *http://www.fao.org/fileadmin/templates/rap/files/meetings/2016/161203_Final_report_01.pdf*

[496] *https://herbaria.plants.ox.ac.uk/bol/rupp*

	Indicator	Examples of actions with focus on most recent actions
		CARDI has been collaborating with NARO to continue the collection of germplasm for conservation and analysis, including at the molecular level to assess the diversity. Between 2014 and 2016, the following were collected and maintained at CARDI as well as at the NARO Genetic Center: A total of 42 accessions were collected in 2014[497], including 1 accession of *Glycine max*, 15 accessions of *Vigna minima*, 5 accessions of *V. radiata*, 3 accessions of unidentified Vigna (*Vigna* sp.), 6 accessions of *V. umbellata*, 10 accessions of V. *unguiculata* and 2 accessions of *V. vexillata*. Another total of 124 samples were also collected in 2014[498]: 49 of *Capsicum* spp., 12 of *Solanum* spp., 41 of *Cucumis melo*, 13 of *Cucurbita moschata*, 6 of *Benincasa hispida* and 3 of other Cucurbitaceae. Twenty-eight genetic resources were collected in 2015[499], including 19 sorghum (*Sorghum bicolor* (L.) Moench) accessions, three erianthus (*Erianthus procerus* (Roxb.) Raizada) accessions, three foxtail millet (*Setaria italica* (L.) P. Beauv) accessions, one maize (*Zea mays* L.) accession, one rice (*Oryza sativa* L.) accession, and one sugarcane (*Saccharum officinarum* L.) accession and another collection in 2015[500] gave 87 solanaceous accessions, including 74 chili peppers (28 *Capsicum annuum* L. and 46 *Capsicum frutescens* L.) and 13 eggplants (*Solanum* spp.). One hundred and fourty six accessions/samples were collected in 2016[501] (including *Sorghum bicolor* 11 samples/accessions; *Erianthus procerus*, 3; *Zea mays*, 4; *Coix lacryma-jobi*, 1; *Sesamum indicum*, 1; *Gossypium* spp., 1; *Cucurbita moschata*, 22; *Cucumis melo*, 15; *Citrullus lanatus*, 6; *Luffa cylindrica*, 6; *Benincasa hispida*, 4; *Cucumis sativa*, 3; *Lagenaria siceraria*, 2; Trichosanthes *cucumeroides*, 1; *Solanum melongena*, 13; *Capsicum annuum*, 11; *Lycopersicum esculentum*, 2; *Brassica rapa*, 6; *Brassica juncea*, 4; *Brassica oleracea*, 3; *Vigna unguiculata* 15; *Glycine max*, 1; *Psophocarpus tetragonolobus*, 1; *Canavalia gladiate*, 1; *Hibiscus esculentus*, 4; *Plukenetia volubilis*, 2; *Allium fistulosum*, 1; *Lactuca sativa*, 1; *Eryngium fortidum*, 1. Duplicate germplasms of some crops are maintained, as a safety backup, in better equipped infrastructure abroad e.g. at the International Rice Research Institute (IRRI) (rice germplasm including the best Cambodian rice varieties and rice wild relatives from Cambodia) and at the Genetic Resources Center of the National Agriculture and Food Research Organization in Japan (*Vigna* spp, Sorghum and other crops collected in recent years in Cambodia). In addition, CARDI shares information with the Musa Germplasm Information System of Bioversity International[502] where information of the 120 Musa accessions maintained at CARDI, of which 97 are from Cambodia.

[497] Takahashi Y, Layheng S, Channa T, Makara O, Tomooka N (2015) Exploration of leguminous crops and their wild relatives in western regions of Cambodia, 2014. AREIPGR 31: 121-149.

[498] Matsunaga *et al.* 2015

[499] Matsunaga *et al.* 2015

[500] Tanaka K. et al. 2016

[501] Hisato OKUIZUMI 1), Eri NONAKA 1), Layheng SEANG 2), Chhourn ORN 2), Sophany SAKHAN 2), Makara OUK 2017. Collaborative Exploration and Collection of Plant Genetic Resources in Cambodia in December 2016. AREIPGR Vol. 33: 143-173, 2017

[502] https://www.crop-diversity.org/mgis/accession-search?f%5B0%5D=country_of_origin%3ACambodia. The Musa Germplasm Information System (MGIS) contains key information on Musa germplasm diversity, including passport data, botanical classification, morpho-taxonomic descriptors, molecular studies, plant photographs and GIS information on 4937 accessions managed in 24 collections around the world

	Indicator	Examples of actions with focus on most recent actions
		Cambodia and IRRI celebrated their 30th year of partnership in 2016. As part of the repatriation process after the civil war, IRRI reintroduced 766 traditional Cambodian rice varieties to the country from the International Rice Genebank. By July 2016, 4,895 types of seeds from Cambodia were being held in trust at the Genebank[503]. There exist also commercial producers who maintain collections of seeds and other planting materials. As an example, East-West Seed is a multinational seed company specialized in cucumber, corn, gourd and long bean, became fully operational in 2016. Recently, Cambodia launched an ambitious project on orchids: "Sok An Phnom Kulen Orchid Research and Conservation Centre". Many species have already been planted at the site in greenhouses located in Phnom Kulen National Park, Siem Reap Province. The aims of the Center are: (i) to inventory all the orchids growing naturally in Cambodia and document their functions; (ii) to rescue threatened and endangered orchid species, conserve native species, and re-introduce them into natural habitats when necessary; (iii) to gather and compile information and knowledge of wild orchids in Cambodia; and (iv) to make available entertainment and relaxation areas for national and international tourisms. As of December 2017, the Department of Biodiversity of GSSD developed an orchid's database containing 134 species representing 52 genera.
3	In-situ conservation of the genetic diversity of cultivated plants and farmed and domesticated animals, as well as the genetic diversity of their wild relatives	Activities related to the in-situ conservation of cultivated plant genetic diversity and crop wild relatives as well as activities on on-farm conservation of native landraces diversity are very limited due to lack of facilities, and limited human as well as financial resources. However, Cambodia has a wide protected area system that promotes in-situ conservation. More data need to be collected to assess the effectiveness of protected areas in conserving the genetic diversity of cultivated plants and farmed and domesticated animals, as well as the genetic diversity of their wild relatives. Cardamom Genetic Conservation Area: 506 ha of the Cardamom Mountains were designated on 5 May 2018 as Genetic Conservation Area. This is part of the largest rainforest in mainland Southeast Asia, one of the planet's 34 internationally recognized biodiversity hotspots and a global repository of genetic diversity in plant and animal life.
4	Laws on Genetic Resources (standard)	• 2008 Law on Crop Seed Management and Rights of Plant Breeders • 2008 Law on Protected Areas • Law on Environmental Protection and Management of Natural Resources • Forest Law • Fisheries Law • Rectangular Strategy-Phase IV • National Strategic Development Plan (NSDP) (2014-2018) • 2016 NBSAP • National Adaptation Programme of Action to Climate Change (NAPA) • National Action Program to Combat Land Degradation (2011-2020)

[503] *http://irri.org/country-of-the-month-cambodia and http://books.irri.org/Cambodia_IRRI_brochure.pdf*

	Indicator	Examples of actions with focus on most recent actions
		• Strategic Plan Framework for Livestock Development: 2016 – 2025 • National Aquaculture Development Strategy 2016-2030 • National Environment Strategy and Action Plan 2016-2023 • The National Strategic Plan for Green Growth 2013-2030 • The Agricultural Strategic Development Plan 2014-2018 • The Strategy for Forestry and Fisheries Management • The Policy on Promotion of Paddy Rice Production and Export of Milled Rice • The National Strategy and Action Plan for Biodiversity Management • The Land Degradation Neutrality (LDN) Program • CBD, UNCCD, UNFCCC
5	Collaboration	In addition to the collaborative activities between RUPP and the '', France and between CARDI and NARO, Japan, IRRI has been supporting MAFF in the field of capacity building. Between 1971 and 2016, (i) more than 250 Cambodians have participated in IRRI short courses and training programs and have, in turn, trained farmers in 46 villages, reaching about 13,000 families; (ii) nine Cambodian scholars completed their Ph.D. (6), Master's degree (2) and Bachelor's (1) programmes in partnership with IRRI; (iii) 1 intern and 27 others were trained on the job; (iv) IRRI's post-harvest management projects in Cambodia, supported by the Asian Development Bank (ADB) and the Swiss Agency for Development and Cooperation (SDC) enabled the training of 276 researchers, farmer intermediaries, and manufacturers of agricultural equipment (in 2014); and (v) as of 2015, fourteen IRRI-bred rice lines have been released in Cambodia, among which Sen Pidao, IR66, and Chul'sa are still being widely grown. Since 2011, Cambodia has been participating in the project "Capacity Building and Enhanced Regional Collaboration for the Conservation and Sustainable Use of Plant Genetic Resource in Asia[504]" (GCP/RAS/240/JPN), which is implemented by the FAO Regional Office for the Asia and the Pacific. The project funded by the government of Japan aims (1) to promote the implementation of the twenty priority activity areas of the GPA for the conservation and sustainable utilization of PGRFA; and (2) to contribute to the establishment of a continuing monitoring framework of the GPA implementation at national and regional levels and a mechanism for gathering and sharing information, as well as for priority setting for GPA implementation. The Cambodian Agricultural Research and Development Institute (CARDI) represents Cambodia in the project and maintains a website[505] supported by the project for sharing national information on plant genetic resources for food and agriculture in Cambodia." The information can be accessed through the Internet address: *www.nismcambodia.org*.

[504] *http://www.fao.org/pgrfa-gpa-archive/khm/files/NISM_Final_Report.pdf*
[505] *http://www.fao.org/pgrfa-gpa-archive/khm/khmwelcomeil.html*

Table 16: Crop germplasm maintained in the Cambodian gene bank at Cambodian Agricultural Research and Development Institute (CARDI)

No.	Crop/plant	Scientific name	Accession/sample	Type of conservation
1	Rice (traditional)	*Oryza sativa* L.	3 545	Gene bank
2	Rice (breeding line)	*Oryza sativa* L.	3 143	Gene bank
3	Wild rice	*Oryza rufipogon* Griff.	295	Gene bank
4	Wheat	*Triticum aestivum*	3	Gene bank
5	Maize	*Zea mays* L.	58	Gene bank
6	Sorghum	*Sorghum bicolor*	29	Gene bank
7	Okra	*Abelmoschus ficulneus*	5	Gene bank
8	Sesame	*Sesamum indicum*	13	Gene bank
9	Mung bean	*Vigna radiata*	14	Gene bank
10	Soybean	*Glycine max*	19	Gene bank
11	Peanut	*Arachis hypogaea*	16	Gene bank
12	Wild Vigna	*Vigna radiata*	137	Gene bank
13	Watermelon	*Citrullus lanatus*	43	Gene bank
14	Gourd	*Benincasa hispida*	27	Gene bank
15	Pumpkin	*Cucurbita maxima*	94	Gene bank
16	Cucumber	*Cucumis sativus*	195	Gene bank
17	Sing qua	*Luffa acutangula*	14	Gene bank
18	Seng qua	*Lagenaria siceraria*	3	Gene bank
19	Bitter Gourd	*Momordica charantia*	3	Gene bank
20	Winged bean	*Psophocarpus tetragonolobus*	3	Gene bank
21	Tomato	*Solanum lycopersicum*	37	Gene bank
22	Chili	*Capsicum annuum*	180	Gene bank
23	Eggplant	*Solanum melongena*	49	Gene bank
24	Mango	*Mangifera indica* L.	26	On-field
25	Fruit tree	*Fruit tree*	30	On-field
26	Cassava	*Manihot esculenta*	28	On-field
27	Sweet potato	*Ipomoea batatas*	36	On-field
28	Yam *(Chheam Moan)*	*Oxalis tuberosa*	1	On-field
29	Yam *(Dai Khla)*	*Dioscorea alata*	1	On-field
30	Potato	*Solanum tuberosum*	4	*In vitro*
31	Taro	*Colocasia esculenta*	7	On-field

No.	Crop/plant	Scientific name	Accession/sample	Type of conservation
32	Banana	*Musa spp.*	153	On-field and *in vitro*
33	Sugarcane	*Saccharum officinarum* L.	34	On-field
34	Wild sugarcane *(Treng)*	*Saccharum spontaneum*	3	Gene bank
37	Lotus	*Nelumbo nucifera*	5	Gene bank
38	Ornamental plants	N/A	5	*In vitro*
	Total		**8 258**	

Also note that 214 accessions of rice were registered for long -term storage in Korea[506].
Source : Chhourn Orn and Kynet Kong. Cambodia, pp. 123 - 135. *In* Li, X. and Siddique, K.H.M. 2018. Future Smart Food - Rediscovering hidden treasures of neglected and underutilized species for Zero Hunger in Asia, Bangkok, 242 pp

(d) for the establishment and strengthening of molecular genetic laboratories;

(e) in the form of equipment and supplies required for functional semen-cryopreservation laboratories.

Collaborative activities among MAFF, CARDI, IRRI[507] and other partners will continue to support and promote the success of the "Rectangular Strategy" of the Royal Government of Cambodia. Currently, 14 projects are ongoing in Cambodia that are supported by a range of partners such as the Asian Development Bank (ADB), the IRRI Fund, the Swiss Agency for Development and Cooperation (SDC) and the United States Agency for International Development (USAID). Themes guiding collaboration include for example: selection and breeding of varieties for climate change adaptation and resilience, development of varieties that not only yield well and have good eating quality but are adapted to flooding and drought, and capacity building in various areas relating to the characterization, valuation and conservation of the rich germplasm present in Cambodia.

Cambodia is making good progress towards the achievement of its biodiversity target 20. CARDI/MAFF with the support of both national and foreign partners, and taking advantage of ongoing collaborative projects within the subregion and of the pilot projects undertaken at the global level, is expanding the number of species and accessions of cultivated plants found in Cambodia in its genebank. More effort is needed to conserve accessions of most, if not all, species of cultivated plants and their wild relatives. The inclusion of NUS is particularly commendable because of their potential in contributing to the sustainable development goals and poverty eradication objectives enshrined in the Rectangular Strategy and related strategies and action plans.

According to Ashwell (1997) cited and completed by Chhourn Orn and Kynet Kong of CARDI, Cambodians habitually utilized at least 931 species of Cambodia's 2,304 plant species. Of the 849 species for which life forms are described, 34.8 percent are trees of various sizes, followed by 21.7 percent herbs (including bamboo and bananas) and 15.1 percent shrubs. The remaining 28.4 percent include shrubs, palm trees, lianas and ferns. Habitats are known for 62.7 percent of these species. The main classes are the cultivated plants (23.6 percent), then species coming from primary evergreen (dense) forest (14.3 percent) and secondary formations habitats. Thus, wild plants appear to be at least as important as cultivated plants. In addition, food plants constitute 37.9 percent (353 species)." CARDI's genebank is expanding steadily. However, there is still much to do to include most cultivated plants in the ex situ genebank. The national

[506] CARDI 2017. Achievements in Research and Technology Development (1999-2017). Editors: Ouk Makara, Seng Vang, Sakhan Sophany, and Pol Chanthy. Cambodian Agricultural Research and Development Institute, Phnom Penh, Cambodia.
[507] http://books.irri.org/Cambodia_IRRI_brochure.pdf

herbarium at RUPP is a useful tool for the description and accurate identification of all the plants maintained in the genebank.

Work on farmed and domesticated animals is being encouraged by the support from partners, including the training of Cambodians and acquisition of equipment needed.

Cambodia has one of the largest protected area systems in the world (about 42% of the land in 2018). It is important to study how these protected areas and other conservation areas, including community protected areas, are effectively protecting in situ the genetic diversity of cultivated plants and farmed and domesticated animals and their wild relatives.

SECTION IV

NATIONAL CONTRIBUTION TO THE ACHIEVEMENT OF EACH GLOBAL AICHI BIODIVERSITY TARGET AND RELEVANCE TO SUSTAINABLE DEVELOPMENT GOALS (SDG)

Any action taken to achieve Cambodia's biodiversity targets and the progress we are making within the country contribute to the achievement of the respective Aichi Biodiversity Targets. In the Table below, we highlight some of the contributions we are making beyond the country, in the subregion and at the global level. References to sustainable development goals are essentially based on the 'National Development Plan' as presented in the document titled "Rapid Integrated Assessment – Cambodia SDG Profile Card"[508]

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
1	**Aichi Target 1** By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	**Target 1** **By 2020, every Cambodian is conscious about the environmental, economic, health, social and cultural value of the services derived from ecosystems**, in particular the value of protected area systems as well as the value of terrestrial and aquatic animal and plant resources including animal wildlife, livestock, agricultural, forest, freshwater and marine	Several publications are generated in Cambodia and about Cambodia's unique biodiversity. Some are in popular magazines, others in scientific journals and conference proceedings, in the media and on Cambodia's clearing house mechanism and other websites. The country has in place mechanisms that attract and assist tourists from al over the world to learn about the cultural, biological and socioeconomic value of Cambodia's nature. In this context, supported by the PES schemes, visitors	12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

[508] http://kh.one.un.org/content/dam/unct/cambodia/docs/RIA_Template2%20-%20Country%20SDG%20Profile_07Oct2016.pdf

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
		resources, and the biomass used for energy production, **and integrates this knowledge in the way they deal with these ecosystems and resources.**	can see some of the remaining populations of threatened species. While visiting, they can also learn or be reminded about respect of the environment In participating in pilot projects such as the one s coordinated by UNESCO on integrating biodiversity in school curriculums, Cambodia is making contributions to facilitate integration of biodiversity value.	
2	**Aichi Target 2** By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	**Target 3:** **By 2020, at the latest, biodiversity values have been integrated into national and sub-national development and poverty reduction strategies and planning processes.**		15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts
3	**Aichi Target 3** By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	**Target 9:** **By 2020, Payment for Ecosystem Services (PES) is used throughout the country as an incentive for the conservation and sustainable use of biodiversity.**	Just like Cambodia has been learning from and consulting with neighbouring countries and Costa Rica while building its payment for ecosystem services schemes as incentive for the conservation and sustainable use of biodiversity, Cambodia's experience with PES including REDD+ can be shared.	12.2 By 2030, achieve the sustainable management and efficient use of natural resources.

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
4	**Aichi Target 4** By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	**Target 7:** **By 2020, Government, private sector and other stakeholders have taken steps to reduce the negative impacts on ecosystems and their services caused by unsustainable production and consumption activities.** .	Cambodia has regulations and policies that ensure sustainable production and consumption. Some of these apply and are in harmony with sub-regional regulations guiding impacts in transboundary areas and waters and across borders. Waste management and pollution control for example are critical in the Mekong Basin. Cambodia is vigilant regarding illegal timber production and export. Similarly, Cambodia enforces laws prohibiting import and consumption of illegally produced goods (e.g., illegally traded ivory)	12.1 Implement the 10-year framework of programmes on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries. 12.2 By 2030, achieve the sustainable management and efficient use of natural resources. 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse. 14.7 By 2030, increase the economic benefits to Small Island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism. 15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species. 8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
				sustainable consumption and production, with developed countries taking the lead In addition, ▪ The Cambodia Industrial Development Policy 2015–2025 mentions setting clear standards and guiding principles on environmental protection and production safety for investment projects located in SEZs and other industrial zones ▪ The National Policy on Green Growth encourages small, medium, and large enterprises to pursue sustainable practices related to the production and use of natural resources. ▪ Implementing Strategic Planning Framework for Fisheries 2010-2019 with the aim of boosting fish production to serve domestic consumption and export markets by relying on 3 pillars: (1) freshwater and marine-based natural fisheries, (2) freshwater and marine aquaculture, and (3) facilitating processing and trade. ▪ Ensure: (1) green cover, forest and wildlife conservation; (2) the sustainability of fisheries resources; and (3) the sustainability of the ecosystem;

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
				▪ Reduce deforestation and degradation of forests; ▪ Protection of biodiversity and aquatic-animal habitats
5	**Aichi Target 5** By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	**Target 12:** **By 2020, the rate of loss of natural forests, coral reefs and other natural habitats is at least halved; and habitat degradation and fragmentation, pollution, overharvesting, introduction of invasive alien species and their impacts are significantly reduced.** Also target 5 for forests.	Cambodia's target equivalent to Aichi Target 5 focused on coral reefs (under Cambodia national target 12) and considered this aspect of reducing habitat loss under Cambodia national target 5 for forests. Regarding coral reefs, in implementing the Strategic Planning Framework for Fisheries 2010 – 2019, Cambodia targets to 840 ha of coral reef under some form of sustainable management. Establishment of the Marine National Park (52498 ha) in February 2018 by expanding the Marine Management established in 2016 was the key measures taken with the improvement of the patrols.	14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans. 15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements. In addition, Ensure green cover, forest and wildlife conservation; the sustainability of fisheries resources; and the sustainability of the ecosystem, so that the quality of land and sustainability of water sources could be improved by focusing on the protection of biodiversity, wetlands and coastal areas
6	**Aichi Target 6** By 2020 all fish and invertebrate stocks and aquatic	**Target 4:** **By 2020, freshwater fisheries and aquaculture are managed**	Cambodia's target does not cover every aspect of Aichi Biodiversity Target 6. Plants, invertebrates and marine fisheries	14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
	plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	**sustainably by addressing their constraints, and by reducing and preventing their possible negative impact on fish stocks and on aquatic threatened species and vulnerable ecosystems**	are not included, nor recovery plans for all depleted species Cambodia is investing in aquaculture to make sure that fish demands can continue to be met if sustainable fish culture can allow to maintain capture fisheries within the ecological limits. The success of Cambodia's community fisheries reforms received international attention both regionally, with an ASEAN workshop show-casing the success of the reforms, and globally	fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics Also, Strengthen the management and conservation of fishery resources in a sustainable manner, especially through the suppression of all violations of laws, rules and regulations related to fisheries including tightened control of fishing gears and fishing period, elimination of overfishing, strengthening fishing communities' capacity for the management, use and conservation of fisheries resources
7	**Aichi Target 7** By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	**Target 5:** **By 2020 the majority of areas under agriculture, animal production, aquaculture and forestry are managed sustainably,** ensuring conservation of biodiversity, sustainable development, poverty eradication and improved well-being.	Cambodia has in place regulations, policies and guidelines that promote sustainable aquaculture, agriculture and forest management. Ecosystem approach or the landscape approach used in the Satoyama Initiative gives an opportunity to manage sustainably and simultaneously forestry, agriculture, aquaculture and animal production across a landscape. Aichi Biodiversity Target 7 needs to be stated in a more measurable way to enable an assessment of contribution	15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally. 15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
			from the implementation of our national target.	are essential for sustainable development. 7.2 By 2030, increase substantially the share of renewable energy in the global energy mix (regarding forest and fuelwood) In addition, Manage forest and wildlife resources in a sustainable and equitable manner, in accordance with the "National Forest Program 2010-2029", in particular through better law enforcement and governance, demarcation, classification and registration of forest, effective management and exploitation of state and private forests, implementation of measures for improving the livelihoods of and promoting participation from forest dependent communities, enhancement of management and effectiveness of conservation measures, reduction of deforestation and degradation of forests, intensified tree planting and forest rehabilitation, strengthening the conservation of wildlife and wildlife sanctuaries, development of institutional and human capacity, and promotion of research studies and their dissemination
8	**Aichi Target 8** By 2020, pollution, including	**Target 16:**	Many actions have been carried out in various parts of the country and for	12.4 By 2020, achieve the environmentally sound management

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
	from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	**By 2020, pollutant pressures on terrestrial and aquatic ecosystems are substantially reduced to levels that are not detrimental to ecosystem function and biodiversity.**	different types of pollutants. They provide a rich set of experiences, some of which have been organized as guidelines and in the form of materials for awareness-raising activities and capacity building, already in use in the country and elsewhere. Research institutions are also participating in addressing gaps in knowledge and providing insights on the way pollutants are produced and how they can be avoided or controlled. Cambodia initiated a programme on the 3R (Reduce, Re-use, Recycle), particularly in the context of the Industrial Development Policy and in line with some of the country's key strategies and plans (e.g. the Green Growth Roadmap and the National Environment Strategy and Action Plan, 2016–2023). While Cambodia has been making progress in addressing solid wastes and pollutants, the technology needed to fully address liquid and gaseous pollutants is being acquired.	of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment. 14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution For marine and coastal areas: 14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information
9	**Aichi Target 9** By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	**Target 18:** **By 2020, major invasive alien species (IAS) and their pathways have been identified and prioritized, and prioritized IAS and pathways are controlled.**	Cambodia, through the Department of Administration for Nature Conservation and Protection (GDANCP), Ministry of Environment, was one of the countries that participated in the 2011-2016 GEF-funded pilot project developed by CABI, UNEP and partners and titled "Managing invasive species in selected forest ecosystems of South East Asia." The overall project goal was to conserve globally important forests, species and	15.8 By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
			genetic diversity in the region, with the initial aim of enhancing the capacity of the four pilot countries - Cambodia, Indonesia, Philippines and Vietnam - to manage their invasive alien species. Cambodia gained a lot from the project and is taking measures to address invasive alien species before they become a problem	
10	**Aichi Target 10** By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	**Target 15:** **By 2020, anthropogenic pressures (pollution, exploitation, sedimentation…) on coral reefs and vulnerable ecosystems impacted by climate change have been significantly reduced.**	See national target 12 above (Aichi Biodiversity Target 5)	14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution 14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels
11	**Aichi Target 11** By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	**Target 8:** **In 2020, at the latest, existing protected areas and conservation areas, including community-based natural resource management areas, have management plans and have started effective implementation.** **By 2020,** **(i) the coverage of marine and coastal protected areas and freshwater protected areas has at**	Cambodia's contribution to the world protected area system is noteworthy. In the last 3 years, the country added a bit more than 23% of its territory to the system including corridors that ensure the needed connectivity; wildlife sanctuaries protecting important fauna and flora including endangered species that are found mainly in Cambodia or can breed only in Cambodia; a marine national park; a genetic conservation area to protect some of the rare genetic materials in the world; natural heritage parks and landscapes, and areas that can be used for many purposes.	15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts (in connection with sub-paragraph (iii) of the national target)

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
		least doubled as compared to the 2010 levels; **(ii) Currently unprotected areas of particular importance for biodiversity and ecosystem services that are under a lot of pressures from human activities are identified and integrated in the protected area system; and** **(iii) Protected areas and conservation areas have been valued, are part of a well-connected protected area system and have been integrated in national sustainable development goals and national green growth strategies, plans and programmes;** **By 2029, protected forest covers 3.0 million hectares, in line with the objectives of the National Forest Programme 2010-2029**.	This addition represents less than 0.05% at the global level but its role is significant. Cambodia's protected area system provides sanctuaries to almost 2% of globally threatened species on IUCN Red List, including 34 mammals, 39 birds, and 20 reptiles. For example, the Prek Toal Core Area of the Tonle Sap Biosphere Reserve is an internationally recognized priority site, the habitat for globally important bird colonies. Populations of many of the targeted globally-threatened bird species (e.g., the greater adjutant (*Leptoptilos dubius*), the lesser adjutant (*Leptoptilos javanicus*), or the white-shouldered ibis (*Pseudibi davisoni*)) are increasing in protected areas.	
12	**Aichi Target 12** By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly	**Target 10:** **By 2020, all species of fauna and flora threatened at national level have been identified and their status has been improved significantly as a result of**	Many success stories regarding rescues, care and breeding at some centers (e.g., the Phnom Tamao Wildlife Rescue Center where thousands of rescued animals found sanctuary between 2014 and 2018 and some animals were born or hatched);	15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
	of those most in decline, has been improved and sustained	**applying measures to address their respective threats.**	release in nature, essentially within protected areas; and recovery away from the release sites. The bird and turtle nest protection programmes are producing positive results as well as other programmes linked to ecotourism such as the IBIS Rice. We report on the measures taken to successfully improve the status of many threatened birds, reptiles, mammals, fishes and few invertebrates.	15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products In addition, ▪ Ensure: (1) green cover, forest and wildlife conservation; (2) the sustainability of fisheries resources; and (3) the sustainability of the ecosystem; ▪ Enhance soil fertility management to combat land degradation and desertification; ▪ Reduce deforestation and degradation of forests; ▪ Protection of biodiversity and aquatic-animal habitats
13	**Aichi Target 13** By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	**Target 20:** **By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals, as well as the genetic diversity of their wild relatives is protected and conserved *in-situ* and *ex-situ*.**	The extensive protected area system that characterizes Cambodia is the best guarantee that plant and animal genetic diversity is well conserved in situ. The designation of Cardamom Genetic Conservation Area is in itself extraordinary. In addition, the "*ex-situ*" collections of crops and their wild relatives at certain research institutions (e.g., crop germplasm at the Cambodian Agricultural Research and Development Institute (CARDI)) provide an opportunity for various ecological and genetic analysis and breeding work. Equivalent institutions for animal resources are needed. The	2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and ensure access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
			work needs to be upscaled to better cover the wide range of diversity found in the country. By maintaining a germplasm of crops and their wild relatives, Cambodia is participating in the global effort to maintain genetic diversity for food security.	
14	**Aichi Target 14** By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	**Target 6:** **By 2020, 10 % of those protected areas, conservation areas, agro-ecosystems and forest ecosystems including mangroves that have been under a lot of pressures in recent years are in an advanced state of restoration and are providing enhanced services, particularly to local communities' and indigenous ethnic minorities' women, old persons and children.**	In Cambodia, it was estimated in 2011 that approximately 2,600,000 hectares of forest land required restoration. In 2010, up to 55% of the total rural population inhabit degraded agricultural land. Cambodia is completing many projects that provide basic information on best ways and means to carry out restoration projects. Projects like the GEF-funded project "Collaborative Management for Watershed and Ecosystem Service Protection and Rehabilitation in the Cardamom Mountains, Upper Prek Thnot River Basin" started in 2017 will be good contributions to the Aichi Biodiversity Targets 14 and 15.	15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally. In addition, Manage forest and wildlife resources in a sustainable and equitable manner, in accordance with the "National Forest Program 2010-2029", in particular through better law enforcement and governance, demarcation, classification and registration of forest, effective management and exploitation of state and private forests, implementation of measures for improving the livelihoods of and promoting participation from forest-dependent communities, enhancement of management and effectiveness of

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
				conservation measures, reduction of deforestation and degradation of forests, intensified tree planting and forest rehabilitation, strengthening the conservation of wildlife and wildlife sanctuaries, development of institutional and human capacity, and promotion of research studies and their dissemination
15	**Aichi Target 15** By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	**Target 11:** **By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks have been enhanced, through conservation and restoration of degraded ecosystems, focusing in particular on degraded forests, protected areas and conservation areas, thereby contributing to climate change mitigation and adaptation and to combating desertification.**	Cambodia's protected area system covers large portions of forests and areas rich in aboveground biomass carbon and soil carbon. Those areas are also rich in biodiversity and expected to be resilient to changes. Studies on carbon stocks are being done through the REDD+ programme.	14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans. 15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world. In addition, Enhance soil fertility management to combat land degradation and desertification
16	**Aichi Target 16** By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and	**Target 13:** **By 2015, Cambodia has designated a national focal point and one or more competent national authorities for the Nagoya Protocol on**	Cambodia ratified the Protocol in time and put in place the recommended structure. Cambodia is now developing its legislation. Cambodia has a lot of biological / genetic resources that could be used for the benefit of all on the	15.6 Ensure fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
	operational, consistent with national legislation.	**Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS), and established a functional ABS Clearing-House as part of the clearing-house mechanism;** **By 2020, Cambodia has developed and is enforcing a legislation and national policies on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization.**	Planet. Finalization of the legislation is expected to encourage and guide access to the resources and yield benefits for the country	
17	**Aichi Target 17** By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	Target 14: By 2015, the National Biodiversity Strategy and Action Plan (NBSAP) have been updated and adopted, and have commenced to be implemented effectively. This is an overall target for the updated strategy	Cambodia adopted its NBSAP in February of 2016 following the requirements for Aichi Target 17. This National Report reports gives an idea of progress made in the NBSAP implementation.	
18	**Aichi Target 18** By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national	**Target 17:** **By 2020, the traditional knowledge, innovations and practices of indigenous ethnic minorities and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are**	Participation of local communities and indigenous peoples in any processes dealing with natural resources is a constitutional right and required through legislation (The Environment and Natural Resources Code of Cambodia). Cambodia and partners organise many training workshops to inform local communities and indigenous peoples, capacity building workshop to empower them, and	

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
	legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	(c) **respected, subject to national legislation and relevant international obligations, and** (d) **fully integrated and reflected in the implementation of the Convention and the NBSAP with the full and effective participation of these communities, at all relevant levels**.	consultations to learn from them and benefit from their know-how, innovations and practices. Cambodia's progress on this target needs to be accelerated. While the mechanisms and framework are in place, there is still quite a lot to do e.g., to adequately document traditional knowledge, know-how and practices with the consent of the local communities and indigenous peoples. Cambodia will benefit from others' experiences. However, Cambodia established many community fisheries, community forests and community protected areas that are generally performing well in terms of protection, conservation and sustainable management of natural resources.	
19	**Aichi Target 19** By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied	**Target 19:** **By 2020, an interoperable and user-friendly information system containing data and information on biodiversity (including its associated ecosystem services) values, functions, status and trends, and threats, and the consequences of its loss has been established and maintained in the responsible institutions for wide sharing among stakeholders.**	Cambodia's target 19 focuses more on the storage of information/data relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, accessibility and sharing and dissemination. As a starting point, Cambodia developed a web portal that is common to the Rio Conventions with focus in the initial phase on sustainable land management, protected area management and ecosystem restoration. In addition, Cambodia developed a 5-year capacity building plan to support every aspect of the synergy among the Rio conventions including the operation and functions of the common web portal/clearing house mechanism.	

	Aichi Biodiversity Target	Cambodia Biodiversity Target	National contribution to global target	Relevant SDGs
			Enhancing synergy among the Rio conventions will yield more benefits e.g., in term s of efficiency in resource use, in line with elements of Aichi Target 20. Cambodia will share its experience.	
20	**Aichi Target 20** By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.	**Target 2:** **By 2020, at the latest, the national budget allocation for biodiversity conservation and sustainable use (including NBSAP implementation) has increased by 20 percent through the development and implementation of a resource mobilization strategy** based on identified needs and taking into account international and national guidance and policies.	Cambodia increased the budget of Ministries dealing directly with biodiversity. That will enable the Ministries to increase their implementation of the NBSAP, engage more people in that work and enhance effectiveness and efficiency	

SECTION V
CAMBODIA'S BIODIVERSITY PROFILE

I. STATUS, TRENDS AND FUTURE DYNAMICS OF BIODIVERSITY, AND ITS BENEFITS TO PEOPLE

1 Generalities[509]

The status and trends of biodiversity in Cambodia reflects the country's geography, history and awareness of the value of this natural asset. In the country, biodiversity is considered at the ecosystem, species and genetic levels, and includes plants animals and microorganisms although there is a large discrepancy in the availability of data for each component.

With a total land area of 181,035 km^2, a 443-kilometer coastline along the Gulf of Thailand and a population estimated at over 16 million in 2018 and growing at an average annual rate of 1.46 percent - among the highest in Southeast Asia, Cambodia consists of low-lying plains in the central part of the country surrounded by mountainous and highland regions in the northern, eastern and western parts. The largest area of the country falls within the Mekong River Basin crossed by the Mekong River and its tributaries such as the Tonle Sap River that joins the Tonie Sap Lake.

Cambodia, which is dominated by monsoon climate, can be divided into four ecological regions:

(a) the Annamite Range moist forests, which is home to 134 species[510] of both endemic and near-endemic mammals, 525 bird species and several species of reptiles. More than 50% of these dense forests have been cleared for timber and firewood;

(b) the Cardamom Mountains moist forests considered as one of the most species-rich ecoregions of Cambodia. This ecoregion composed of evergreen forest plant species is home to over 100 mammals with elephants being the most important mammals in the area, 450 species of birds and several reptiles. The ecoregion is generally protected and intact, but cases of illegal logging are being reported;

(c) the Central Indochina dry forests in the arid plains of Cambodia. The ecoregion consisting of sparse woodland communities dominated by deciduous trees has 167 species of mammals with the majority being threatened megaherbivores and over 500 species of birds. The ecoregion is threatened essentially by land clearing for settlement; and

(d) the Mekong freshwater ecoregion, characterized by a high diversity of habitats including deciduous forests, grasslands, wetlands, and riparian environments. It hosts an exceptionally high species diversity with at least 212 mammal species, 240 reptile species, 536 bird species, 850 freshwater fish species, 435 marine fish species and more than 2,000 plant species, many of which have not yet been taxonomized. Hydroelectric dams constructed along the river, sand mining and over-fishing impact the ecoregion negatively.

[509] Texts were taken from various documents developed by Cambodia such as document GEF project ID 9781 "Integrated Natural Resource Management (INRM) in the productive, natural and forested landscape of Northern Region of Cambodia".
[510] All the figures are from World Atlas accessed on 7 Nov. 2018 at https://www.worldatlas.com/articles/ecological-regions-of-cambodia.html

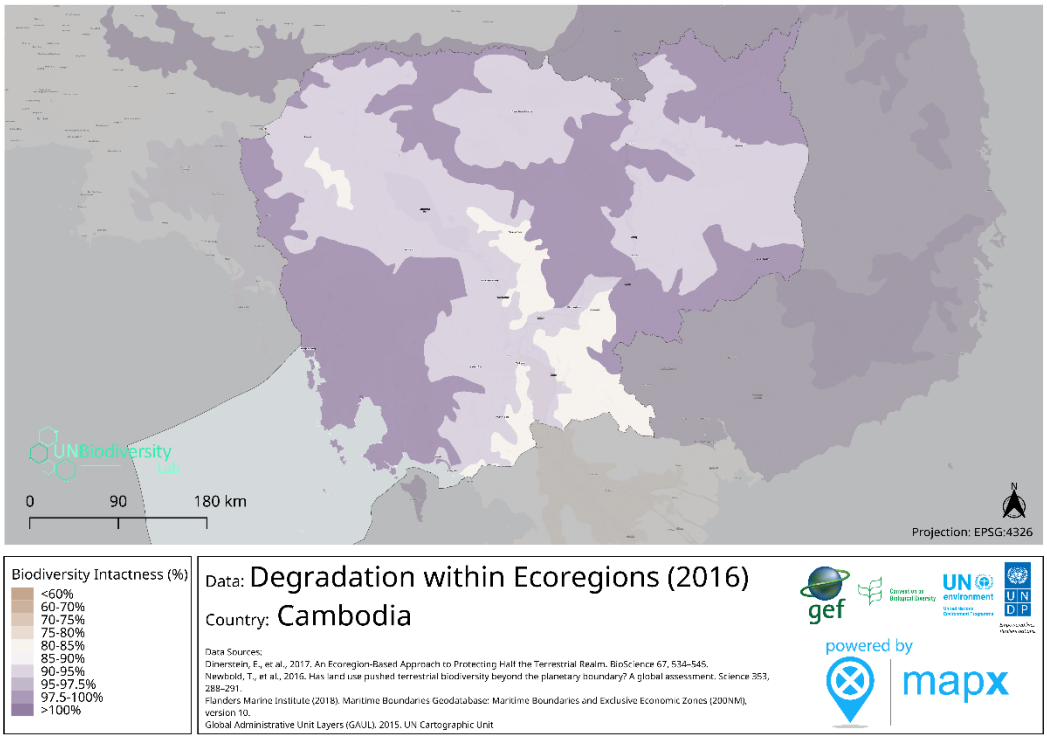
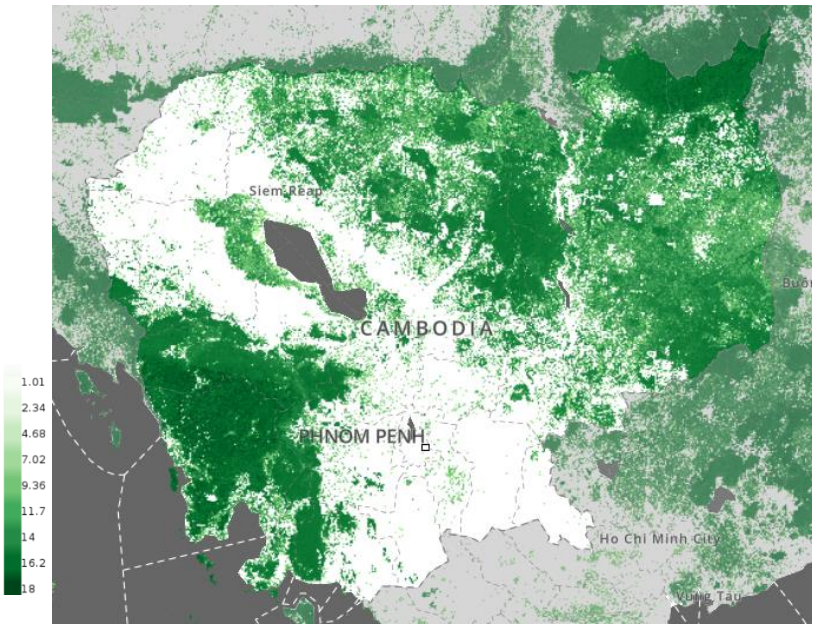


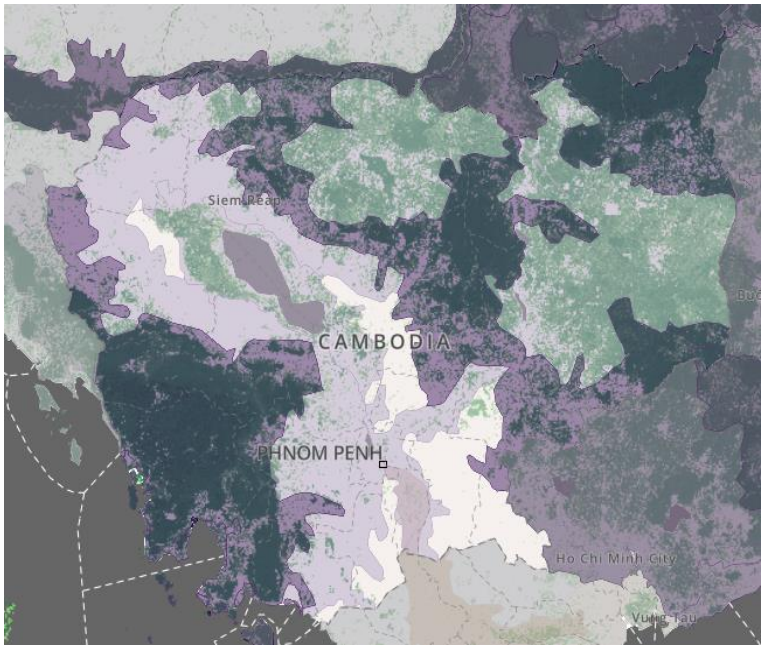
Figure 53: Biodiversity intactness of the ecoregions in Cambodia

Figure 53 shows the level of degradation within the ecoregions in Cambodia. There are large areas that are still relatively intact (with biodiversity intactness values ranging between 85 and 100%). They correspond to forested ecosystems (***Figure 54***)

Large forested landscapes and grasslands support a rich biodiversity including endangered large mammals and rare birds, reptiles, insects and plants species. Freshwater wetlands are of great importance for a diversity of fish (estimated at more than 850 species), amphibians, regionally significant water-bird colonies, and river dolphins. Coastal and marine habitats support major areas of seagrass, coral reefs, fish nurseries and turtles.



A. Forest structural condition 2017
Source: UN Biodiversity Lab



B. Map of Cambodia ecoregion degradation (see figure 53 above) overlaid with map of forest cover in A above

Figure 54: Map of biodiversity intactness of ecoregions in Cambodia overlaid with the map of forest structural condition index-2017

Source: UN Biodiversity Lab (*https://www.unbiodiversitylab.org/)*

Cambodia is unique with one of the world's largest natural freshwater lake fish[511], for the Greater Mekong forests and river complex, and the largest contiguous block of natural forest remaining on the Asian continent's mainland, which is an important constituent of the Indo-Burma Biodiversity Hotspot. In addition, five of nine high priority biodiversity conservation corridors in the Greater Mekong Sub-region are in Cambodia.[512] The Ministry of Agriculture, Forestry and Fisheries classifies wildlife species into three categories: near extinct, rare and common. The near extinct includes 10 mammal species, six bird species. The rare category includes 27 mammal species, 45 bird species, 5 reptile species, and many of endangered plant species. 23 species of wildlife in Cambodia are in the IUCN Red List as globally endangered species.

In recent years, Cambodia has been increasing its capacity for *ex-situ* conservation e.g., at the Royal University of Phnom Penh (RUPP) and has embarked on genetic studies including for example the use of DNA sampling for the identification of crocodiles in captivity, or the use of fecal DNA to study populations of wild elephants. There are plans to develop a database of native orchids based on their DNA.

1.1 Terrestrial biomes

Forests and woodlands

Cambodia has one of the highest levels of forest cover in Southeast Asia, with approximately 10.1 million hectares of forest in 2010[513], which makes it the 13th most forested country by percentage of land area. Forest ecosystems are home to many flora and fauna, and thus serve as a gene pool for biodiversity conservation. Forests play a significant role in rural livelihoods, providing construction wood, fuelwood, food and medicine, as well as ensuring ecosystem functions such as watersheds, storm and coastline protection.

Forests in the northern plain of Cambodia, for example, which are recognized by the government as the Northern Plain Dry Forest Priority Corridor, harbor a unique assemblage of threatened vertebrates, including Banteng, Gaur, Eld's Deer, Asian Elephant, Dhole, Clouded Leopard, Giant Ibis, White-shouldered Ibis, Sarus Crane, Greater Adjutant, Green Peafowl and the world's only stable populations of three Critically Endangered Vultures. In addition, the Northern Plain forests supply both underground and surface freshwater in the catchment. They prevent siltation from erosion in the rivers and Tonle Sap Lake.

Economically, the forest ecosystems contribute valuable services to local residents through ecotourism and provision of natural resource (e.g., medicinal and aromatic plants, resin, wild fruits and other non-timber forest products (NTFPs) for either subsistence uses or commercial purposes. Cambodian forests are intimately linked to and maintain the sustainability and productivity of agriculture and inland fisheries. Forest resources are also still important sources of energy for Cambodian households, many of which still relying on fuelwood for cooking. Almost half of the rural dwellers depend on forests for 20-50% of their total income while 15% of them earn more than 50% of their income from the forests. The forests are also known to mitigate droughts and floods.

Forests and their products are used to respond to many demands within and outside the country. As a result, the total forest cover is declining at a fast rate in Cambodia. It has decreased from approximately 72% in 1973 to 48% in 2014, while dense forest has decreased from 42% to 16% over the same period and the level of mixed forest cover (inclusive of some plantations) has stayed relatively stable over this period, being 30% in 1973 and 31% in 2014. Since 2000, 45% of the remaining primary forest loss occurred in and around protected areas. Much of the forests have been cleared for rubber plantations and timber. The rate of forest loss within concession lands, leased by the government to domestic and foreign investors

[511] The Mekong giant catfish
[512] Forestry Administration 2013
[513] http://www.un-redd.org/AboutUNREDDProgramme/NationalProgrammes/Cambodia/tabid/6896/Default.aspx

for agriculture, timber production and other uses, varied from 29 to 105 percent higher than in comparable lands outside the concessions.

The 2010 National Forestry Program 2010-2029 (NFP) sets out a plan for long-term management of Cambodian forests. Figure 3 presents the structural condition of forests in Cambodia. In many parts of the country (e.g. in Koh Kong, Pursat, Ratanakiri, Stung Treng, Kampong Thom and Preah Vihear provinces), forests are generally still dense and relatively little or not disturbed. They are home to a rich biodiversity and are thus expected to be more resilient to climate change.

The Forestry Administration targets under the NFP included: two million ha of community forests (up from about 400,000 ha); three million ha of protection forests (up from c.1.5 million ha); 2.6 million ha of production forests under sustainable forest management (SFM); and three million ha of protected areas managed by the General Department of Administration for Nature Protection (GDANCP) under the Ministry of Environment (MoE). This would provide significant gains for biodiversity conservation as well as significant climate change benefits through emission reductions in the framework of REDD^{+}. Large proportions of forested land are within protected areas, and as such carbon stored in the forest is protected (Figure 55).

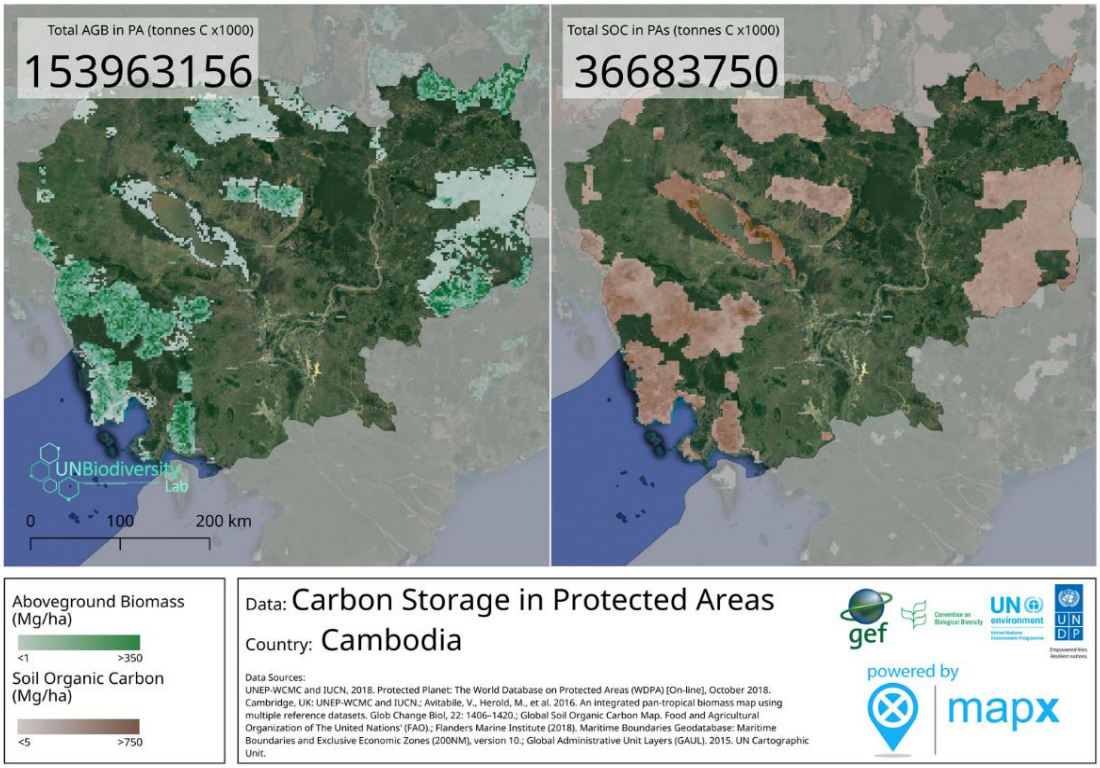


Figure 55: Aboveground biomass and soil organic carbon in Cambodia's protected are system.

(**Note**: Protected areas shown on the map are from WDPA. They do not include the 23 % of Cambodia territory that were included in the country's protected area system from 2016 to 2018. Thus, the figure presents the situation prior to 2016 and is presented just to illustrate the level of aboveground biomass and soil carbon in protected areas)

Agro-ecosystems and agrobiodiversity

Agriculture (including crop and livestock production and fisheries) is the dominant livelihood in Cambodia. It contributed close to 30% to the GDP in 2015. Rice is by far the most important crop and the country has achieved food security with respect to its production. The production of other food crops such as soybean, mung bean, maize, sesame, peanut, chili, sweet potatoes, cassava and cowpea is expanding rapidly particularly in areas poorly suitable to lowland rice. Industrial crops include rubber, sugarcane, cotton, tobacco and jute. Cambodia has also a treasure of local knowledge regarding so-called 'neglected and underutilized plant species'. These plants, including a long list of native cereals, roots and tubers, pulses, fruits, vegetables, nuts, seeds and spices, can be grown on marginal and degraded lands while contributing to increased agricultural production, crop diversification and a better environment. In addition, they are usually nutrition-dense, climate-resilient, economically viable, locally available and/or adaptable as 'Future Smart Food.' As such, they are attracting more and more interest in research and mainstreaming into plans for the implementation of the sustainable development goals.

Noting that since 2012 growth in agriculture has started to slow down essentially because expansion of cultivated lands that determined agricultural growth in the past has reached its limits, Cambodia is paying more attention to ways and means to enhance sustainable agriculture and thus grow more food on existing land, using fewer resources and in an ecologically friendly manner. Various projects and application of best/good practices are under way in various parts of the country including relevant cropping/farming systems and integrated managements of pests and wastes. Cambodia has developed lists and collections of weeds, insect pests and plant pathogens as well as experiences to address them as part of sustainable agriculture. Work on soil agrobiodiversity is still in its infancy but its importance has been mainstreamed in sectoral plans, bearing in mind that Cambodian soils are relatively low in fertility and that conventional rice cultivation destroys its structure.

Animal husbandry has been an essential part of Cambodian economic life. Traditionally, draft animals, such as oxen and water buffalo, have been used intensively for land preparation for cultivation.

With a view to propelling its green growth, Cambodia is investing in ways and means to cope, in a holistic manner, with declining agricultural yields, emergence of pests and diseases, and occurrence of abiotic stresses like drought, floods and pollution by considering traditional knowledge and crops, experiences from other countries, new technologies including biotechnology. In this view, Cambodia ratified the Biosafety Protocol, the Nagoya Protocol and other MEA including the International Treaty of Plant Genetic Resources for Food and Agriculture (ITPGRFA). In line with the Rectangular Strategy Phase III and the National Development Plan, Cambodia will continue giving precedence to the agricultural sector with emphasis on agricultural productivity, diversification and commercialization, promotion of livestock raising and aquaculture, land reform, and sustainable management of forestry and fishery resources, key elements to the development of the national economy and poverty reduction, while reducing the contribution of agricultural systems to the greenhouse gas emission and other degradations.

Mountain ecosystems

Cambodia has three major mountain ranges: the Dangret range on the northern border with Thailand, the Cardamom range in the west and the Eastern Highlands along the border with Laos. Apart from the mountains in the Cardamom Range, elevation of these mountains is relatively low. There are many protected areas established along the mountain ranges. Biodiversity on the mountains is still relatively poorly researched in Cambodia. There is not much wildlife in the Dângrêk Mountains.

The mountains of Cambodia have been severely exploited. Illegal and uncontrolled logging is taking place both within and outside the protected areas. Hunting for game meat has significantly affected the population of wildlife. Many agricultural activities are also taking place on the mountain slopes.

Mountains offer vital ecosystem services. For example, the annual value of the goods and services provided by the Cardamom Mountains, including timber, crops, carbon storage, non- timber forest products (e.g., game animals, nuts, seeds, berries, medicinal plants), water and recreation, is estimated to be more than US$ 1 billion. Cardamom Mountains are increasingly vulnerable to illegal logging, hunting, forest clearing and land encroachment.

Urban ecosystems

There is little information about biodiversity in urban ecosystems in Cambodia. However, as Cambodia is enjoying rapid industrialization and economic growth, some rural populations migrate to the cities[514], which results in poorly controlled expansions of urban areas, in disconnection with urban planning and development of basic infrastructure. Sewage and domestic wastes in addition to industrial effluents are contaminating air as well as both surface- and ground-water in many urban areas. No or poorly planned urban expansions and infrastructure development lead to ecosystem degradation and loss of biodiversity and its contribution to people. Urbanization, infrastructure development and rapid economic growth are also modifying consumption and production patterns, lifestyles and dietary habits. There is some evidence that some invasive species were introduced primarily in urban areas.

Grasslands and savannas

In Cambodia, savanna grasslands predominate in the central lowland region, in the transitional plains and in the Eastern Highlands, the high plateaus are covered with grasses and deciduous forests. Grasslands and savannas are home of many grazing animals; a few of them are endemic. Loss of habitat and excessive hunting have significantly reduced their numbers. The number of bird species is estimated at 500, some of which are endemic. Reptiles and amphibians require more studies. Large areas of this region are protected, including for example Kulen Promptep Wildlife Sanctuary and Beng Per Wildlife Sanctuary

1.2 Inland freshwaters and wetlands

Water resources are an essential component of the nation's environment and natural resource base. A long dry season and pollution from various sources limit the amount and quality of water available for human consumption, agriculture and other uses, and aquatic life. Wetlands cover more than 30 per cent of Cambodia. They include streams, ponds, freshwater swamps, marshes, the Mekong River and its floodplain, Tonle Sap (the Great Lake) and its floodplain, the Stung Sen River and the coastal estuaries of Stung Koh Pao and Stung Kep.

Rivers, lakes and other inland waters

Tonle Sap Lake, Tonle River and the Mekong River dominate the Cambodian landscape. The Mekong River is the longest river in Southeast Asia, and it runs approximately 500 km through Cambodia. Nearly 500 of the 1,200 fish species found in the Mekong River are in Cambodia, with a high degree of endemism[515] particularly in the upland areas of the northeast and in the mountains bordering Thailand. One hundred and six of the 435 bird species found in Cambodia are water birds and the wetlands of the Lower Mekong Basin support 15 globally threatened species including the critically endangered Giant Ibis (*Pseudibis gigantean*). Over 20 species of turtles live in the Lower Mekong Basin, 10 of which are listed in the IUCN Red List[516]. Of the 160 mollusks identified in the Mekong River and its Mun tributary, about 70% of species are endemic.

[514] The statistics show that in 2017, 21.18 percent of Cambodia's total population lived in urban areas and cities as compared to 19.41 percent in 2007

[515] Endangered species include the Giant Catfish (P*angasianodon gigas*) and Try Trasak (*Probarbus jullieni*)

[516] Other endangered species include the Irrawaddy Dolphin (*Orcaella brevirostris*) and the Siamese Crocodile (*Crocodilius siamensis*).

The Mekong River provides a wide range of benefits at both national and community levels. It serves as a migratory channel for fish between rivers, tributaries and lakes. The Mekong River swells during the wet season (May to October) and its waters flow into the Tonle Sap River, forcing it to reverse its course and flow back into the Tonle Sap Lake. The lake expands from 2,500 km^2 in the dry season to 13,000 km^2 in the wet season creating a vast wetland area rich in biodiversity. The wet season flow reversal brings into the lake sediments, nutrients and an abundance of fish from the Mekong River. Cambodian fishers and farmers have used the seasonal relationship between the Tonle Sap River and the Mekong River to develop dependable cultural and economic practices for their livelihoods.

The Tonle Sap Lake is the largest inland freshwater body in Southeast Asia. It is drained by the Tonle Sap River into the Mekong River. A complex of [14] mountain forest watersheds regulates a system of river tributaries to Tonle Sap Lake and thus plays an important role for the survival of the lake's rich biodiversity and fisheries. The Tonle Sap ecosystem is a unique ecological phenomenon believed to be one of the most productive inland waters and one of the most fish-abundant lakes in the world. The lake and its floodplains serve as migratory routes as well as spawning and nursery grounds for various aquatic animals. They provide directly or indirectly to the livelihoods and food security of about half of the population in Cambodia. The Tonle Sap Lake is a Ramsar site and the whole ecosystem as been nominated as Biosphere Reserve.

There are many other lakes, streams and pond, some of which are seasonal, distributed through out Cambodia. They have not been studied as much as the large wetlands. They are important for domestic, agricultural and industrial water supply; for agriculture and fisheries; as wildlife habitats or for the conservation of genetic resources. They can also serve for aquaculture.

Wetland products harvested by local communities include water, fish, waterbirds, edible plants, medicines, and firewood. However, Cambodian freshwater wetlands are under threats from various pressures, including unsustainable fishing methods; excessive harvesting of biological materials (e.g., collection of migratory birds' eggs, and overharvesting of medicinal plants), water pollution from domestic wastes, agricultural run-off and mining as well as other industrial activities; invasive alien species e.g., *Mimosa pigra*, land conversion and infrastructure development including hydropower dams.

In Cambodia, fish is an important diet staple, accounting for 61**%** of households' animal protein intake and the second most consumed food after rice. Fishing and fisheries, both freshwater (mainly from Tonle Sap, Mekong and Bassac rivers) and marine, make up another cornerstone of Cambodia's rural economy.

Aquaculture

Fisheries play a significant role in supplying Cambodians with food, as well as in supporting the national economy. However, fisheries in the Mekong, Tonle Sap and Brassac rivers and their associated floodplains are under a significant amount of anthropogenic pressure that is leading to a projected decline in fish stocks and in the size of fish caught. In 2014, the annual yield of all fisheries, including fish and other aquatic organisms, was estimated at 745,065 tonnes. Aquaculture contributed around 120,055 tonnes, and its relative contribution is increasing annually. Aquaculture production in Cambodia is still predominantly small-scale. It grew from around 26,000 tonnes in 2005 to 120,055 tonnes in 2014 with a value estimated at USD 240 million. Mariculture gives lower yields than freshwater aquaculture both in terms of volume and value.

1.3 Marine and coastal areas

Cambodia has a 435 km coastline, along which can be found a number of closely interrelated ecosystems, consisting of beach forest, strand vegetation, mangroves, estuarine ecosystems, seagrass bed and coral reefs. These complex coastal and marine ecosystems maintain a rich biodiversity of ecological and economic significance. These ecosystems that have remained relatively isolated are now being explored for research. Preliminary biodiversity studies identified more than 60,000 ha of some 30 species of mangroves, seagrass beds of which 8 species have been identified, some 70 species of corals belonging to 33 genera and 11 families[517], four species of marine turtles[518], 435 fish species[519] from 97 families with an estimated stock of marine fish of 50,000 metric tonnes, and a number of marine mammals including whales and dolphins[520] as well as crustaceans and mollusks.

In the coastal zone, mangroves provide important spawning grounds for fish and protection from floods, and there are vast mudflats and estuaries, which are very productive systems and are rich feeding grounds for many vertebrates. Coastal wetlands also act as barriers against storm surges and protect the coastline from erosion. Using UNEP estimates of annual net economic value of seagrasses (US$ 1,186/ha) and mangrove forest (US$ 882.35), Mangroves for Future estimated the total net economic value of mangroves (78405 ha) and seagrasses (33,814 ha) at approximately US$ 69.2 million/year and US$ 40.1 million/year respectively in Cambodia[521]. According to a coastal study undertaken by the Asian Development Bank (ADB) in 2000, the benefits of the coastal and marine biodiversity to the local communities was estimated at US$ 12 million annually together with economic value of US$ 100 million annually for fisheries export[522] (SPF 2010:2019).

Marine areas and coastal wetlands are threatened by various activities including tree felling for charcoal production, mangrove clearing for shrimp, finfish and crustacean farming, destructive fishing practices including trawling and motorized push nets in shallow waters that destroy the seagrass beds. Establishment of national parks and other conservation areas has been used as a way to address these threats. As an example, between 2000 and 2010, the area of mangroves declined from about 85,100 hectares to 78,405 hectares due to their unmanaged exploitation (e.g. for charcoal production) and conversion to other land uses (e.g. shrimp farms and settlement in response to population growth).

II. MAIN PRESSURES ON AND DRIVERS OF CHANGE TO BIODIVERSITY (DIRECT AND INDIRECT)

Cambodia's terrestrial, marine and coast ecosystems face a lot of direct threats and indirect pressures, as described below.

1. Direct drivers

[517] Acropora and Montipora are two of the most common ones
[518] Hawksbill turtles (*Eretmochelys imbricata*), Green turtles (*Chelonia mydas*), Olive Ridley (*Lepidochelys olivacea*) and Leatherback (*Dermochelys coriacea*).
[519] A UNEP study gives 520 marine fish species
[520] Marine mammals (*Dugon dugon*) and marine dolphins are found, including the endangered Irrawaddy Dolphin (*Orcaella brevirostris*). Other species of cetaceans known to occur in Cambodia's coastal waters are the IndoPacifi c Humpback Dolphin (*Sousa chinensis*), Common Dolphin (*Delphinus delphis*), Bottlenosed Dolphin (*Tursiops truncatus*), Shinner Dolphin (*Stenella longirostris*), and Finless Porpoise (*Neophocaena phocaenoides*)
[521] Mangroves for Future 2013. Cambodia Nation Strategy and Action Plan 2014-2016. Accessible at *https://www.iucn.org/sites/dev/files/import/downloads/cambodia_nsap_2013_07_04_webversion__in_english_.pdf*
[522] Cambodia's Strategic Planning Framework **2010-2019** for Fisheries cited in a ProDoc to GEF

1.1 Land-use and land-cover changes

Between 1964 and 2014, Cambodia lost 20% of its forest cover. The deforestation rate increased by almost 3% annually between 2010 and 2014. This is one of the highest deforestation rates globally. Mangroves, savannas and grasslands were also affected by land use change. Cambodia's ecosystem conversion and degradation were driven mainly by:

(a) Extensive land use changes for industrial agriculture, aquaculture, rubber, sugar cane, cassava, and other commodities, both legal and illegal;

(b) Economic Land Concessions (ELCs) granted for agro-industrial plantations, including some granted within protected areas. Their number increased steeply in the 2000s. In-migration of people to formerly remote forested areas as a result of ELCs and infrastructure development led to increased clearance for settlement;

(c) Hydropower dam construction and development of roads and other infrastructure, particularly towards mining sites;

(d) Unsustainable agricultural practices reduce soil fertility and crop productivity on the long-term. They include continual use of chemicals (pesticides and inorganic fertilizers); slash-and-burn, tillage systems that remove a lot of soil nutrients and soil cover resulting in a high risk of soil erosion. 60 percent of the soils covered by Cambodia's soil database (mainly agricultural lowland area) are very low in total N, about 88 percent are low in extractable P, and about 86 percent are low in organic C.

Habitat fragmentation and conversion is one the main drivers of biodiversity loss in Cambodia. Loss of natural habitats has considerable impacts on biodiversity, on the provision of ecosystem services, and on the livelihoods of forest dependent communities. Forest degradation has reduced forest quality and its regeneration capacity which in turn reduces its ability to provide socio-economic and environmental services. Degradation of habitat and biodiversity severely diminishes ecosystem richness and reduces their future use-values.

1.2 Natural resource overexploitation (overfishing, overharvesting, unsustainable use)

The most significant threat to key wildlife species is over-hunting, which has probably already eliminated some of the charismatic species[523] that lived in Cambodia such as Tiger (*Panthera tigris*), and Kouprey (*Bos sauvelii*. More recently, populations of ungulates, pangolins, turtles and other taxa were drastically reduced by over-hunting or hunting using very destructive practices. Most hunting with serious conservation impacts is for domestic market or international trade. Species of high commercial value, such as turtles and tortoises, pangolins, bears, deer and wild cattle, are commonly targeted for international trade. In addition, exploitation of wildlife in the region is high, particularly the collection of eggs and chicks of migratory birds and the destructive harvesting methods that eliminate non-target fish or plant species. Overharvesting of plants for traditional medicine and food is also threatening the ecosystems.

1.3 Pollution

The rapid industrialization of the Lower Mekong Basin, expansion of agricultural production requiring the clearing of natural habitats, extension of mining activities and intensive logging and deforestation are all affecting the quality of water streams by increasing the levels of pesticides and/or chemical wastes from rubber and palm oil industries, from sediments washed loose from degraded and bare soils towards rivers or coastal areas downstream resulting in the loss of ecosystem functions.

[523] Wild Water Buffalo (*Bubalus arnee*), and both the Javan (*Rhinoceros sondaicus*), and Sumatran (*Dicerorhinus sumatrensis*) rhinoceros,

Research results confirmed that increased application of chemical inputs is resulting in soil acidification, reduced soil biological activity and low soil fertility.

1.4 Invasive alien species

Two invasive alien species have been reported in the Lower Mekong Basin:

(a) the Giant Mimosa (*Mimosa pigra)*, a thorny plant from the Amazon, that has proliferated in the Tonle Sap area, threatening agriculture, fishing and flooded forests;

(b) Golden Apple Snail (*Pomacea canaliculata*) introduced from South America, which has become an important pest in rice fields and invaded some freshwater systems where they compete with native snails for food and cause destruction of native aquatic vegetation.

1.5 Climate change and variability, and land degradation

Cambodia is among the countries most vulnerable to climate change in Southeast Asia. Its economy and the livelihood of the great majority of its population depends on climate-sensitive sectors such as agriculture, water resources, forestry, fisheries and tourism. These sectors are impacted by climate change primarily through the increased intensity and frequency of floods and droughts. According to the National Communication to the UNFCCC, vulnerabilities of communities living around Tonle Sap in particular have increased significantly as a result of the threats posed by the increased frequency of heavy rainfalls during the wet season combined with the annual flooding of the Mekong river, destructive to crops and infrastructure around the Tonle Sap plain. In addition, unpredictable rains are making rain fed crop growing riskier[524]. Floods coupled with droughts have resulted in significant economic losses. Under extreme climate conditions, populations of some pests, such as rice bug, armyworm and rats, and diseases will likely increase. Although on aggregate the land-use change and forestry sectors were reported as a sink in 2015, Cambodia pays attention to the GHG emissions contribution of its agriculture and land-use sectors.

1.6 Natural disasters

Natural disasters (in particular floods) that occurred in recent years in Cambodia caused serious damage to infrastructure and ecosystems, especially agro-ecosystems. They disrupted social and economic

[524] The most severe droughts observed were in 1995, 1996, 2002 and 2015 and 2016. Due to the effect of El Nino events, Cambodia experienced, a dry and hot weather event from December 2015-May 2016. Between April and May 2016, the temperature reached 41 degree Celsius and it was declared the hottest year ever recorded.

activities. Figure 56 shows almost inexistent risk of tsunami along the coast in Koh Kong province. The risk may be high to populations on the Cambodia's islands.

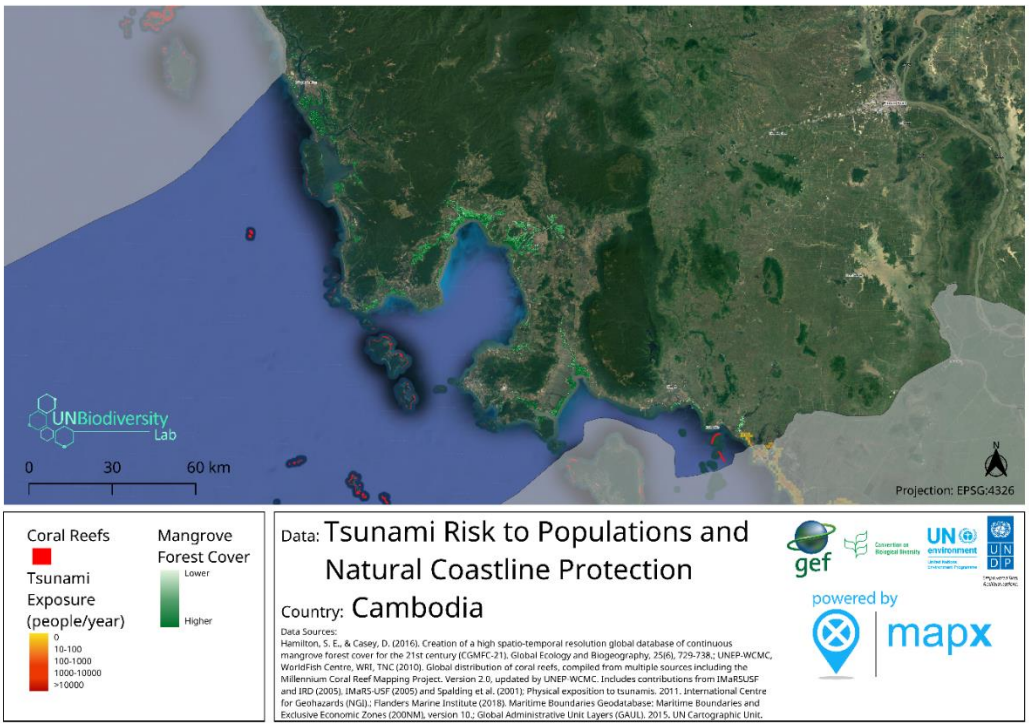


Figure 56: Tsunami risk to populations and natural coastline protection

2. Indirect drivers

Cambodia recognizes the need to identify, assess and address indirect drivers of biodiversity loss if our actions to control and/or eliminate direct drivers have to succeed. The most visible indirect drivers of biodiversity loss in Cambodia consist of:

(a) Increasing human population with the related urban expansion, increase demand for natural resources and changes in consumption and production patterns; large-scale development projects impacting natural ecosystems with improved roads facilitating access to all areas including those that were protected because isolated from the core human activities.

(b) Human population in Cambodia has been growing steadily (at the rate of 1.51 %) as well as the average income per capita and thus the purchasing power of the populations. The poverty rate fell sharply from 53.2% in 2004 to 16% in 2013, but the majority of the population remains highly vulnerable. 80% of the population lives in the countryside and is highly dependent on natural resources. Cambodia also has a strong tourism sector with more than 4.5 million international visitors recorded in 2014, and an estimated income of US$ 2,700 million from these tourists;

(c) Cambodia's economy is largely based on agriculture; with livestock production on an increase. In order to respond to the high and ever-increasing food demands, while avoiding further conversion of forestland to agriculture, the country is taking environmentally friendly measures to increase agricultural productivity and efficiency, food processing and marketing, in line with the laws, strategies and plans adopted since 2002 relating to agriculture and animal production. However, Cambodia is facing major challenges to harmonize economic development with forest and biodiversity conservation goals;

(d) Over 84% of Cambodian households meet their energy needs through fuelwood, which accounts for approximately 70% of the total national energy demand. The domestic use of fuelwood and charcoal commonly requires heavy forest logging, which generates indoor/outdoor air pollution and creates severe environmental problems. Energy supply in Cambodia also relies heavily on imported fuels. The country is exploring new sources of energy, including hydropower, offshore and onshore oil and gas, and renewable energy to respond to the increasing energy demand;

(e) Cambodia is also making efforts to strengthen its institutional and human capacities for every aspect of natural resource management.

III. MEASURES TAKEN TO IMPLEMENT THE CONVENTION

1. Background

Cambodia relies predominantly on its rich biodiversity and other natural resources for its socio-economic development and for most people's food, livelihoods and well-being. In the past decades, high population growth and the increasing economic demands of this growing population have often led to the conversion of natural forests to agriculture, to land degradation and pollution caused by unsustainable agriculture and industries; they have led to habitat fragmentation from public works and urbanization; to the overharvesting and overexploitation of resources particularly in forests, freshwaters and marine and coastal areas. These pressures on biodiversity and its associated ecosystem services are often exacerbated by the impact of climate change and more frequent natural disasters.

The Royal Government of Cambodia became a Party to the Convention on 10 May 1995, to the Cartagena Protocol on Biosafety on 16 December 2003, to the Nagoya Protocol on Access and Benefit-sharing on 19 April 2015 and to the Nagoya – Kuala Lumpur Supplementary Protocol on Liability and Redress on 5 March 2018. Cambodia has been actively involved in the life of the Convention through the participation in all the meetings of the Conference of the Parties and its subsidiary bodies, and in various workshops and meetings of experts organised on specific topics. Cambodia has also been a member of the Bureau of the Conference of the Parties and the SBSTTA.

At the national level, Cambodia carefully reviewed the Convention provisions as well as the provisions in the Protocols and reflected them in the implementation of its laws and decrees. Cambodia has also been very attentive to COP decisions and always undertook to implement them in accordance with its priorities enshrined in the Rectangular Strategy and its strategies for sustainable development and poverty reduction. As an example, Cambodia developed in 2011 an "Action Plan for Implementing the Convention on Biological Diversity's Programme of Work on Protected Areas" with an Appendix that translated at the national level some of the elements from the Strategic Plan for Biodiversity 2011-2020 and the Millennium Development Goals while using as foundation the 2008 "Protected Areas Law".

Cambodia is finalizing "the Environment and Natural Resources Code of Cambodia", which is the legal framework for the management of the environment and natural resources. Its purpose is "to enable the sustainable development of the Kingdom of Cambodia, by protecting the environment and conserving, managing, and restoring natural and cultural resources". Box 14 contains its specific objectives. The drafting of the Code started in 2015. The 10th draft was being considered in 2018.

Box 14: Objectives of the Environment and Natural Resource Code (Article 2 in Book 1 Title 1)
a) Protect the environment to avoid and mitigate disasters and environmental harm; a) Conserve, manage, and enhance biodiversity, natural resources, and ecosystem services;
b) Preserve and promote the Kingdom of Cambodia's national cultural resources, preserve prehistoric and historic monuments and artefacts and surface and sub-surface archaeology, and protect and restore historic sites; b) Guarantee and enhance the wellbeing of the people in accordance with the Constitution of the Kingdom of Cambodia;
c) Enhance and protect the rights of all individuals and the collective rights of indigenous people throughout the process of managing, protecting, and conserving natural resources throughout the Kingdom of Cambodia; c) Encourage and enhance the rights of national and international organizations in the process of environmental protection and natural resource management in the Kingdom of Cambodia;
d) Ensure that all environmental considerations are fully integrated into all relevant national and sub-national planning and decision-making concerning economic and social development; d) Promote a cooperative, transparent, and inclusive approach for environmental protection and natural resource management with participation of the Royal Government of Cambodia, communities, property holders, indigenous people, and vulnerable people, including minorities, women, youth, disabled people, and the marginalized;
e) Promote international environmental responsibilities in the Kingdom of Cambodia; e) Enforce the international legal instruments to which Cambodia is a party; and
f) Implement vital legal principles and environmental policies stated in this Code. *Reproduced from "Revised Ninth Draft (Draft 9.1) - Environment and Natural Resources Code of Cambodia | 25 July 2017"*

Measures taken to implement the Convention are in line with the provisions of each article of the Convention to ensure the conservation of our natural assets, their sustainable use and management to ensure the well-being of all the persons living in the country and to try as much as possible to ensure that all stakeholders benefit from the use and commercialisation of genetic resources. Cambodia recognizes the benefits from cooperation in the region, South-South as well as South-North cooperation. Cambodia is particularly promoting the synergistic implementation of the Rio conventions.

As of November 2018, Cambodia submitted to GEF 75 projects for funding under all the focal areas. Implementation of these projects has allowed the country to make good progress in implementing the Convention. Among these projects, Cambodia updated its 2002 National Biodiversity Strategy and Action Plan (NBSAP) in 2016.

2. Implementation of the NBSAP and national biodiversity targets

As part of its fulfilment of its obligation under the Convention, Cambodia updated its 2002 National Biodiversity Strategy and Action Plan (NBSAP). Cambodia's vision for biodiversity is that, through this updated NBSAP and in support of the National Strategic Development Plan, *by 2050, Cambodia's biodiversity and its ecosystem services are valued, conserved, restored where necessary, wisely used and managed so as to ensure equitable economic prosperity and improved quality of life for all in the country*. The roadmap or mission for achieving this vision consists of *using, protecting and managing biodiversity for sustainable development in Cambodia*. This implies that biodiversity issues and values are

mainstreamed into national development and sectoral policies, plans and programmes; that biodiversity, our natural capital, is protected by reducing the various direct and indirect pressures causing its loss or degradation, that it is used wisely so as to enhance the benefits derived from it to the people of Cambodia, particularly in rural areas; and that an enabling environment for the effective and efficient implementation of this mission is strengthened. Cambodia's updated NBSAP consists of 498 key actions identified to achieve 78 strategic objectives under 24 themes.

Overall and in line with the National Sustainable Development Strategy, the country intends to achieve productive land resources, rich forest resources, high quality ground- and surface-water resources, rich fish resources, functional wetlands, sustainable marine- and coastal environment, rich biodiversity, limited influence on the climate, efficient use of natural resources, limited waste generation, limited impact from natural disasters, and clean air.

As stated by the Prime Minister when the NBSAP was launched in 2016, the Strategy and Action Plan reflects the government's will and firm commitment to safeguard biodiversity and optimize its contribution to the country's economy, poverty reduction and sustainable development. He also noted that the NBSAP will guide line ministries and assist non-governmental organizations and development partners in developing concrete and appropriate measures and actions to conserve and use biodiversity sustainably in line with the National Sustainable Development Strategy, the Strategic Plan on Green Growth, the Cambodia Climate Change Strategic Plan, and the Sustainable Development Goals.

Two years into the adoption of its updated NBSAP, Cambodia has noted some progress in each of the 24 themes covered by the 2016 NBSAP. Some progress has also been noted in the achievement of the national targets, but still insufficient to meet the 2020 level of each target. The overall slow progress is partly due to still insufficient human, financial and institutional capacities, while knowledge about the value of biodiversity is being gathered, awareness about the contribution of biodiversity to human well-being and the country's economy is being raised, and biodiversity is being further integrated into policies and programmes dealing with sustainable development and poverty reduction in the country.

3. Contribution to the achievement of the 2020 Aichi Biodiversity Targets and sustainable development goals

What is particularly remarkable about Cambodia's NBSAP is that it has mainstreamed biodiversity into all the important economic sectors and includes 20 national targets that reflect to some extent the Aichi Biodiversity Targets. The strategy's overarching priority is to make sure that every Cambodian, in particular decision- and policy-makers, is conscious about the environmental, economic, health, social and cultural value of the services derived from ecosystems, in particular the value of protected area systems as well as the value of terrestrial and aquatic animal and plant resources including animal wildlife, livestock, agricultural, forest, freshwater and marine resources, and the biomass used for energy production. The second priority is about mobilizing the necessary resources for action.

Most of the actions towards the national targets are in the initial phase but Cambodia is proud of the progress made on national target 8 regarding protected areas. As of November 2018, Cambodia's terrestrial protected area system has reached about 41 percent of land area including a wide set of corridors linking protected areas and other conservation areas. Additional efforts and resources are needed to make significant progress on the development of management plans and their implementation. Cambodia is on track to achieve almost all the targets adopted in its NBSAP.

In drafting the Cambodia SDG (CSDG) framework, biodiversity national targets are being taken into account (see Section IV) and, together with the CSDG framework, they will be integrated into the National Strategic Development Plan 2019 – 2023.

With the transition from the least developing country status to a middle-income country, Cambodia is stepping-up the effectiveness of the protection (including measures that control pressures upfront), conservation and restoration of ecosystems; the sustainable use, transformation and commercialisation of its natural resources; and the sharing of benefits from the utilization of natural assets for the well-being of all in the country. In doing so, Cambodia is paying particular attention to the reduction of greenhouse gas emissions (from forest degradation, deforestation and other economic sectors) and sustainable production (particularly in agriculture, forestry, and the manufacturing, tourism and infrastructure sectors).

4. Support mechanisms for national implementation (legislation, funding, capacity-building, coordination, mainstreaming, etc.)

Cambodia has taken a number of measures to reduce biodiversity loss, in particular the designation of a wide network of protected areas. However, limited financial resources and capacities in general (including management capacity at institutional level and technical capacity at operational level), combined with poor awareness of the value and vulnerability of ecosystems, limited knowledge and data, and lack of positive incentives, have not allowed for an effective control of the drivers of biodiversity loss. This, of course, has detrimental consequences for the country's sustainable development.

Building on the findings from the National Capacity Self Assessment and follow-up capacity development monitoring, Cambodia continue strengthening its human capacity for research, information management, communication and at the science-policy interface. There are plans in particular for developing capacities for the synergistic implementation of the three Rio conventions.

In the last decade, Cambodia adopted many laws and strategies of relevance to the objectives of the Convention. They provide safeguards in the implementation of the Convention at the local, national and regional levels.

Cambodia maintain a strong collaboration with a few international environmental NGOs who support its programme especially in areas where technology is still lacking. Cambodia also foster collaboration among line ministries identified in the NBSAP.

In addition to the national budget, Cambodia has been applying to the financial mechanism and mobilizing partners to fund some of the actions listed in the NBSAP.

5. Mechanisms for monitoring and reviewing implementation

Monitoring and evaluation are critical components of the implementation review and are useful in reporting on implementation progress and the outcomes of measures taken. In addition, monitoring and evaluation allow an adaptive management capability to be mainstreamed in the strategy and ensure the flexible nature that characterizes effective and efficient strategies and action plans. While monitoring should be a continuous process, so that it can detect unexpected changes requiring urgent attention, Cambodia is planning to establish an annual internal reporting on agreed common elements of the three Rio conventions. The more formal reporting is done in response to the obligations already agreed upon by Cambodia, such as the submission of national reports under the MEAs or obligations vis-a-vis a funding agency. Monitoring, evaluation and reporting will rely on the national biodiversity clearing house mechanism (CHM) and the national web portal of the Rio conventions. Adequate human and financial resources will be needed to keep the CHM and the web portal active.

At the thematic level, Cambodia will continue using the Management Effectiveness Tracking Tool (METT) and RAPPAM for protected areas as well as the conservation software Spatial Monitoring and Reporting

Tool (SMART), which is an improved tool (superseding MIST) to measure, evaluate, and improve the effectiveness of wildlife law enforcement patrols and site-based conservation activities.

IV. NATIONAL CONTACTS

Convention on Biological Diversity

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Nagoya Protocol on ABS

H.E. Somaly Chan	Nagoya Protocol Primary NFP

APPENDIX: SIXTH NATIONAL REPORT DEVELOPMENT PROCESS

The process for the development of the 6th National Report consisted of:

(i) Planning phase
(ii) Inception workshop
(iii) Data gathering and drafting
(iv) National validation of the findings
(v) Finalization and submission of the report

I. Planning phase

In May-July 2018, an international consultant and a national consultant were recruited during this period. Plans were detailed regarding the rationale, objectives, description of methodologies for the process of national report drafting. Internal exchanges of views among MOE, UNDP and the consultants were undertaken on sources for key information, tools for data collection tools and training/information needed by MoE staff who would assist in data collection. Members of the other Rio conventions were also laterally involved in this phase, considering the fact that Cambodia is strengthening synergy among the three Rio conventions.

A quick overview of the national biodiversity targets (NBTs) was presented as well as their **r**elevance/linkages to Aichi Biodiversity Targets and the Sustainable Development Goals (SDGs)/targets.

Key information needed for the report covering the period 2014 to 2018 were described around the indicators identified in the 2016 National Biodiversity Strategy and Action plan for each national target, bearing in mind that additional indicators could be found in documents prepared or recommended by the Secretariat of the Convention on Biological Diversity including the lists prepared by the Biodiversity Indicators Partnership. The sources of information were multiple, such as national reports of relevance to biodiversity (e.g., MAFF national reports, and CMS and CITES national reports), various thematic and annual reports of national and international conservation/environment organisations active in Cambodia, and reports and strategic documents by UN and related bodies (e.g., UNESCO, World Bank,) and regional organisations (e.g., Asian Development Bank, ASEAN etc.). The use of the IUCN Red List, IBAT, UN Biodiversity Lab maps and data as well as publications by Cambodian scientists were particularly encouraged. It was agreed to consider carefully data published by some organisations and the media on forest cover and protected areas as they may not correspond with latest data gathered by the government.

II. Inception workshop

The inception workshop for the development of the 6th National Report took place on 7 September 2018. The workshop gathered many participants representing all the stakeholder groups mentioned in the NBSAP, including the Ministries, their departments and provincial agencies, universities and other research institutions, national and international non-governmental organizations and representatives of local communities.

After the usual introductory remarks, the workshop consisted of 3 parts:

(a) generalities on the 6th National Report on Biodiversity including the different sections of the reports based on the Technical Guidelines endorsed by the CBD Conference of the Parties;

(b) actions relating to Sustainable Use and Legal Framework & Strategy under which the following breakout groups were established to review the achievements of the national targets:

(i) **Group 1:** freshwater fisheries and aquaculture management; majority of areas under agriculture, animal production, aquaculture and forestry;
(ii) **Group 2:** payment for ecosystem services (PES); ecosystems protection and restoration;
(iii) **Group 3:** participation of government, private sector and other stakeholders to reduce the negative impacts on ecosystems and their services; anthropogenic pressures on coral reefs and vulnerable ecosystems impacted by climate change have been significantly reduced;

NBSAP have been updated and adopted and have commenced to be implemented effectively;

(iv) **Group 4:** reduce of Habitat loss and restoration of natural habitat and wildlife corridors; financial mechanism modality; Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS).

(c) Actions relating to Education and Conservation & Community considered by 4 breakout groups::

(i) **Group 1:** Knowledge of the stakeholders on Biodiversity values; he integration of biodiversity kalues into development plans at national and subnational levels; reduction of pollution on terrestrial and freshwater ecosystems;

(ii) **Group 2:** Biodiversity Information Management; protection and conservation of threaten species; invasive alien species (IAS);

(iii) **Group 3:** conservation of existing protected areas; protection and improvement of ecosystems and their services; in-situ and ex-situ conservation;

(iv) **Group 4:** traditional knowledge and practices of indigenous ethnic minorities and local communities relevant for the conservation and sustainable use of biodiversity.

The review of the achievements of the national targets did not use indicator-based questionnaires as recommended in the Technical Guidelines but participants were encouraged to report on relevant actions. Breakout group discussions took place essentially in Khmer and allowed a very active participation of everyone. Participants were also asked to assess the level of progress under each national target. The list of the activities undertaken under each national targets were translated in English and used for the drafting of the 6th national report.

III. Data gathering and drafting

The consultants organized series of consultation meetings with experts from relevant institutions and/or agencies, including for example from the private sectors and academia, the Ministry of Environment, Forestry Administration, Fisheries Administration, Ministry of Water Resources and Meteorology, National Committee for Disaster Management (NCDM), National Center for Traditional Medicines of the Ministry of Health, Apsara National Authority, Tonle Sap Authority, The Royal University of Phnom Penh, the Royal University of Agriculture. On the occasion of field visits e.g., in Siem Reap, Kampong Thom, Preah Viehear, Mondulkiri, Stueng Treng, Porsart, Koh Kong, Preah Sihanouk, Kamport, Kep and Beanteay Meanchey, local communities and indigenous peoples were approached for information.

Participation in 6NR Technical Webinars enabled the consultants to familiarize with useful knowledge products.

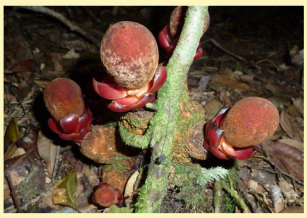
IV. National validation of the findings

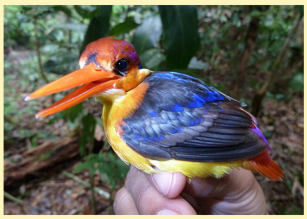
In December, a validation workshop that gathered more than 110 people was organized to consider the zero draft of the national report. The consultants took the opportunity to ask for additional details. Participants contributed a lot and expressed satisfaction with the findings. Participants were from MOE, MAFF and their Administrations, Departments and provincial representatives, all the other relevant ministries listed in the NBSAP including for example Ministry of Education Youth and Sport, Ministry of Planning, Ministry of Commerce; National Center for Traditional Medicines of the Ministry of Health; RUPP, RUA, other schools of agriculture and the Institute of Environmental Rehabilitation and Conservation; Gender and Climate Change Committee; and national as well as international non-governmental organizations.

V. Finalization and submission of the report

The report was finalized and submitted to the Biodiversity Technical Working Group / MoE and thereafter to UNDP before submission to the General Secretariat of the National Council for Sustainable Development (GSSD).






Department of Biodiversity

General Secretariat of the National Council for Sustainable Development/ Ministry of Environment

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