



Lessons Learned from REDD+ Implementation in Cambodia



BCAMP
Biodiversity Conservation and
Management of Protected Areas
in ASEAN



**ASEAN CENTRE
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Contents

Figures	iv
Acronyms	v
Executive Summary	vi
Introduction	1
Current Redd+ Policies and Regulation in Cambodia	3
Forest Cover in Cambodia	3
History of REDD+ in Cambodia	5
Policy and Regulation Supporting REDD+ Project in Cambodia	6
National REDD+ Strategy	6
Forest reference level	7
Safeguard information system	7
National forest monitoring system	7
Current REDD+ Implementation in Cambodia	8
Keo Seima REDD+	8
Southern Cardamom REDD+ Project	10
Completed Projects	11
Upcoming REDD+ Project in Cambodia	12
Tumring REDD+ Project at Prey Lang	12
Prey Lang REDD+ JCM	13
Central Cardamom REDD+ by Conservation International	14
Critical Factors in Assessing the Feasibility of Voluntary Carbon Market for Virachey National Park	16
Conclusion	21
References	22

Figures

1	Forest cover change, Cambodia, 1960–2018	4
2	Land use and land cover, Cambodia, 2018	4
3	Programme coordination and implementation of REDD+ in Cambodia	5
4	Timeline of Keo Seima REDD+ project development	9
5	Keo Seima REDD+ project site	9
6	Southern Cardamom REDD+ project site	10
7	Tumring REDD+ project site	12
8	JCM project phase	14
9	JCM Prey Lang project site	15
10	Land use and land cover changes, Virachey National Park, 1987–2017	18
11	Driver forces, pressures, states, impact, and response analysis, Virachey National Park	19

Acronyms

CCB	Climate, Community, and Biodiversity
CI	Conservation International
CPA	community protected area
ELC	economic land concessions
FA	Forestry Administration
FCPF	Forest Carbon Partnership Facility
FRL	forest reference level
GHG	greenhouse gas
JCM	Joint Crediting Mechanism
JICA	Japan International Cooperation Agency
KSWS	Keo Seima Wildlife Sanctuary
MoE	Ministry of Environment
NRS	National REDD+ Strategy
NTFP	non-timber forest product
REDD+	Reducing Emission from Deforestation and Degradation in Developing Countries
SCRP	Southern Cardamom REDD+ project
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCM	voluntary carbon market
WCS	Wildlife Conservation Society

Executive Summary

Billions of dollars in climate finance are available annually. However, developing countries, including Cambodia, continue to struggle to access these funds in order to support national climate actions.

The United Nations Framework Convention on Climate Change (UNFCCC) REDD+ programme is suitable for forested countries. Accordingly, Cambodia has tremendous potential for carbon storage services. According to the forest reference level (FRL) of the UNFCCC, Cambodia can claim the production of around 10 million tons of carbon credits per year to obtain funds for results-based payment. The REDD+ process requires extensive initial preparation time and effort to establish the necessary framework. As such, the study must identify potential areas for REDD+ project development by measuring the carbon stock and its potential economic value in the forest areas under threat.

Cambodia has implemented two REDD+ projects, including Keo Seima REDD+ in Mondulkiri and Southern Cardamom REDD+ in Koh Kong. Two additional REDD+ projects have reached the negotiation stage, namely, the Tumring REDD+ in Prey Lang Wildlife Sanctuary, Kampong Thom province and the Joint Crediting Mechanism (JCM) REDD+ in Prey Lang Wildlife Sanctuary, Stung Treng province. Another project, the Central Cardamom REDD+ at Cardamom National Park being implemented by Conservation International Japan, is currently in the project documentation and proposal stage.

All of the current REDD+ projects in Cambodia are operating within the voluntary carbon market, which follows the Verified Carbon Standard, the Climate, Community, and Biodiversity standard, and Joint Crediting Mechanism. The Royal Government of Cambodia has dedicated explicit efforts in developing a National REDD+ Strategy and in submitting the nation's FRL. In addition, the safeguard information system and national forest monitoring system are already finalised and are ready for submission to receive the results-based payment.

Unfortunately, other large forest areas in Cambodia are still unable to benefit from REDD+. This research chose Virachey National Park due to its potential for carbon sequestration, and its urgent need for the kind of intervention that innovative carbon financing can provide such that forests in Cambodia can be properly managed, thus preventing further biodiversity loss.

Introduction

Climate finance flows have steadily increased from USD 349.5 billion in 2013 to USD 612 billion in 2017, only lowering slightly to USD 546 billion in 2018 (Buchner et al., 2021). Reducing Emission from Deforestation and Degradation in Developing Countries (REDD+) is a more cost-effective climate mitigation strategy than the other mitigation options because it contributes a large portion of revenue directly to communities while reducing CO₂ emission (Ehara et al., 2021; Nantongo and Vatn, 2019). REDD+ can also strengthen the cooperation between REDD+ project implementers and the private sector to reduce deforestation associated with the production of key global commodities and investments in land use governance, land tenure, land use planning, forest monitoring capacity enhancement, and sustainable local economic activities (FAO, 2012; GCF, 2019).

Southeast Asia has the highest rate of forest loss among the tropical forest countries. The destruction of tropical forests contributes around 15 per cent of anthropogenic CO₂ emissions. As such, REDD+ is often regarded as a win-win strategy in Southeast Asia; it can receive large flows of international finance towards reducing forest CO₂ emissions, which benefits forest communities, ecosystems, and the climate.

At present, Cambodia and Indonesia have received payments from the voluntary carbon market (VCM) totalling over USD 100 million, with Indonesia having the largest VCM project in the world. Viet Nam has also completed the results-based payments supported by the Forest Carbon Partnership Facility (FCPF) and has fulfilled the official agreement. In the agreement, the FCPF organisation pledged to purchase 10.3 million tonnes of CO₂ at USD 5 per tonne (a total of USD 51.5 million) via the Emission Reductions Payment Agreement.

On the other hand, Myanmar and Thailand are still working to complete all the required framework documents and are currently making good progress. The status in Malaysia and the Philippines is less clear — at least from the perspective of the documents gathered by the authors for a desk review. Southeast Asian countries have already developed and traded in the carbon market through REDD+. Accordingly, there is greater potential in this market due to the large forest cover available in Southeast Asia, especially in the protected areas (PAs) of each country in the region.

According to the forest reference level (FRL) submitted to the United Nations Framework Convention on Climate Change (UNFCCC), Cambodia can claim the production of around 10 million tons of carbon credits per year to obtain funds for results-based payment (MoE, 2020). Cambodia has approximately 8.5 million hectares of forest land, which constitute about 47 per cent of the country's total land area. From 2010 to 2014, Cambodia's net total annual CO₂ emissions averaged 130,905,048 total CO₂ content per year (Cambodia REDD+, 2017).

Although Cambodia has tremendous potential for carbon storage service, it also has limited capacity and financing to develop REDD+ projects in order to trade in the global carbon market (Cambodia REDD+, 2017). Hence, Cambodia can be portrayed as the great hotspot in Southeast Asia for developing and implementing REDD+.

In this context, this study reviews the lessons learned from REDD+ project development and implementation in Cambodia, such that the next REDD+ project can be prepared more effectively. This review will also provide the rationale as to why Virachey National Park of Cambodia should be developed to be the next REDD+ project.

Current REDD+ Policies and Regulation in Cambodia

Forest Cover in Cambodia

In the 1960s, 73.04 per cent of Cambodia's land area was believed to consist of forest lands (FA, 2010). Forest cover declined from 61.15 per cent in 2002 to 59.09 per cent in 2006 (FA, 2010). In 2010, it further decreased to about 58 per cent, and continued to decline to 53.60 per cent in 2015 (Figure 1). According to the 2016 assessment of the Ministry of Environment (MoE), forest land covers an area of 8,742,401 hectares or 48.14 per cent of the country's total land area (MoE, 2018). The most recent report from the MoE have shown that forest cover in 2018 was only 41 per cent of the country's land area (MoE, 2020). This new trend of deforestation is not only increasing the speed of forest destruction but also creating conflicts among the local communities. Accordingly, deforestation has become one of the most critical threat to biodiversity, local livelihoods, and the environment as the emission of CO₂ to the atmosphere continue to increase.

In 2018, Cambodia's forest cover was approximately 8,510,807 hectares or 46.86 per cent of the nation's total land area, including plantations of rubber, palm oil, and other perennial crops (Figure 2). In the context of the National Forest Program and for use under the Cambodia REDD+, forests are classified as evergreen forests (15.41 per cent of total land cover), semi-evergreen forests (5.72 per cent), deciduous forests (17.65 per cent), flooded forests (2.6 per cent), mangrove forests (0.17 per cent), rear mangrove (0.14 per cent), pine forests (0.05 per cent), and bamboo forests (0.67 per cent). These equate to 7,922,280 hectares of forest cover (43.62 per cent) that can be used as REDD+ areas.

Different types of forests are unevenly distributed in all provinces. Provinces with the highest forest cover in 2018 were in hilly districts, namely, Preach Vihear (1,045,230 hectares), Mondul Kiri (1,207,494 hectares), Stung Treng (943,740 hectares), Ratanakiri (884,285 hectares), Koh Kong (896,696 hectares), Pursat (721,630 hectares), and Kratie (688,616 hectares).

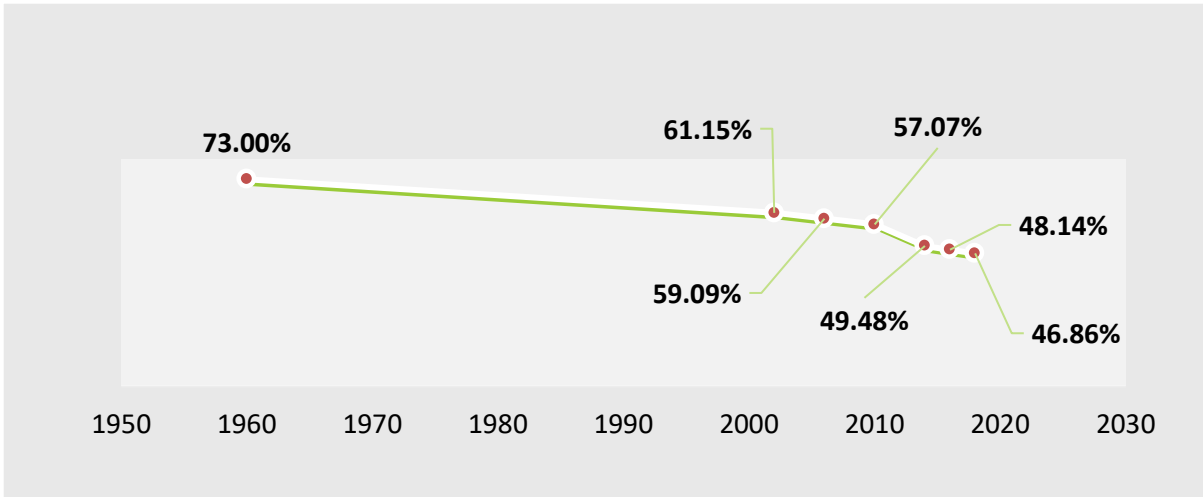


Figure 1. Forest cover change, Cambodia, 1960–2018

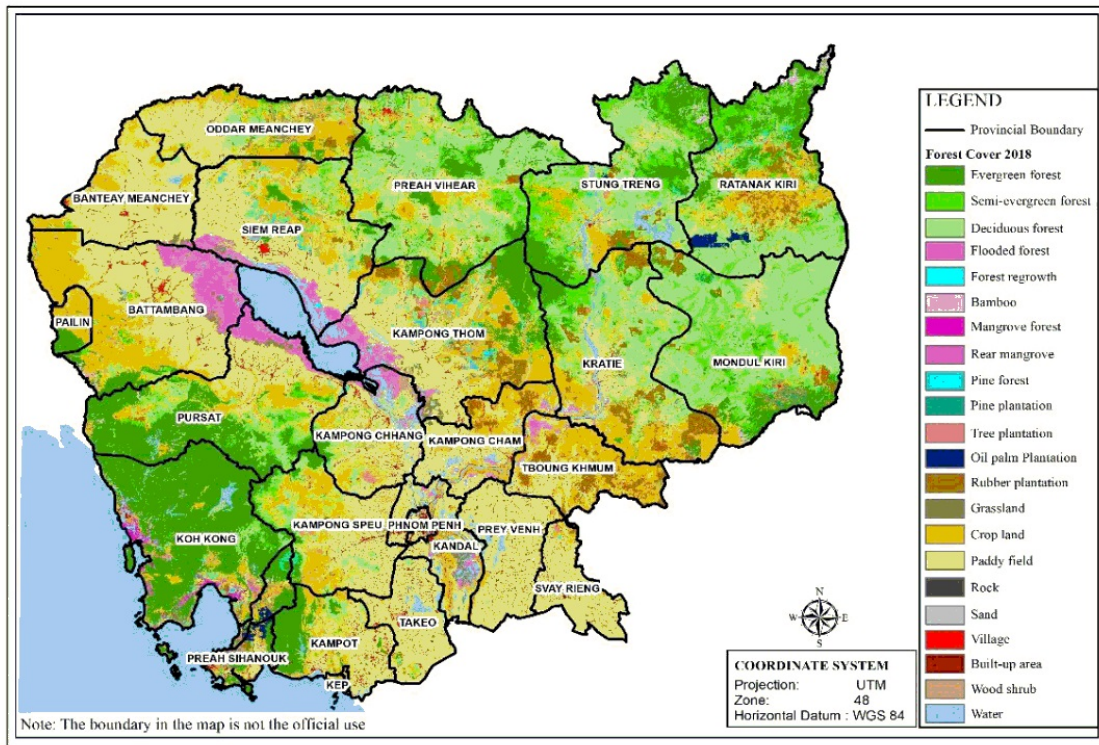


Figure 2. Land use and land cover, Cambodia, 2018

Source: MoE (2020)

History of REDD+ in Cambodia

The Cambodian government recognises REDD+ as a crucial strategy to fight the country’s rapid and complicated deforestation and degradation. As such, the government has organised the REDD+ national programme coordination and implementation in Cambodia (Figure 3).

Cambodia started its first pilot REDD+ project under the Verified Carbon Standard (VCS) in Oddar Meanchey from 2008 until the verification period in 2013, with 63,831 hectares of evergreen and dry deciduous forests. The Oddar Meanchey REDD+ project is expected to generate approximately 8.2 million tons of verified emission reduction over the period of 30 years (FA, 2014; Terra, 2014).

Thereafter, Cambodia implemented the Keo Seima Wildlife Sanctuary REDD+ (KSWS REDD+) in 2010 (WCS Cambodia, 2020). This became the first large-scale private sector collaboration for carbon credits in 2016 when Walt Disney Co. officially purchased USD 2.6 million in carbon credits from a climate change mitigation project in KSWS. The project covered 300,000 hectares of forest area in Monduliri province to offset its global footprint (Phak and Kali, 2016). The KSWS REDD+ is also verified by VCS and by the Climate, Community, and Biodiversity (CCB) standard.

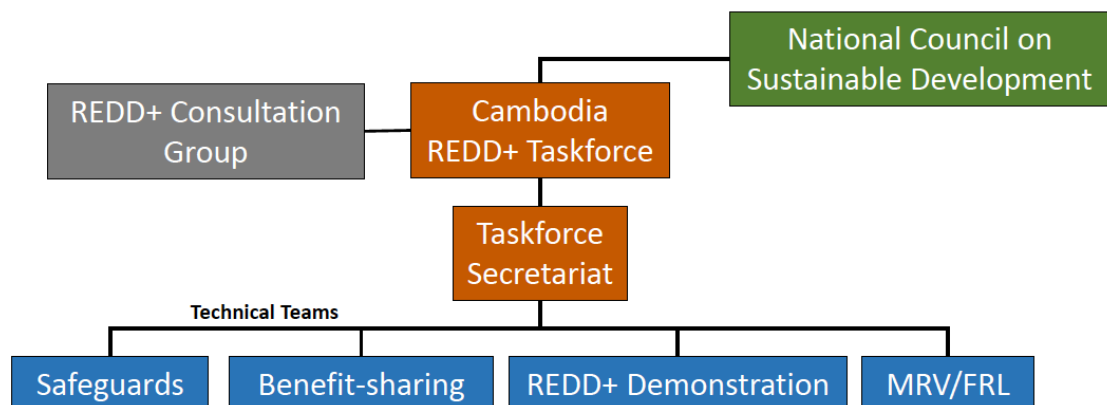


Figure 3. Programme coordination and implementation of REDD+ in Cambodia

Source: Wildlife Conservation Society (WCS) (2020)

Note: FRL = forest reference level
MRV = monitoring, reporting, and verification

Under the REDD+ programme, Cambodia could sell some carbon, albeit the country's carbon market remains rather weak. During the reporting period, Cambodia started two new REDD+ projects as follows:

1. The Southern Cardamom REDD+ Project implemented by the Wildlife Alliance and Stand for Trees. The project has potential for 497,000 hectares of lowland tropical rainforest, with annual avoided emissions of around 4,000,000 tons of CO₂ (Stand for Trees, 2020).
2. The Tumring REDD+ Project implemented by Cambodia's Forestry Administration (FA) and Korea's Forest Services. It has a potential for 67,791 hectares of forest land and a net emission reduction of 645,410 tons of CO₂ (FA, 2020).

In early 2018, following a critical report by the forestry NGO Fern, Virgin Atlantic Airways announced that it had removed the Oddar Meanchey REDD+ project from its carbon offset portfolio. To date, the total funding generated by carbon sales in Cambodia is around USD 12 million. The Joint Crediting Mechanism (JCM) project, which is supported by Mitsui Co. and coordinated by the Conservation International (CI), completed its Phase 1 in 2021 and is currently undergoing the process of registration to sell carbon in Prey Lang.

All the existing and developing REDD+ projects in Cambodia follow only the VCS and CCB standard. With these, the payment for carbon credit currently ranges from USD 5 to USD 13 per ton of CO₂ in carbon markets. Although this price is relatively low, it is expected that REDD+ will widely generate greater new funding sources for forest management. This would then reduce greenhouse gas (GHG) emissions from deforestation while improving local livelihoods and protecting biodiversity.

Policy and Regulation Supporting REDD+ Project in Cambodia

Cambodia's progress on REDD+ readiness activities and on the initiatives supported by the FCPF has been on track to achieve long-term goals. Cambodia has already prepared four main strategic policy documents based on the Warsaw framework to receive results-based payment.

National REDD+ Strategy

The government endorsed the National REDD+ Strategy (NRS) 2017–2026 in December 2017 and is implemented in two phases. Phase 1 (2017–2021) involved finalising the action plan and institutional arrangements for the implementation of the NRS. The NRS focus during Phase 2 (2022–2026), on the other hand, is to complete the transition from readiness to implementation and prioritise the achievement of measurable results. One of the key milestones during this phase is the establishment of a rigorous forest monitoring mechanism that can review policies and measures to address drivers of deforestation and forest degradation for effectiveness and efficiency (MoE, 2017)

Forest reference level

Cambodia's first FRL was endorsed in May 2017. The FRL is the basic data for measuring the implementation of REDD+ policies and measures the carbon pools and the reduction in emission deforestation and forest degradation. The FRL was prepared based on the guidelines of the Intergovernmental Panel on Climate Change for emission factors (Egleston et al., 2006) and is consistent with the decision of the UNFCCC.

Safeguard information system

The safeguard information system document has already been finalised by the Cambodian government. It is one of the important documents under the UNFCCC that is linked to the results-based payment. Safeguard information systems are established according to each country's national circumstances, policies, regulations, and laws to ensure each country's rights to the effective implementation of REDD+.

National forest monitoring system

The national forest monitoring system is the basis for sustainable forest management strategies. Cambodia started implementing forest monitoring in 1965; from 2003 to date, the country has been performing forest assessment every four years. The forest inventory is developed in a systematic manner as a reporting mechanism, which transmits information from the national to the subnational level. This national forest monitoring system is crucial to forest management in a REDD+ project area as it is based on the existing mechanisms and methods.

Although Cambodia has already prepared all documents based on the Warsaw framework, some challenges need to be addressed including the following:

1. The lack of a system for data collection on safeguards and data sharing;
2. The need to address the drivers of forest loss/degradation from outside the forest, bearing in mind that REDD+ in Cambodia has focused only on interventions in the forest sector thus far;
3. The need for adequate financial and human resources for effective regulatory enforcement; and
4. Incentivisation of local and indigenous ethnic minorities.

Current REDD+ Implementation in Cambodia

Cambodia has received a total of USD 11.6 million from selling carbon credits through two REDD+ projects. All current REDD+ projects in Cambodia have operated within the VCM, which follows the VCS and the CCB standard (Yeang, Washington, Ken, Choup, and Silverman, 2018). The Royal Government of Cambodia has exerted significant effort in developing a national REDD+ strategy and in submitting the nation's FRL (Ehara et al., 2021; GCF, 2019). In addition, the safeguard information system and national forest monitoring system have been finalised and ready for submission in order to receive the results-based payment (MoE, 2020). Unfortunately, other large forest areas in Cambodia are still unable to benefit from REDD+.

Keo Seima REDD+

The first project is the Keo Seima REDD+ in Mondulkiri province. To date, this project has generated around USD 3.8 million of carbon revenue. The Keo Seima REDD+ project is located in KSWS, which has a total land area of 292,690 hectares. The REDD+ project development started in 2010 and covered 167,000 hectares of forest area. This project was implemented through the coordination between the FA and the WCS from 2010 to 2016, and between the MoE and WCS from 2016 to the present (Figures 4 and 5).

The Keo Seima REDD+ project can contribute up to 17.4 million tons of CO₂ emissions avoided over the next 10 years. This is equivalent to annual CO₂ emissions from four million passenger vehicles, two million homes, and approximately four coal-fired power plants. This project benefits 13,000 people living in KSWS across 20 villages, including the central land people and the native people of Bunong. This project can also save the habitats of the endangered black-shanked douc and yellow-cheeked crested gibbon. Moreover, it is also the home of 130 Asian elephants, which is one of the largest remaining populations in the Lower Mekong (WCS Cambodia, 2023).

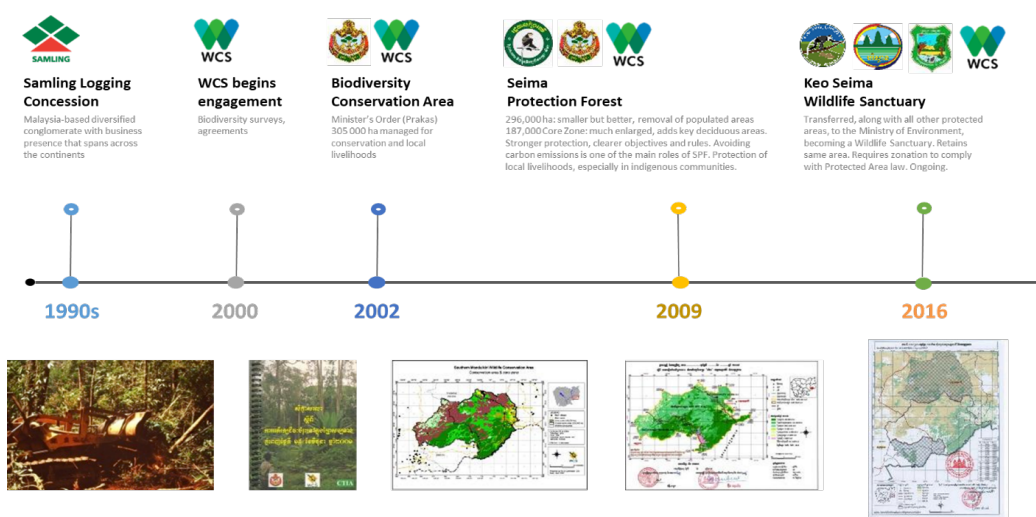


Figure 4. Timeline of Keo Seima REDD+ project development

Source: WCS Cambodia (2020)

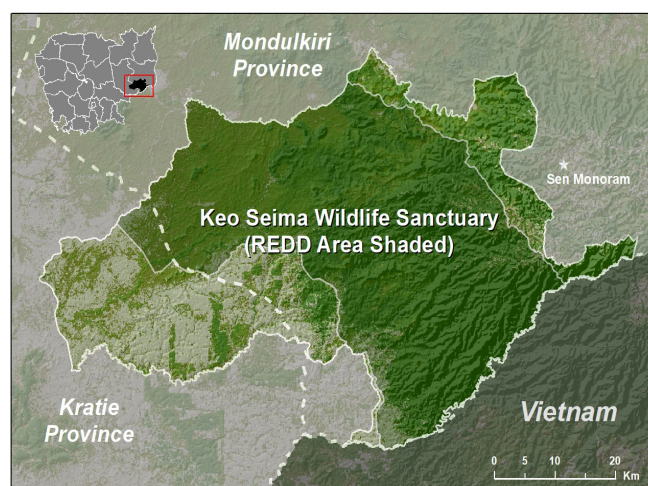


Figure 5. Keo Seima REDD+ project site

Keo Seima REDD+ project is implemented under the VCS and CCB standard. The revenue from the carbon traded from this project helps to achieve the following important outcomes:

1. A total of 25,000 hectares of deforestation avoided since 2010
2. A total of 11.5 million tons of avoided GHG emissions since 2010
3. Preserved cultural identity and natural resources for over 2,500 households
4. Creating 449 jobs (patrol team and community agents)
5. A total of 782 children engaged in education programmes
6. About seven villages securing legally recognised communal land titles
7. Establishment of the Jahoo Gibbon Ecotourism Camp

Southern Cardamom REDD+ Project

The second REDD+ project is located in Southern Cardamom National Park in Koh Kong province, Cambodia (Figure 6). The Southern Cardamom REDD+ Project (SCRP), which is jointly implemented by the MoE, Wildlife Alliance, and Wildlife Works, aims to avoid 3–4 million tonnes of emissions per year for 30 years.

The SCRP is implemented within the framework of the VCS and CCB standard. The project covers an area of 493,582.6 hectares, which encompass parts of Southern Cardamom National Park and Tatai Wildlife Sanctuary. It will protect a critical part of the Cardamom Mountains Rainforest Ecoregion.

The SCRP accounting area, as defined by the VCS, is 442,871 hectares. The project's climate benefits include the avoided emission of approximately 3,836,375 tons of CO₂ equivalent during the third monitoring period and over 108 million tons of CO₂ equivalent throughout the duration of the project.

The SCRP will generate substantial community and biodiversity co-benefits. New and sustainable livelihood opportunities (e.g., direct employment, alternative income-generating activities, and initiatives to stimulate investment in businesses) will be designed to reduce pressure on the environment while significantly improving the community's well-being.

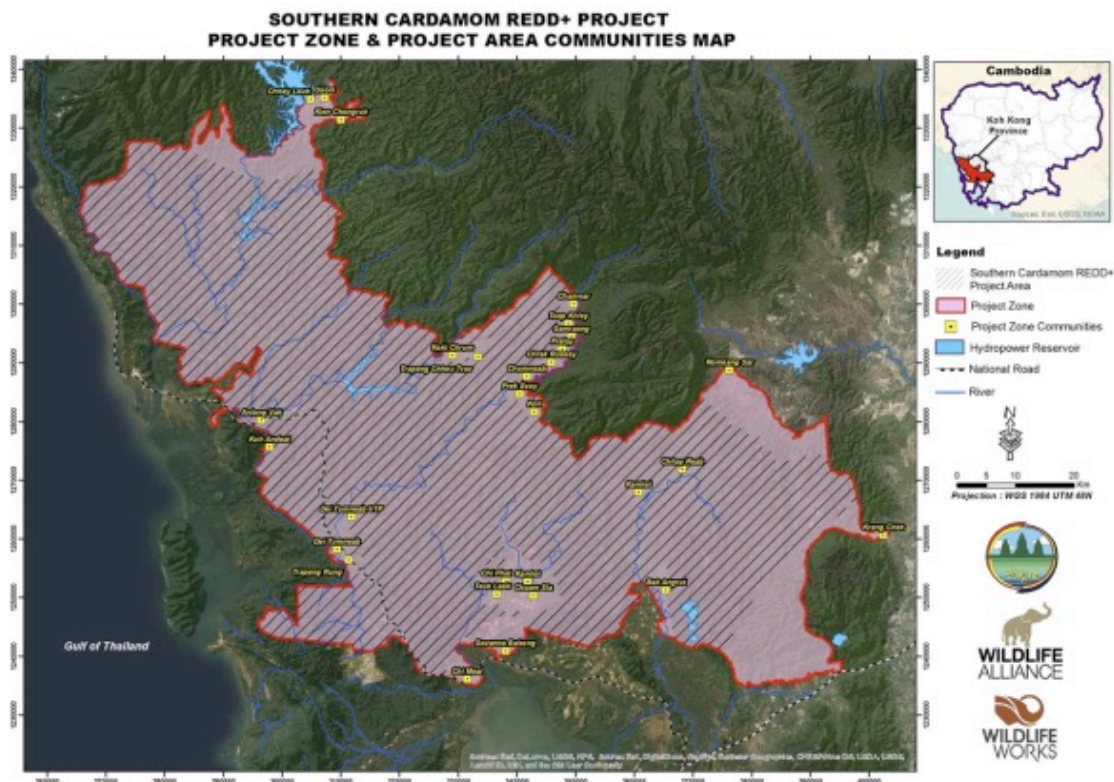


Figure 6. Southern Cardamom REDD+ project site

The revenue from carbon is helping to achieve the following important outcomes:

1. About 250 families trained on agricultural methods and intensification
2. Eight training events on community-based ecotourism conducted for 196 community service providers in Chi Phat and Chhay Areng
3. A total of 27 villagers employed and undergoing on-the-job training in 2021
4. Conduct of awareness raising activities about the Southern Cardamom REDD+ initiatives in 85 meetings in 29 villages (3 meetings/village) of 10 communes and 4 districts of Koh Kong province
5. A total of 148 rangers appointed in 2021 to assist in forest management

Completed Projects

The Oddar Meanchey Community Forestry REDD+ project was the first pilot project in Cambodia, and it continues to have great potential for full operation (Yeang et al., 2018). However, following a report by the forestry NGO Fern in the early 2018, Virgin Atlantic Airways announced that it would remove the Oddar Meanchey REDD+ project from its carbon offset portfolio.

Upcoming REDD+ Project in Cambodia

Tumring REDD+ Project at Prey Lang

Korea's Forest Services and the FA of the Cambodian government have completed the project documentation for the Tumring REDD+ project in Prey Lang and has already reached the verification and price negotiation stage. Tumring REDD+ is within the Prey Lang landscape, which contains the largest remaining area of lowland evergreen forest in Cambodia and encompasses a part of the Indo-Burma hotspot. Prey Lang is one of the world's 34 biodiversity hotspots. The Tumring REDD+ project is located in Kampong Thom province, Cambodia, and is currently coordinated by the FA and Wildlife Works (Figure 7).

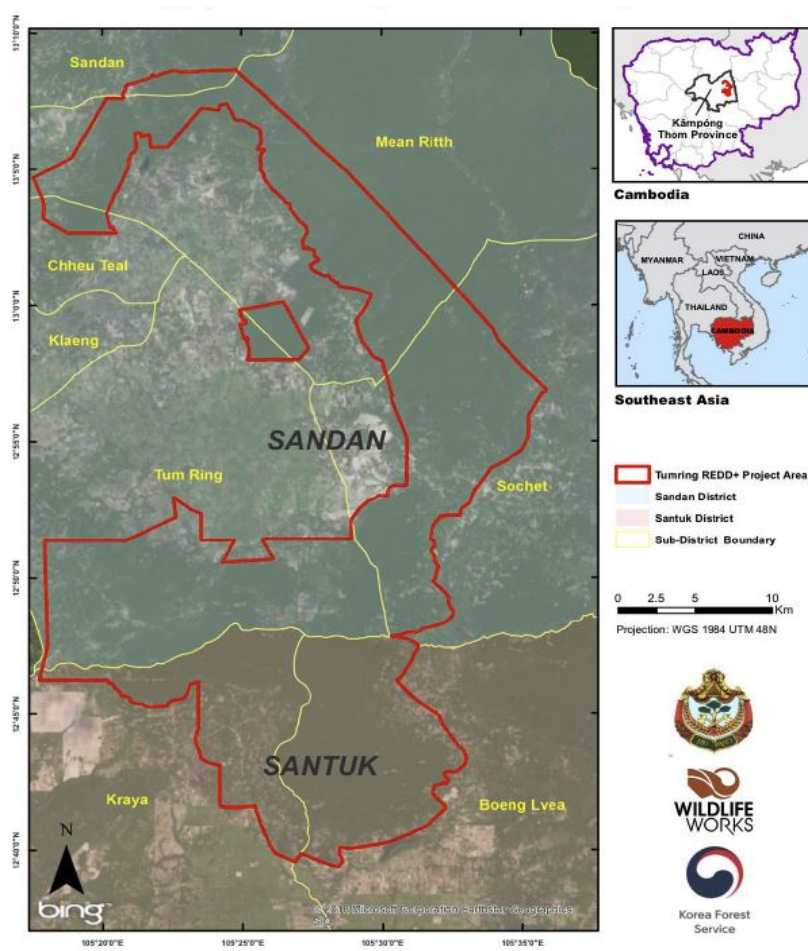


Figure 7. Tumring REDD+ project site

The current carbon stock within the accounting area of Tumring REDD+ are as follows:

- Evergreen forest: 40,541 hectares = 495.4 tons of CO₂ equivalent per hectare
- Semi-evergreen forest: 197.71 hectares = 135.5 tons of CO₂ equivalent per hectare
- Deciduous forest: 456.78 hectares = tons of CO₂ equivalent per hectare

The Tumring REDD+ project expects to reduce over 3 million tons of CO₂ emissions over a 10-year timeframe. The expected outcomes from Tumring REDD+ are as follows:

1. Increase forest protection by expanding the current rangers and community protection forces
2. Assist local communities by promoting effective land use planning and granting secure land tenure
3. Promote alternative livelihoods through enhancing agricultural productivity
4. Manage unsustainable natural resources extraction
5. Protect the western edge of the Prey Lang landscape so that viable populations of threatened species (e.g., clouded leopard, dhole, and bear) are maintained

Currently, the Tumring REDD+ project has reached the negotiation stage with several buyers. The Cambodian government has negotiated the price between 5 USD and USD 10 per ton CO₂ equivalent.

Prey Lang REDD+ JCM

The Prey Lang JCM project, which was invested by Mitsui Co. and coordinated by Conservation International (CI), completed Phase 1 in 2021 and is now undergoing the process of registration to sell the carbon in Prey Lang. This is the first project, which used the JCM scheme in Cambodia.

Phase 1 of the JCM project started in 2008. During the early stages, Conservation International (CI) Cambodia worked with FA Cambodia in the project; after 2016, Prey Lang was designated as a wildlife sanctuary. Currently, the proponents of the project are the MoE, Mitsui Co., Conservation International-Cambodia, the local Cambodian NGO Sansom Mlup Prey, and a number of sub-national authorities (Figure 8).

Project Phases and Target area for Implementation

- PhaseI: 2018-2020, Stung Treng Province, PLWS
- PhaseII: 2021-2031, PLWS
- PhaseIII: Other Projected area of Cambodia

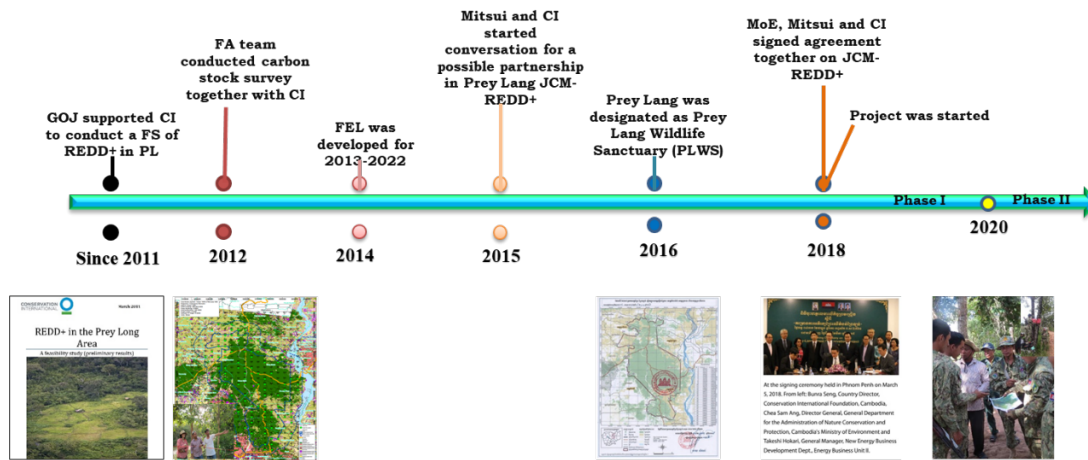


Figure 8. JCM project phase

Note: CI = Conservation International JCM = Joint Crediting Mechanism
 FA= Forestry Administration MoE = Ministry of Environment
 FS = feasibility study PL = Prey Lang
 GoJ = Government of Japan PLWS = Prey Lang Wildlife Sanctuary

The JCM is located in Stung Treng province, Cambodia. Based on the forest accounting conducted during Phase 1, the total forest area under the project was 86,738 hectares covering nine villages (Figure 9). The project expects to reduce GHG emissions by about 4.5 million tons CO₂ equivalent within the period of 13 years (2018–2029). Currently, the JCM project has reached the validation and registration stage. However, the current price of carbon offset remains unclear. In Phase 2 of the project, Mistui Co. has invested USD 2,396,875 from 2021 to 2031 (about USD 395,000 per year). The expected outcomes from the JCM REDD+ are as follows:

1. Enhanced forest protection through law enforcement
2. Improved consultation and participation in REDD+
3. Benefit-sharing for the community members' benefit

Central Cardamom REDD+ by Conservation International

The new REDD+ project development is implemented by CI in Central Cardamom National Park. The Central Cardamom REDD+ is located in the provinces of Koh Kong, Pursat, and Kampong Spue. The project site is an excellent habitat for more than 400 wildlife species, 70 fish species, and more than 200 flora species. Moreover, this national park is one of the important water sources for Tonle Sap Lake. Since 2021, CI has been developing the project documentation in this national park such that it can be developed as the next REDD+ project in Cambodia. The specific location and the targeted communities are yet to be identified. CI expects to finish the draft project documentation by 2023.

Deforestation Map in Prey Lang JCM-REDD+ Project From 2018-2020

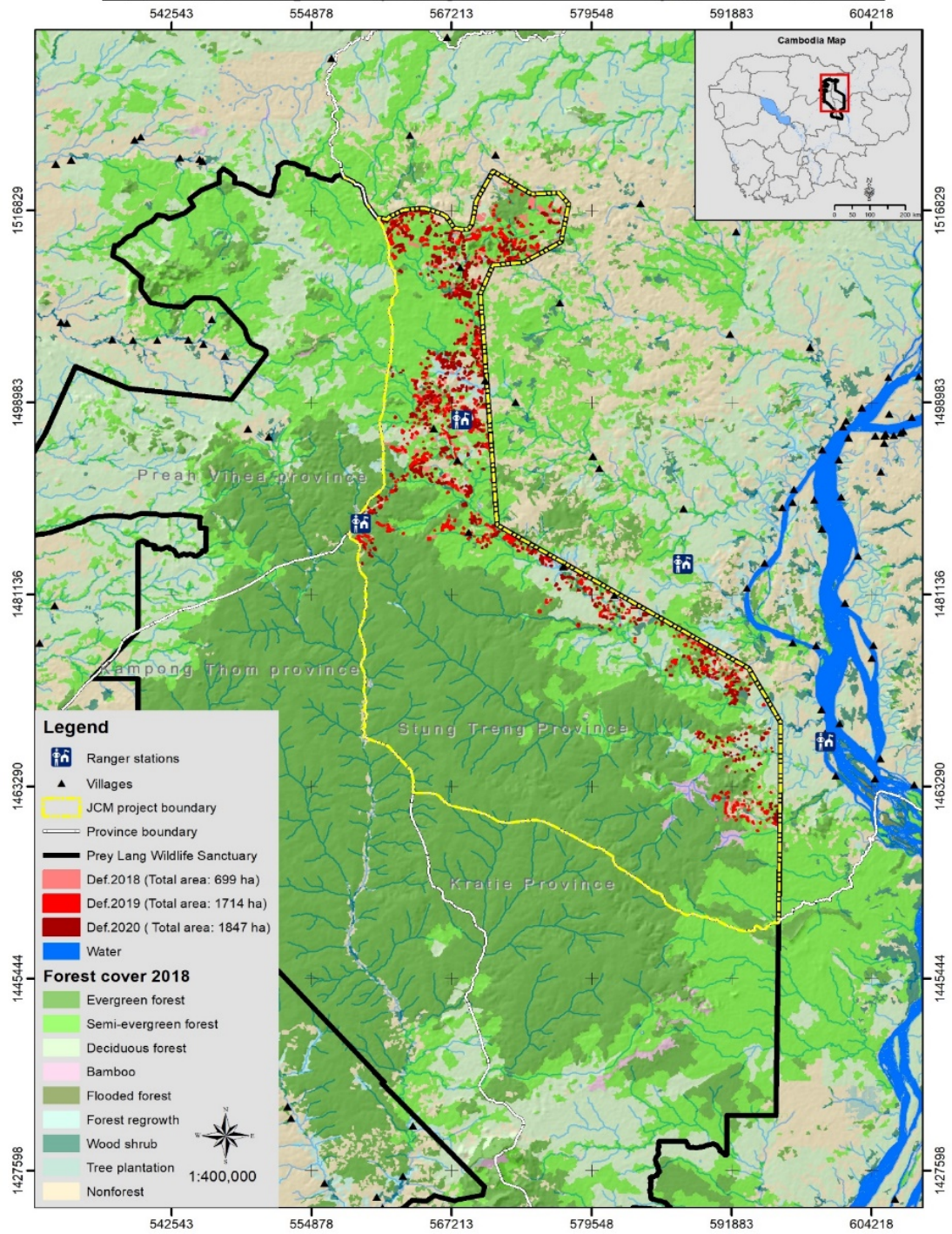


Figure 9. JCM Prey Lang project site

Critical Factors in Assessing the Feasibility of Voluntary Carbon Market for Virachey National Park

The development and implementation of the REDD+ initiative in Cambodia should generate a significant new source of funding towards the effective implementation of sustainable forest management and the enhancement of forest carbon stocks, biodiversity, forest conservation, ecosystem protection services, and improving the rights and livelihoods of forest people.

Virachey National Park was established as a PA in Cambodia by virtue of a Royal Decree on November 01, 1993. Likewise, Virachey was named an ASEAN Heritage Park in 2003. It is located in Northeast Cambodia and has a total land area of 3,325 square kilometres (332,500 hectares) in Ratanakiri and Stung Treng provinces. It is one of the top priority areas for conservation in Southeast Asia, with it being the largest PA in Cambodia. Virachey is bordered to the north by Lao PDR and to the east by Viet Nam. This national park spans two provinces and includes four districts and eight communes.

Virachey National Park has tremendous potential for carbon credit through its rich semi-evergreen and deciduous forests. It has unique terrestrial landscapes, which include mountains, rivers, waterfalls, grasslands, and forests. It contains dense semi-evergreen forest, bamboo forest, mixed deciduous forest, montane forest. Therefore, it has rich biodiversity (Baird and Dearden, 2003).

Virachey's vast forests provide a great habitat for many endangered species such as elephants, wild cattle, and several spectacular, globally threatened primate and bird species (Chanrith, Baromey, and Naret, 2016). According to the records of Virachey National Park Authority, the recorded wildlife in the national park are 11 species of amphibians, 15 species of mammals, 100 species of birds, 26 species of reptiles, 37 species of fish, 19 species of katydid, and 30 species of ants. The current flagship species in Virachey are cloud leopard, gaur, banteng, bear, elephant, vulture, among others.

Virachey has been home to indigenous and hill tribe people for centuries and remains a centre for cultural diversity in Cambodia and the ASEAN region. About 85 per cent of the population are composed of indigenous peoples (i.e., Kavet and Brau). Shifting cultivation and extraction of non-timber forest products (NTFPs) are the main livelihood activities in the area (Ironsides and Baird, 2003).

Currently, Virachey National Park is collaborating with local communities and the MoE to organise and develop five community protected areas (CPAs). These CPAs were simultaneously in the national park on 21 June 2006 to protect the forests and to enhance local livelihoods. The CPAs are as follows:

1. O Toung, covering 9,862 hectares in four villages (i.e., Rok, La Lai, La Meuy, and Trak), Kok Lak commune, Veun Sai district, Ratanakiri province;
2. O Kampha, covering 2,383 hectares in four villages (Sonh, Pang Kit, Ki Kuong, Reang Vinh) Taveng Leu commune, Taveng district, Ratanakiri province;
3. O Tabok, covering 2,800 hectares in Tabok village, Taveng Leu commune, Taveng district, Ratanakiri province; and
4. Mondul Yon, covering 550 hectares in Tabok village, Taveng Leu commune, Taveng district, Ratanakiri province; and
5. O Chai, covering 2,801 hectares in Santipheap and Thmor Keo communes, Siem Pang district, Stung Treng province

Currently, the forests and biodiversity in Virachey National Park are decreasing at an alarming rate. The deforestation in Virachey has caused the local communities to lose their livelihoods and has caused social injustice, loss of cultural identity, and conflicts. Most importantly, the spreading story about the ‘Dragon’s Tail’¹ area of Virachey has made it infamous internationally, which has consequently triggered international fund support from development agencies. Currently, very few NGOs organise and implement small-scale community development programmes in the area. Accordingly, these situations reflect the lack of international and national interventions in rural land management, law and enforcement, and livelihood improvement programmes.

Figure 10 shows the 1987–2017 satellite images of the land use and land cover analysis of Virachey. The images show that deforestation due to human-induced activities (i.e., illegal logging and forest land conversion to agricultural plantations) has reached the critical level. The worst period of deforestation happened from 1997 to 2007, when many economic land concessions were granted during the period and illegal logging activities became rampant along the border of Viet Nam at the Dragon’s Tail area and Siem Pang district, Stung Treng province close to the Lao border.

¹ Dragon’s Tail area (right top in Map 2 in Figure 10) is an area with many problems on economic land concessions due to logging. More details can be found in <https://thediplomat.com/2016/05/hope-and-horror-in-cambodias-virachey-national-park/>

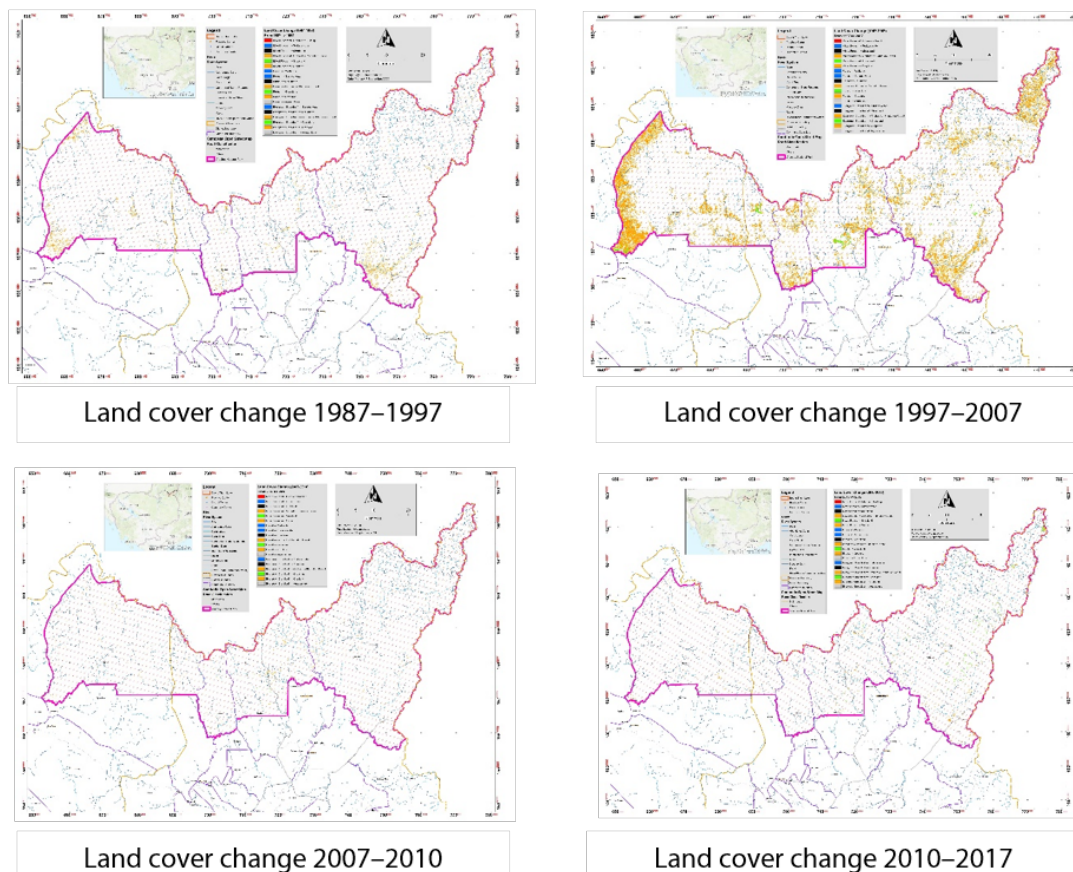


Figure 10. Land use and land cover changes, Virachey National Park, 1987–2017

Note: Areas shaded in yellow represent deforested areas

According to the DPSIR (driver forces, pressures, states, impact, and response) framework analysis, at least four main driver forces have negatively affected the natural environment and social development in Virachey National Park (Figure 11). The severe driver force that pushes illegal logging in the park is the *increasing demand for timber of the domestic and international markets*. Timber has been illegally logged and transported directly to neighbouring countries. Poachers are very active in the national park that even park rangers have begun to do more patrols in recent years (McCann, 2016).

The second driver is *economic land concessions* (ELC). The local people did not find any positive correlation between ELC and improved environmental governance; enhanced environmental education programme; better conservation; or increased funding for environmental protection, preservation, and restoration. Instead, ELC investments have caused the quality and quantity of land and natural resources, habitats, and NTFPs to decline and have caused ecosystem loss (Chanrith, Baromey, and Naret, 2016).

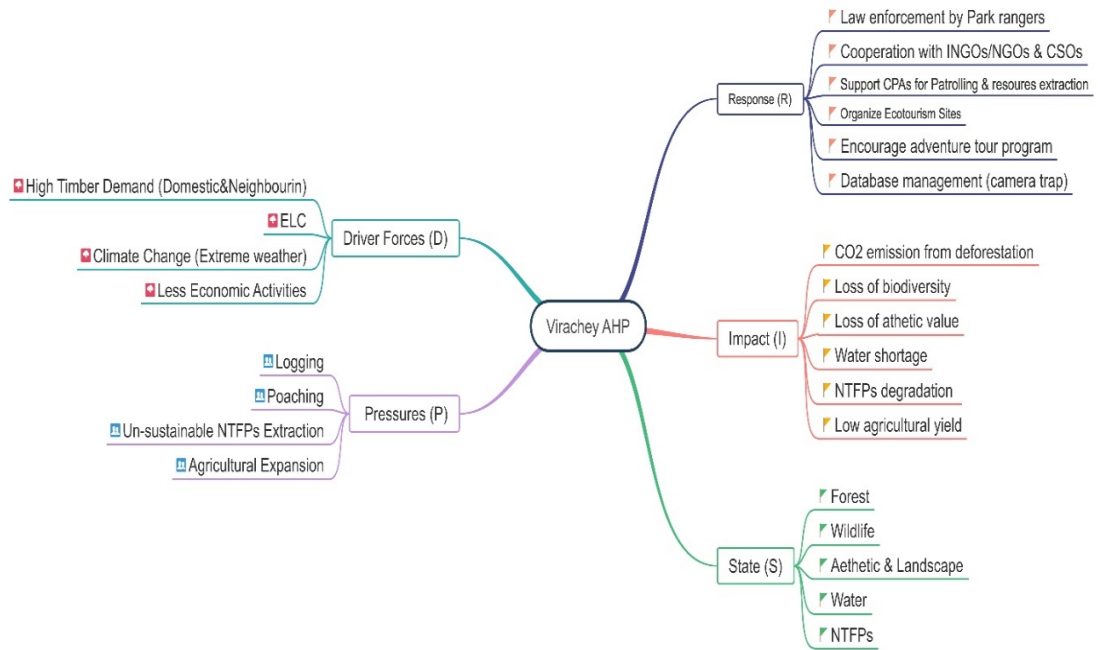


Figure 11. Driver forces, pressures, states, impact, and response analysis, Virachey National Park

Note: AHP = ASEAN Heritage Park
 INGO = international non-governmental organisation
 CPA = community protected area
 NGO = non-governmental organisation
 CSO = civil society organisation
 NTFP = non-timber forest product
 ELC = economic land concession

Climate change is the third driver that induces ecosystem degradation and triggers more disasters, including increased frequency and intensity of unusual rain, drought, and extreme temperature (Chou and Sovann, 2019). Virachey National Park has also been recently impacted by these extreme events, according to interviews with the provincial officer, park manager, and CPA representatives.

The fourth driver is *less economic activity* due to increase in wilderness area. Economic activities such as collecting NTFPs, swidden agriculture, fishing, hunting, and ecotourism are the traditional economic practices in the area. Thus, the local communities highly depend on natural resources for their livelihoods and survival (Cheb and Kong, 2017).

These drivers (e.g., logging, poaching, unsustainable NTFP extraction, and agricultural land expansion) put direct pressure on Virachey’s wilderness and cultural landscape. They directly influence the ecosystem value of Virachey, such as the value of forests, wildlife, aesthetic and landscape, water, and NTFPs. Indeed, many critical problems are happening in Virachey, such as CO₂ emission from deforestation, loss of biodiversity, loss of aesthetic value, water supply shortage, NTFP degradation, and low agricultural yield.

Hence, the Cambodian government at the national, provincial, and park levels and the communities together with partner NGOs have developed measures to counter these circumstances. Such measures include intensifying law enforcement to crack down illegal logging, cooperating with development agencies, supporting CPA patrolling, reducing

resource extraction, establishing ecotourism sites, developing adventure tour programmes, and establishing database management.

Nevertheless, these are not enough to address all the problems mentioned. The current conservation activities being implemented cannot effectively preserve the forests and biodiversity in Virachey. Thus, innovative conservation financing is needed to enable stakeholders to design improved and more impactful funding for and implementation of conservation measures.

Accordingly, this study selected Virachey National Park as a site for REDD+ project due to its potential for carbon sequestration. Moreover, it urgently needs the kind of intervention that innovative carbon financing can provide in order to manage the forest areas in the national park and to prevent further biodiversity loss.

Conclusion

The REDD+ process requires extensive initial preparation time and effort to establish the necessary framework. The study needs to identify potential areas for REDD+ project development by measuring the carbon stock and the potential economic value of the forest areas under threat.

This current study is the first step in assessing the gains and losses in carbon stock based on the changes in forest cover. It then reveals a unique example of the cost of CO₂ emission, which amounts to approximately USD 1 billion, owing to the deforestation in Virachey National Park alone. If the forest cover in Virachey further changes in the future because the identified drivers and pressures are not properly managed, then the carbon stock available would also be affected, thereby worsening the CO₂ emission situation.

This study also highlights the high potential of carbon credits from the VCS due to the REDD+ projects. Although Virachey has an extremely high potential for carbon storage, REDD+ project development must also consider other aspects, including the following:

1. Technical prospects (i.e., adequate data to estimate and verify forest cover change, annual carbon sink, and response capacity to reduce deforestation);
2. Institutional management;
3. On-the-ground partners (i.e., stakeholder engagement and local project implementers or facilitators);
4. Prospects for fair and equitable agreement (i.e., benefit-sharing mechanism); and
5. Cost-benefit analysis (i.e., cost-effectiveness and economic return from carbon finance)

These aspects are needed to meet the JCM, VCS, and CCB standard, and accordingly obtain results-based payment.

Therefore, more in-depth research should be conducted to verify the forest cover, biodiversity inventory, institutional management, the operational costs of REDD+ development under varying scenarios, community capacity assessment, and community sentiment regarding benefit sharing.

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