

# **Sustainable Landscapes and Ecotourism in Cambodia**

## **FINAL**



**CONSERVATION  
INTERNATIONAL**

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# Introduction

In August 2018, the World Bank (Bank) contracted Conservation International (CI) to develop this “stocktaking” report on Forests and Ecotourism in support for the World Bank-financed “Integrated Landscape and Natural Resources Management Project”. The Bank is currently formulating a \$50 million International Development Association (IDA) loan program support to the Royal Government of Cambodia to “improve natural resources management and related value addition in selected landscapes.” The loan program will focus on the Cardamom-Tonle Sap landscape in southwest Cambodia. The Cardamom Mountains serve as carbon sinks, protect watersheds including those that feed into the Tonle Sap, reduce soil erosion and loss of soil fertility, and prevent flooding and sedimentation. The Tonle Sap is one of the largest and most productive freshwater fisheries in Indochina, supporting millions of people with income, food and water. The program consists of three components:

- 1) Investments for Monitoring and Sustainable Landscape Planning
- 2) Infrastructure to Support Ecotourism and Related Value Chains
- 3) Project Management, Coordination, Monitoring and Evaluation

In support of the loan program development, CI was hired to:

- conduct a stocktaking of ecotourism to support ecotourism hotspot mapping in the Cardamom Mountains and around the Tonle Sap, specifically the adjacent target provinces;
- conduct a stocktaking of key forest landscape challenges/issues, and forestry-related activities in targeted provinces; and
- identify potential activities to be financed to provide value-added to ecotourism and forestry.

The stocktaking is organized around three key issues: governance of land ownership, non-timber forest product (NTFP) value chains, and forest ecosystem services. In addition, CI conducted a stocktaking exercise to gather and organize information to support mapping of ecotourism hotspots in Cambodia, as part of the project preparation process and identification of potential ecotourism hotspots in the Cardamom-Tonle Sap (with a focus on Prek Toal) landscape.

## Governance of Land Ownership

### History of Land Governance in Cambodia

Historically in Cambodia, land tenure was dictated by traditional Khmer rural codes from pre-colonial times. While the King owned all the land in the country, citizens had possession rights based on the activities they did on the land (clearing, cultivating, settling, etc). The practice and perception of communal management and collective use of common property resources such as forests and fisheries also stem from these early times (Scurrah and Hirsh, 2015).

During the Democratic Kampuchea period (1975-79), the Khmer Rouge eliminated previous land tenure systems and destroyed all land records. The system of ‘ownership rights’ and ‘possession’ rights, which was in place since the French colonial period was revoked. The French had put in place a system of “ownership,” which was an “inalienable right to land irrespective its use,” whereas “possession” was tied to land use (Scurrah and Hirsh, 2015). However, during the Khmer Rouge regime, all land belonged to the State and a systematic process of relocation of people to work collective farms took place.

Following the signing of the Paris Peace Accords in 1991, the first land law was passed in 1992, that stated that all land belonged to the State but allowing only “possession” rights to citizens. However, by this time many properties, especially in Phnom Penh, were informally owned by politically powerful or

well-connected families, or had been occupied by the refugees from the countryside that had come back to the city after 1979. People applied for certificates of possession but only about 10 percent of the 4.2 million applications that were received got the certificates. At the same time, a donor funded effort, led by the World Bank, aimed to establish a centralized forest concession system to generate revenues for post-war reconstruction (Scurrah and Hirsh, 2015).

In 2001, the Land Law was amended establishing a legal framework and major reforms for the recognition of land and property rights throughout Cambodia. Importantly, the 2001 Land Law created a new system of land ownership, namely state-public land, state-private land, and private individual land and indigenous/communal land. Critically, it also inherently established a market for land and for the first time sought to attract foreign direct investments, through the establishment of a formal system of granting two types of land concessions on state-private land: economic land concessions (ELCs) for economic purposes (agribusiness) and Social Land Concessions (SLC) for livelihood and subsistence purposes and as a way to redistribute land to landless people after the war. The new law provided for:

- private ownership for both residential and agricultural holdings under Article 38;
- creation of a land registry and system for registering titles and encumbrances;
- communal tenure for indigenous communities and religious sites; and
- a cap on industrial agricultural concessions to 10,000 hectares.

Under the Land Law, the Ministry of Land Management, Urban Planning and Construction (MLMUPC), through the Cadastral Commission is responsible for issuing land titles. MLMUPC is responsible for identifying, mapping and registering land for the purposes of issuing titles. The Law also created two different ways to register land. In the first, the government chose areas in which all the plots of land are measured, registered and titled. In the second, sporadic registration was initiated by citizens applying for land titles from the central Cadastral Commission office.

In 2002, to support the legal and institutional framework of the land-law, a multi-donor program, led by the World Bank, called the Land Management and Administration Project (LMAP) was initiated. The LMAP project aimed to facilitate the establishment of the land market and secure land tenure through a systematic process for land titling and registration. Sub-decrees No. 46 and 47 were adopted on May 31, 2002 to support implementation of the Land Law, and systematic and sporadic land registration commenced; between June 2012 and December 2014, almost 2.6 million titles and 610,000 titles were issued under each system respectively and an average of 400,000 titles per year were issued each year. By 2017, the Ministry of Land Management, Urban Planning and Construction (MLMUPC) had issued 4,881,582 titles for the country's estimated 7 million land parcels (MLMUPC annual report January 2018). However, a major constraining factor faced by LMAP in ensuring tenure security was inherent in the Land Law itself; the Land Law only recognized land "ownership" rights for land that was settled after the law was promulgated, i.e., no ownership rights were granted to tracts of land that had been settled prior to 2001. Additionally, the vast majority of these titles were issued for low-land settlers; in upland areas, where there were far greater cases of overlapping claims to land, concessions, and in-migration of people from low-lands, it was a much more contentious endeavor to issue clear land titles. LMAP avoided registering land that were disputed and facing the possibility of concessions, thereby exposing people to the possibility of eviction. This issue came to a head in the case of the Boeung Kak lake in Phnom Penh, which resulted in the World Bank ending its engagement in the program in 2009 (Scurrah and Hirsh, 2015).

During this time, with the rapid increase in ELCs approved a significant increase in the number of land disputes ensued due to the uncertain land tenure status of parcels of land, particularly in rural upland areas adjacent to the ELCs. In response, in May 2012 land registration and titling commenced under a government order Order 01BB (commonly known as "Order 01") on Measures for Strengthening and Increasing the Effectiveness of the Management of Economic Land Concessions, issued by Prime Minister Hun Sen. Order 01 issued a moratorium on new ELCs, and issued land titles for people living on state land, forestland, land overlapping with ELCs, and forest concessions.

However, in 2008, with World Bank and German Development Assistance, the Land Allocation for Social and Economic Development (LASED) project was started with the aim to allocate SLCs and



create a partnership between ELCs and SLCs (i.e., people who were granted SLCs could be employed by the ELCs). While there was an increase in the allocation of SLCs during the project, in reality far fewer SLCs were granted than was the goal (Scurrah and Hirsh, 2015). The LASED program provided MLMUPC assistance to continue the land titling process that was hampered under LMAP. Order 01 was seen by many as politically motivated by the Prime Minister in the lead-up to the 2013 national elections. The titling process under Order 01 was discontinued after the elections.

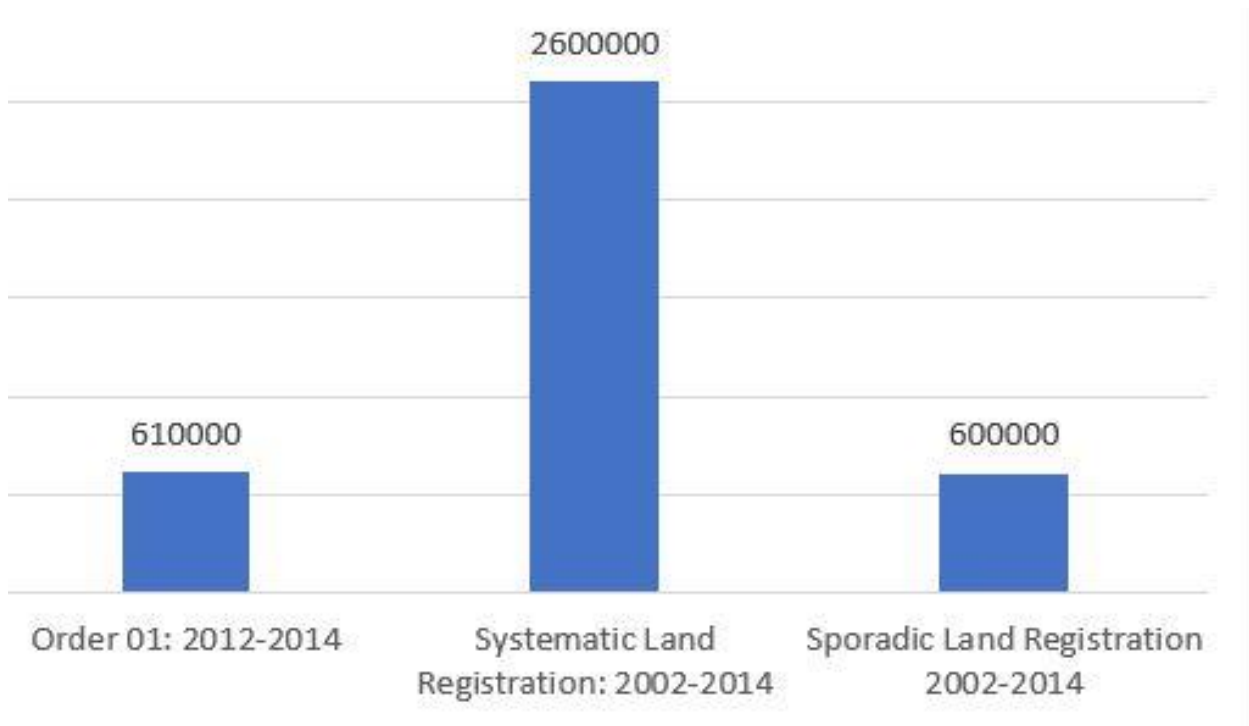


Figure 1 Land titles issues under various policies in Cambodia between 2002-2014.  
 Source: <https://opendevelopmentcambodia.net/topics/land-tenure-and-titling/>

## Types of Private Land Titles in Cambodia

### Hard Title

A hard title is an ownership certificate which is issued by the Cadastral Office and recognized at national ministerial level as well as at the Sangkat (council) and district level. This is the most secure form of ownership, as registration should be the only evidence required of ownership. These are the form of land titles that were registered under the LMAP (about one million by 2009). However, many land transactions are still done with soft title deeds at the commune and district level.

### Soft Title

Land held under soft title is land that has been registered and issued at the local Sangkat or district level only and not at the national level. It is technically considered “possession” status and not ownership. Soft title documentation can take a variety of forms. Owners with no evidentiary documentation may request a possession status certificate from the local Sangkat. A letter of transfer from the previous possessor stamped by the Sangkat and the district office is also proof of soft title. Soft titles are no longer able to be issued by Sangkat/commune, but can now only be issued by national government and provincial government.

## **Possession**

All legal possessors of land have the right to convert their possession into ownership when systematic registration comes to an area or a sporadic title is applied for. To be considered legal, possession must have commenced before August 30, 2001, and must have been continuous, peaceful, honest, unambiguous and known to the community. There can be no legal possession of state public land, private stateland, or collective land. Legal possession of land is not as strong as ownership, but it gives the possessor rights to live on the land, transfer it to others and stop people from entering.

## **Foreign Ownership of Land**

Foreigners are barred from owning land in Cambodia, under Article 44 of the Constitution, although the Investment Law of 1994 permits investors to use and develop land, and to sign unlimited long-term lease agreements. Generally, private land can only be owned by Cambodian individuals or by Cambodian legal entities. A legal entity has Cambodian nationality if 51 percent or more of its shares are held by Cambodian citizens. Long-term leases lasting between 15 and 50 years are an alternative way for foreigners to invest in Cambodian property. Prior to December 2011, leases could be granted for up to 99 years in accordance with the Land Law (2001).

## **State Land**

The 2001 Land Law also included mechanisms for identifying the boundaries of state land its distribution as “social concessions”.

The law divided land into three main classifications: State property, private property and collective property. Collective property is divided into monastery and indigenous community property. State property is divided into state public and state private property.

State public land is that which is available for the public to use, or land that provides a service to the public. This includes property of natural origin (forests, riverbanks, seashores, lakes); airports, roads, public gardens, public hospitals, administrative buildings; and archeological, cultural, or historical sites. State public property cannot be bought or sold by individuals or companies. It may be leased, but for no longer than 15 years, and the lessor must not damage the land or change its public function. State public land can be converted to state private land by prime-ministerial sub-decree. Thereafter it may be sold or leased by the government in accordance with the law such as through the issuance of ELCs (Gordon and Associates, 2011).

State private land is defined as land that is neither state public land nor privately or collectively owned under the Land Law of 2001. Any land that is not private land or is not reserved for public use is classified by default as state private land (Land Law 2001). State private land can also become state private land by sub-decree. State private land can be allocated for concessions (ELCs or SLCs).

## **Economic Land Concessions (ELC)**

Under the Land Law, the 2005 Sub-Decree on Economic Land Concessions set out conditions and procedures for the establishment and management of ELCs. ELCs allows the government to lease state private land to private enterprises for industrial agriculture with a maximum duration of 99 years. By the end of 2013, 2.6 million hectares of land, or 14 percent of the country, had been allocated to ELCs for agro-industrial plantations and other types of land concessions. These land allocations have become controversial due to their environmental and social impacts: many land concessions have been allocated within the boundaries of national protected areas, and conflict resulting from the inclusion of forest lands and community lands in ELCs has been common. Due to the significant public benefits they provide, it has been argued that there is no legal framework to justify or support the allocation of the country's forest lands to ELCs for monoculture plantation development or the cutting and collection of conversion timber (Forest Trends 2015). As noted above, under Order 01, the Prime Minister signed a directive declaring a moratorium on the granting of new ELCs. Thereafter, the National Strategic

Development Plan 2014-2018 promoted the reallocation of underperforming ELCs to SLC status. ELCs are approved by the Ministry of Agriculture, Forestry and Fisheries (MAFF).

### **Social Land Concessions (SLCs)**

Social land concessions (SLC) are enabled under Sub-decree No. 19 on Social Land Concessions (2003). SLCs aim to serve a social purpose – focused on poverty reduction – by allowing beneficiaries to build residences on SLC land or to cultivate it for subsistence purposes.

## Land Issues in Cambodia

By law, an individual may only be deprived of ownership if it is in the public interest, and only after the payment of fair and just compensation. However, the only indisputable proof of ownership is a land title certificate, and many Cambodian landholders still do not have formal title, and instead depend on “soft” possessory rights. Without formal titles, landholders face substantial risk of land conflict.

Land disputes in Cambodia are mainly linked to the granting of ELCs, forced evictions, actions of local authorities and powerful elites, SLCs, unclear boundaries, and family disagreements. This is particularly true for those in upland areas where land use is contested and there are often disputes between settlers, migrants, and concession lands. In agricultural low-lands, land is less disputed. Formalizing the land titling process has unfortunately undermined soft title possessory rights, which are often denied when property becomes highly valued (Grimsditch et al 2012), thereby creating a risk of forced eviction for many. This has impacted both urban populations, especially those living in high-value areas, and rural populations.

However, insecurity is not just about actual evictions and displacement; many people who have not been directly displaced experience uncertainty and fear. Underlying much land sale activity is a feeling of land tenure insecurity; people fear their land may be taken and so by selling when they can, they at least ensure some economic return. Land distress sales and landlessness may also be driven by broader livelihood insecurities, including physical and mental health risks, food insecurity, indebtedness, and in-migration (Beban and Pou 2015).

## Land Tenure in the Cardamom Mountains and around Tonle Sap (Prek Toal)

The landscape encompassing the Cardamom Mountains and Tonle Sap Lake covers over 2.5 million hectares. The people in the region are substantially dependent upon land and natural resources for their livelihoods. Socioeconomically, this region contains the poorest communities in the country, with some 80% of the population relying directly upon forest and lake resources (Killeen, 2012).

The Cardamom-Tonle Sap landscape, particularly the Cardamom Mountains and flooded forests around the Tonle Sap, are part of Cambodia’s terrestrial protected area network. Cambodia’s protected areas are governed under the *Protected Areas Law (2008)* (PA Law). The PA Law defines the framework for the management, conservation and development of Cambodia’s protected areas. It has the objectives of ensuring that protected areas are managed to conserve biodiversity and that natural resources are used sustainably. Under the PA Law, the Nature Protection and Conservation Administration (NPCA) of the Ministry of Environment (MoE) has jurisdiction over protected areas<sup>1</sup> (Souter and Simpson, 2018). The MoE is responsible for:

- Developing strategic and action plans and technical guidelines for PA management;
- Making proposals for the establishment or modification of any protected area;

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<sup>1</sup> Since 2016, the Ministry of Agriculture, Forestry and Fisheries is responsible for managing ELCs that were previously part of protected areas.

- Investigating, controlling and cracking down on natural resource offenses in PAs and initiating prosecution;
- Promoting public education and participation in the conservation and protection of natural resources; and
- Formulating agreements on community protected area development programs.

The PA Law categorizes ten types of protected areas:

1. *National Park*. A natural area that protects ecosystems for human benefit. In a National Park human impact on natural resources and processes is to be reduced, while the park can be used for recreation, education, research and cultural practice.
2. *Wildlife Sanctuary*. An actively managed area to ensure the protection and maintenance of animal and plant species and the habitats they rely on.
3. *Protected Landscape*. Areas with abundant biological resources in which human interactions with nature create unique natural beauty, ecology or culture.
4. *Multiple Use Area*. Areas rich in intact natural resources that provide natural products and services for local communities. Multiple use areas require active management to ensure long term protection and maintenance of biological resources and ecosystems.
5. *Ramsar Site*. Internationally important wetland areas and their surroundings.
6. *Biosphere Reserve*. An important, largely intact ecosystem that is surrounded by sustainable development zones within which limited human activities are allowed.
7. *Natural Heritage Site*. Natural or semi-natural sites with valuable and unique ecosystems, beauty or cultural importance.
8. *Marine Park*. A coastal or marine area notable for its biological, historical or cultural value.
9. *Wetland, Protected Slopes, Coastal Areas to Be Established for Management and Conservation*. An area where the natural functions are protected against erosion, natural damage and development, whilst providing the community with opportunities and socio-economic benefits.
10. *Provincial/Municipal Protected Area*. An area within which the biological resources and ecosystems are maintained for the sustainable use by the community within a province or city.

The PA Law states that each protected area shall be divided into four management zones:

1. *Core zone*. High conservation areas containing threatened and critically endangered species and fragile ecosystems. Access is only allowed with permission to conduct conservation research, or for national security and defense.
2. *Conservation zone*. High conservation areas containing natural resources, ecosystems, watershed areas, and natural landscapes located adjacent to the core zone. Access is allowed with permission, or for national security and defense. Small-scale community uses of Non-Timber Forest Products (NTFPs) to support local ethnic minorities' livelihoods may be allowed under strict control.
3. *Sustainable use zone*. Areas of high economic value and conservation of the protected area, that through sustainable use may contribute to the local community and indigenous ethnic minorities' livelihood improvement. Development and investment activities may be permitted after extensive consultation.
4. *Community zone*. Areas for local community and ethnic minority socio-economic development, which may contain existing residential lands, paddy fields, gardens or swidden.

The PA Law prohibits activities that may damage biodiversity and ecosystems. For example, activities such as forest clearance and construction are strictly forbidden in the core and conservation zones and require Government approval before being carried out in other zones. A range of other damaging activities such as hunting, fishing, timber collection and processing forest products are also proscribed. The requirement that protected areas provide sustainable resources for local communities, including indigenous people, is common to most types of protected areas. The NPCA must also respect the rights of local communities, ethnic minorities and the public when making decisions related to sustainable management.

While the PA Law defines ten separate PA categories in practice, they are often not strictly adhered to, with many PAs managed as an amalgam of multiple categories (Dunai 2008). While the structure of the management zones has received some criticism (Dunai 2008) numerous sub-decrees have been issued defining sustainable use zones (Open Development Cambodia 2017). However, most PAs in Cambodia have yet to establish zonation and demarcation despite the importance of this being highlighted when the PA Law was legislated (Dunai 2008).

The nine provinces (Sihanoukville, Koh Kong, Palin, Battambang, Kampong Speu, Kampong Chhang, Kep, Kampot and Pursat) of the Greater Cardamom Region was inhabited in 2012 by approximately 900,000 men, women and children, likely to be closer to one million in 2019. The relative levels of healthcare and education of the Greater Cardamom region are comparable with the national average as tracked by the Millennial Development Goal initiative (Killeen 2012). However, affluence varies greatly across the provinces, with the coastal communities of Koh Kong faring much better than the inland communities of Pursat. Killeen estimated in 2012 that 16% of the population the north-eastern side of the Cardamoms are farmers or farm workers who do not grow or earn enough to achieve satisfactory daily calorie intake (Killeen et al 2012). Those in the mountainous regions fare the worst: isolated from urban centers and major transportation routes and neither integrated into the rice and fishing economy of the Tonle Sap watershed nor the tourism, plantations or fisheries of the coast (ibid).

Table 1 shows the breakdown of different land tenure in Pursat, Koh Kong, Battambang, Kampong Speu, Kampong Chhnang, Siem Reap and Kampong Thom provinces. Note that the data was compiled from multiple sources as we were unable to obtain complete 2018 data from the government.

*Table 1 Land ownership status in Pursat, Koh Kong, Battambang, Kampong Speu, Kampong Chhnang, Siem Reap and Kampong Thom provinces*

| Land unit                    | Areas (Ha) | Source   | Year |
|------------------------------|------------|--|------|
| Protected Area (PA)          | 3,473,506  | Ministry of Environment                          | 2016 |
| Community Protected Area     | 95,349     | Winrock International                            | 2015 |
| Community Forestry           | 156,085    | NA   | 2013 |
| Community Fishery            | 454,076    | Open Development Cambodia, Department of Fishery | 2013 |
| Biodiversity Corridor        | 278,134    | Wildlife Alliance                                | 2016 |
| Total protected area         | 4,457,150  | NA   |      |
| Economic Land Concession     | 852,800    | LICADHO  | 2013 |
| Order 01                     | 461,215    | NA   | NA   |
| Systematic Land Registration | 683,082    | Open Development Cambodia                        | 2015 |

*Source MoE, Winrock, Open development, WA, LICADHO*

Based on the above data, the Cardamom-Tonle Sap landscape includes 4,457,150 ha of PAs, 852,800 ha of ELCs, and 1,144,297 ha of titled land ownership. This amounts to 69.06% PA, 13.21% ELC and 17.73% land titles/ownership.



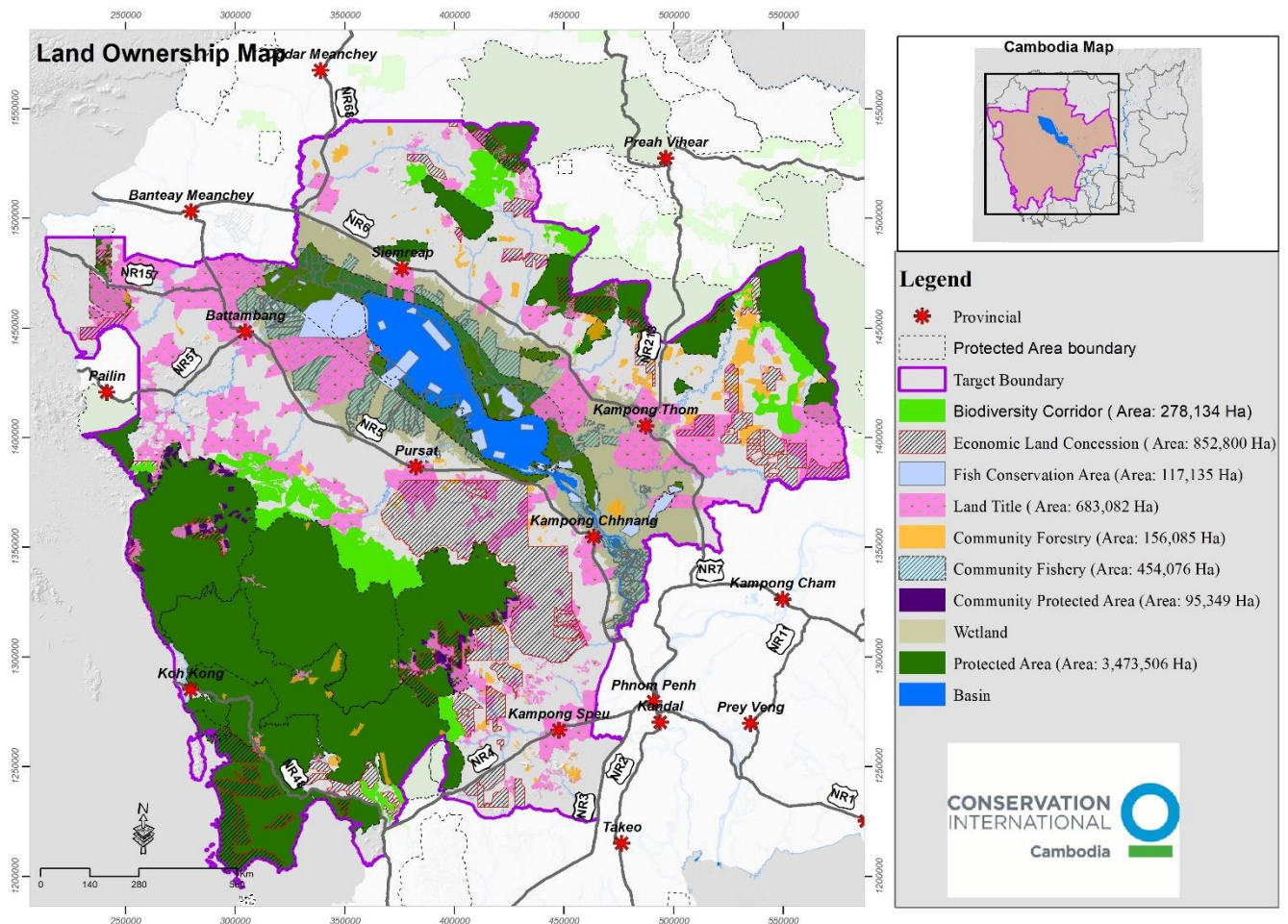


Figure 2 Land ownership in Pursat, Koh Kong, Battambang, Kampong Speu, Kampong Chhnang, Siem Reap and Kampong Thom provinces

### Land tenure issue/disputes in the target area

An NGO study in 2015, deliberately un referenced, surveyed 382 random households from Kampong Speu, Kampong Chhnang, Pursat and Battambang. It found that less than half (48.1%) of the respondent villagers who have rice fields in the region held documents to prove their ownership. This was also the case for 57.1% of villagers who have residential land, 76.9% of those who have Chamkar<sup>2</sup> land, 72.1% of those with forest land and 67.3% of the community land. These lands had only certification issued by the village and commune chiefs. Land disputes were most likely to arise over agricultural land of forest land, reflecting the importance land has in providing rural communities with their sources of subsistence and income. Over 75% of the respondents claimed that their household does not have sufficient income for maintaining the basic livelihood needs, and that losing access to land significantly worsens this situation.

The NGO study found that there were there are three main drivers of land disputes:

- competing land claims under the 2001 law versus customary possession;
- inconsistent decision-making between different levels of government; and
- slow issuance of land title in contrast to rapid granting of land concessions

The study found that economic land concessions were the root cause of 73.2% of land disputes (concentrated in Kampong Speu and Pursat provinces), and social land concessions prompted 26.8%.

<sup>2</sup> Chamkar land is a Land which is used for growing crops other than rice

Of the land disputes studied, 89% were resolved at the village or commune level. There were also six out of 28 disputes with companies that were solved at the commune levels and five resolved at the district level. The study concluded that goodwill amongst parties, clear decision-making authority for government agencies and community cohesion were important factors in successful resolution of the disputes.

## Non-Timber Forest Product (NTFP) Value Chains

Non-timber forest products (NTFPs) play a very important role in supporting the livelihoods of Cambodian people. A vast majority of Cambodians live near forests and rely on these resources for primary subsistence, house construction, and to generate income. In 2006, it was estimated that an average of 30 - 40 percent of household income is generated from NTFPs, and the annual household income from NTFPs was about \$100 –\$450 (FA 2008). Therefore, NTFPs are considered by many development agencies as a key tool for poverty reduction at the local level. As stated in the Protected Area Law (2008), managed by Ministry of Environment (MoE), local communities who live near protected areas are allowed to access and use (traditionally at a small scale) forest products including NTFPs inside community protected areas or the sustainable use zone of nationally protected areas (Protected Area Law 2008).

The Forestry Law (2002), managed by the Ministry of Agriculture, Forestry and Fisheries (MAFF), states that all forest products and by-products from production forests are allowed to be exported with the approval of the MAFF in cases where the supply is higher than local demand (Forestry Law 2002). This also states that local communities who live near a Permanent Forest Reserve do not need to request a permit to use or collect NTFPs if the harvest is small scale and for family consumption or traditional use. By contrast, those who attempt to harvest those resources for commercial purposes must obtain a harvest permit/export permit issued by MAFF (see Chapter 7 of the Forestry Law 2002).

The following sections examine the availability, use, value and value chains of four main NTFPs in Cambodia: rattan, resin, bamboo and agarwood (*Aquilaria* species). These four NTFPs are some of the most commonly collected and valuable throughout the country, including the Cardamom Mountain Landscape. They have significant national and international markets and can be harvested in environmentally and economically sustainable ways, making them ideal for adding value through certification and management systems and indicating potential for scaling up production to contribute to poverty reduction. Examination of these four value chains will deepen the understanding of NTFP value chains broadly.

Recent data was hard to find on the volume of trading of NTFPs in Cambodia, but from 2000-2006 these was some growth in these markets (Table 2).

*Table 2 The numbers of rattan, bamboo, and resin traded within Cambodia and exported in 2000-2006.*

| NTFPs  | Unit | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | Total |
|--------|------|------|------|------|------|------|------|------|-------|
| Rattan | Ton  | 0    | 79   | 23   | 10   | 147  | 4.5  | 40   | 303.5 |
| Bamboo | Ton  | 808  | 240  | 3075 | 2562 | 1634 | 558  | 3280 | 12157 |
| Resin  | Ton  | 157  | 208  | 304  | 364  | 683  | 185  | 1494 | 3395  |

Source: Forestry Administration, 2006.

Major supporters of NTFP market development in Cambodia have been the World Wide Fund for Nature (WWF) (for rattan); the Cambodia HARVEST project (with a focus on rattan and bamboo) and the Supporting Forests and Biodiversity Project in Prey Lang, both funded by USAID; the Non-Timber Forest Products-Exchange Programme for South and Southeast Asia in Mondulkiri and Preah Vihear (honey and resin, funded by a range of donors); and local NGOs such as My Village, Ponlok Khmer and Mlup Baitong.

Conservation International is currently searching for potential markets for resin from Prey Lang Wildlife Sanctuary and Veun Sai-Siem Pang National Park.

## Rattan

Rattan is a climbing palm in the subfamily Calamoideae with over 550 species (Peters and Henderson 2014). The International Network of Bamboo and Rattan (INBAR) produced a 2014 summary of the market, highlights from which include:

- China is by far the largest producer and exporter of bamboo and rattan products in the world, accounting for 65% of the world exports of bamboo and rattan products, with a value of \$ 1,194 million
- The EU was the largest importer of bamboo and rattan products, importing about \$557 million of bamboo and rattan products, which accounted for 34% of the world import of bamboo and rattan. The USA followed, with \$276 million (17%) of imports and then Japan third with a market share of 14%.
- China was the main importer of raw rattan materials (\$26,565 in 2014) – the main producer was Singapore
- The EU, USA, Japan that order imported the highest volumes of woven rattan products – the main producer was China

The latter indicates that China is possibly importing raw rattan, value-adding and then exporting rattan products.

Rattan industries are estimated to contribute approximately \$1.5 million in income for local communities annually (Chey et al. 2015). According to the Cambodian Forestry Administration, between 2000 and 2006 approximately 303.5 tons of rattan were collected for trading both in the country and for international export (Table 2). Generally, rattan has been used for house construction, basket and furniture production, and rattan shoots have been used for food and medicine both domestically and internationally (Peters and Henderson 2014; Chey et al. 2015). Local communities harvest rattan from forests, for use at home as described above or for sale as raw material to middlemen in local markets (Peters and Henderson 2014). The increase of the international market in rattan products in Vietnam, Thailand and China has provided a very important source of income for villagers who collect wild rattan in Cambodia. In the 2000s, Vietnam was the largest global rattan exporter followed by Indonesia; the value of this export was about \$68.6 million. Approximately 33,000 tons of rattan are predicted to be imported to Vietnam (mainly from Cambodia and Laos) to meet the requirement of its rattan industry (Peters and Henderson 2014). However, since 2005, the regional trade of rattan within the Mekong region (Vietnam, Cambodia and Laos) has declined. By contrast, trade from Cambodia increased, as shown by Figure 4 below (copied from Peters and Henderson 2014). This may indicate a depletion of rattan species in Laos and Vietnam, providing a market opening for Cambodia. Green portions of the histograms for Laos and Cambodia show the value of rattan sold to Vietnam.



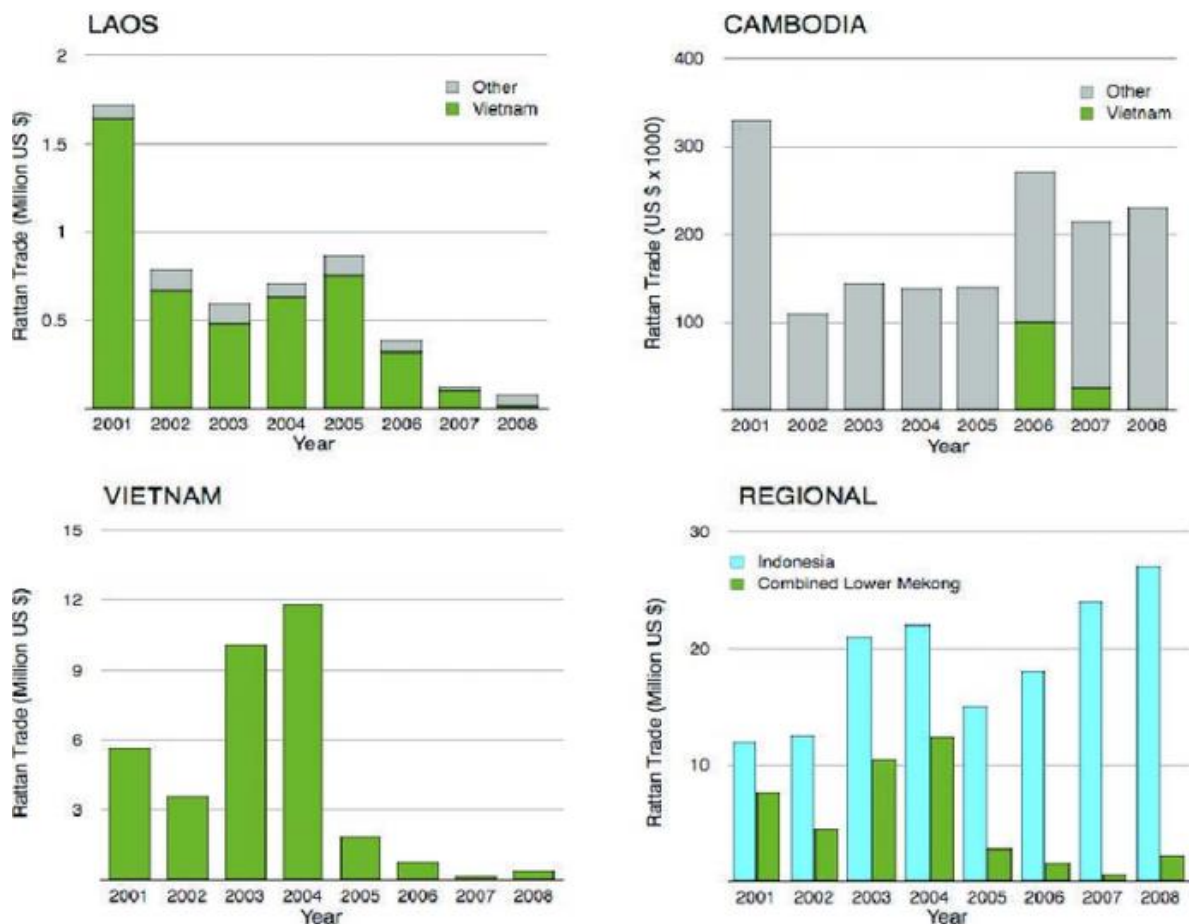


Figure 3 Value of rattan trade in Laos, Cambodia, and Vietnam from 2001 to 2008, together with combined data for the entire Lower Mekong Region and Indonesia during the same period. Note scale change in y-axis for Cambodia.

WWF have undertaken extensive work in Cambodia to make the rattan supply chain more sustainable, including assisting the development of a new private entity, the Rattan Association of Cambodia. The Association was established in 2009 in partnership with six agencies including WWF, a private sector representative<sup>3</sup>, and government ministries<sup>4</sup>. The details and names of agencies are detail in Appendix 3. The Association was recognized by the Royal Government of Cambodia and registered in the Ministry of Commerce, allowing it to trade. The aim of this Association is:

1. to encourage rattan producers to work with communities in a way that benefits both parties;
2. to apply improved management techniques and reduce rattan waste along the supply chain;
3. to strengthen the voice of rattan enterprises in policy discussion; and
4. to improve communication and market linkages to gain better access to domestic, regional and international markets (Chey et al. 2015).

The Association works very closely with communities who rely heavily on rattan for their incomes in five provinces: Koh Kong, Kampong Thom, Kampot, Preah Vihear, and Preah Sihanouk. WWF provides support to local communities and helps them harvest rattan sustainably as well as establish community-based business in Cambodia and identify market opportunities for rattan products (Chey et al. 2015). Moreover, WWF works with a private company, Khmer Rajana Rattan Handicraft, to establish high quality rattan products as well as increase employment opportunities for local communities. In 2014, the company's initial investment was \$36,200, while WWF contributed \$3,800 (Chey et al. 2015). The company has a rattan factory on the outskirts of Phnom Penh, and a shop in central city for selling

<sup>3</sup> Artisans' Association of Cambodia (AAC)

<sup>4</sup> National Cleaner Production Office-Cambodia, Ministry of Industry, Mines and Energy, Ministry of Commerce, Ministry of Agriculture, Forestry and Fisheries.

finished products to customers and other traders. The Rattan Association became a member of the World Fair Trade Organization (WFTO) in 2011.

The process of producing rattan products includes harvesters, traders, processors, and service providers. Approximately 160 families from five communes in Koh Kong and Preah Sihanouk provinces work with Kang Art facility to produce rattan products. The raw materials have been harvested from 4,491 ha from sustainable forest management areas (Chey et al. 2015). The company buys 10,500 canes of raw rattan per month (worth \$2,380) from local communities. The company also employs villagers to work in the processing of rattan products, including weaving and other processing, as well as other jobs. Employees earn an average of \$52/month, up to \$82/month (Chey et al. 2015). Table 1 provides the most common products produced by the company.

*Table 3 The average monthly rattan products produce by Krang Art facility*

| Rattan products | Number of Units | Unit cost (US\$) | Total (US\$) |
|-----------------|-----------------|------------------|--------------|
| Small chair     | 50              | \$8.5            | \$425        |
| Medium chair    | 156             | \$11             | \$1,716      |
| Large chair     | 51              | \$19             | \$969        |
| Sofa            | 8               | \$85             | \$680        |
| Total           |                 |                  | \$3,790      |

*Source: Chey et al. 2015.*

The Cambodia Harvest Project (funded by USAID) also contributed to rattan and bamboo market development, and the project website claims that ‘the non-timber forest product component benefited 2,600 households in 30 communities and providing technical assistance to 69 non-timber forest product producer groups, which have evolved into small and medium-sized enterprises composed mostly of women. The groups increased their revenues by 430% and increased their profits by 535% over baseline’. It is not clear how these results disaggregate between rattan and bamboo.

The presence of national and international demand for rattan indicates a strong potential for rattan to serve as an income-generating NTFP for local communities. Henderson and Peters (2014) claim that Cambodia has ‘the infrastructure and the manpower to harvest, process, and sell considerably more rattan than is currently traded’ and that managing the wild rattan populations better would achieve the greater supply of rattan that is required to achieve this. Commercially desirable species are native to the Cardamom Mountains, although further research is needed to correctly identify the specific species and market value of the rattan in the Cardamom Mountains. But given that rattan can be a wild harvested NTFP, thus requiring intact forests, there is potential for sustainable harvesting and production under a certification and compliance scheme that would ensure the persistence of wild species, promote conservation of natural resources and serve as a sustainable source of income to communities. There is already a strong indication that populations of rattan have declined in the wild, thus an unmanaged and unregulated increase in market demand would risk further depletion of the wild species. Similarly, if methods of management and/or cultivation were pursued in the communities, there is also a risk of market demand driving the conversion of natural and conservation areas to rattan production.

We recommend that any program of supporting the development of a rattan industry must have a strong compliance and monitoring system focused on the sustainability of wild harvesting and no impact on the natural environment. A benefit of such a scheme is that it could be certified as such, and thus carry a price premium for the communities. This would require a strong market connection, significant technical support at the community level (agricultural and institutional), and ongoing independent monitoring for compliance, ideally from a conservation institution. Additional support in developing on-site post-harvesting processing to add additional value would also be extremely beneficial to the community members.

## Resin

Resin provides a prominent source of income for approximately 100,000 people who live in or near forested areas in Cambodia (Prom and McKenney 2003). Records show that commercial resin tapping has been happening in Cambodia since at least the 1930s, but families have gathered resin from the trees for subsistence purposes for even longer (Evans et al. 2003). Liquid resin is collected by local communities from several tree species (*Dipterocarpus alatus*, *Dipterocarpus costatus*, *D. dyeri*, *D. jourdainii*, and *D. intricatus*), and solid resin is collected from *Shorea quiso* mainly from natural habitats. Resin tappers collect resin by cutting a backward sloping hole in some tree species, then lighting a small fire in the hole to stimulate resin flow (Neang 2009). The tapper then will return to collect resin a few days later. Tapping does not damage the trees when done correctly, but there is a risk of forest fire when collectors are careless (Prom and McKenney 2003). It is reported that trees that grow near water sources seem to produce more resin compared to the ones that grow at higher altitudes (Neang 2009). Although the ownership of each tree is not recognized by the government, ownership is agreed upon among communities. Please see Appendix 4 for an excerpt from Evans et al., which describes in detail the framework for resin tree ownership in their study area of Southern Mondulakiri.

The Forestry Law 2002, (Article 29) suggests that resin trees be protected but with many caveats. Logging interests have taken advantages of loopholes in the Law or directly engaged in illegal removal of resin trees. *D. costatus* and *D. alatus*, are now listed as Vulnerable on the IUCN Red List. Local communities from Kompong Thom, Preah Vihear, Siem Reap, Kratie, Stung Treng, Mondulakiri, Ratanakiri, Koh Kong, and Oddaar Meanchey are the main groups of people collecting resin (Prom and McKenney 2003; Neang 2009). Resin has been used as raw material in making varnish, soap, leather, painting, waterproof products, and sealing wax (Winrock International 2018). It can also be used in sealing boats, and fuel for torches. With proper processing, the essential oil compound of resin can occasionally be used in perfumes, usually from *Dipterocarpus kerrii* (Prom and McKenney 2003).

The value of resin products varies depending on the species and quality. A 2009 study (Neang 2009) found that 30 trees produced 30 liters of resin per week. In 2017, Dyrmosse et al reported from their 2014 field work (in which they interviewed 43 resin tappers in Prey Lang) that 30 liters, at least in Prey Lang, was selling for \$16 in the dry season and \$24 in the rainy season, and that the selling price for solid resin was \$0.5/kg throughout the year (Dyrmosse et al 2017), and some villages around Prey Long Wildlife Sanctuary can sell liquid resin between \$0.35 – \$0.53/kg, while solid resin can be sold for \$0.38 – \$0.65 (Uch et al. 2013). The same study reported that a single resin tree contributed a cash income of \$12 per year, and the total annual household gross income from resin extraction in Prey Lang was \$3,236 per household (ibid). This is considerably more than was found in 2004 by McKenney et al., who reported that the average resin income for collectors (per household) in Preah Vihear, Kompong Thom and Mondulakiri was \$100, \$160 and \$340, respectively (McKenney et al. 2004). This discrepancy could be due to differences in data interpretation or changes in market prices in the 13 years that separate the studies.

Resin can be collected almost year-round, except between March and April when the trees do not produce resin (Neang 2009; Uch et al. 2013). A single individual can tap 50 to 100 trees per week (ibid). Local communities collect resin in the wild, and then sell it raw to middlemen, who then export mainly to Vietnam and then China (Prom and McKenney 2003).

Prom and McKenney (2003) reported that in 2003 approximately 20,000 tons of resin was collected in Cambodia each year: 3,000 – 4,000 tons utilized in the domestic market, and 16,000 – 17,000 tons exported to Vietnam. This, they estimated, was equivalent to about \$6 million annually (Prom and McKenney 2003). This estimation contrasts sharply with the data provided by the Forestry Administration, which states that in the same year of 2003 only 364 tons of resin was collected (FA, 2006) (Table 2). Unfortunately, we do not have means to verify which is the accurate estimate or an explanation for the vast discrepancy.

Prom and McKenney (2003) reported the following regarding resin prices:

The market price of resin ranges from \$172 per tonne (domestic market) up to \$325 per tonne (export market). Trading resin from tapping villages to these end markets costs an average of \$93 per tonne in trade costs (\$56 per tonne) and fees (\$37 per tonne). Thus, fees add 65 percent to the total costs of resin marketing and sharply reduce profits. If applied to all 20,000 tons of resin produced and traded annually in Cambodia, total fees on resin range from about \$500,000 to \$1 million per year (p iii)

The demand in the domestic market is mainly for use in sealants and waterproofing for boats, whereas the demand from the international market is mainly for use in paint and varnish manufacturing (ibid). Communities collect resin and sell produce to middlemen - this marketing chain involves resin collectors, traders, wholesalers, transporters, domestic retailers and exporters (Fig 1). In Cambodia, most resin is exported over long distances, starting from the Tonle Sap and south to the Mekong Delta in Vietnam, and the trading fees are collected at different point along the trading route (Prom and McKenney 2003).

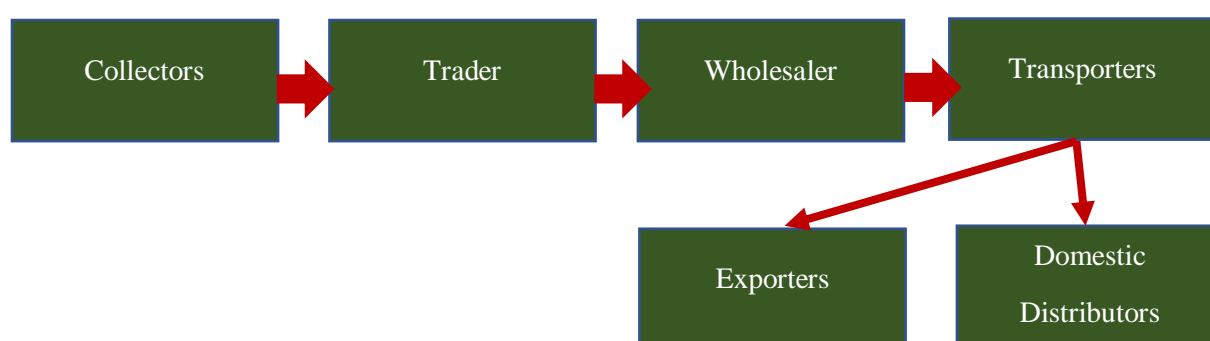


Figure 4 Marketing structure of in Cambodia. Source: Prom and Bruce 2003

**Collectors:** Mainly communities who live in/near forested areas. They may spend between five and 15 days at a time in the forest collecting resin from their trees. They normally sell to middlemen (traders) in the forests or in the village (Prom and McKenney 2003).

**Traders:** Mostly people outside the village, traveling by motorbike to each village to buy resin. Sometimes, they use motorbike to transport resin (200kg), while for large amounts they use oxcarts, which can carry 300–400 kg of resin. Then traders bring the resin to center of the town where they sell directly to wholesalers (Prom and McKenney 2003).

**Wholesaler:** Members of this group normally wait to buy product from traders, but sometimes also buy directly from collectors. They will collect, filter and stock resin until it is enough (generally from 1-2 tonnes) to export. According to the report from Winrock International 2018, the 60 kg of raw resin were filtered to only 20 kg of clean resin. Before export, normally wholesalers perform filtering in a rudimentary manner to improve resin quality. Anecdotal reports from a professional associate of the authors in this field, are that:

“...in Stung Treng, the wholesalers mix different resin species in order to increase resin volume and then filter the resin so there are less impurities (dirt, solid particles, etc). This is a rather simple process. Mixing is also done at the village trader level – filtering not so much. In my opinion, in Stung Treng, this value addition is a service that is mainly provided by the village trader (partially) and the provincial wholesaler. They seemed reluctant to give this up when broached on this topic – probably because of their earnings. They were of the opinion local collectors “didn’t know” to mix/filter properly. However, this is only at one province”.

Sometimes wholesalers give loans to traders and resin collectors to ensure continuity of the resin supply (Prom and McKenney 2003).

**Transporters:** Trucks, taxis, or boats are used to transport resin to exporters. For domestic demand, the resin is normally transported by taxi to the retailer directly.

**Exporters:** This group of people purchase resin from wholesalers and prepare for export internationally. Most exports are transported via Memot, Kompong Cham province and then to Vietnam in shipments that that range from 1 – 20 tonnes (Prom and McKenney 2003).

**Domestic distributors:** This group of people are generally in the provincial market or near the fishing areas where there is high demand for resin for use in boat construction (Prom and McKenney 2003). Overall, the collection and sale of resin shows promise as a sustainable income source for local communities because it has a significant international market demand, with potential growth as more environmentally sound plastic alternatives are sought. From a conservation standpoint, resin collection has significant benefits, as Dipterocarp trees which are commonly used for collection are usually large emergent trees, which means the resin industry requires large tracts of high canopy intact forests. The communities in the Greater Cardamom landscape, though, do not collect resin at the same scale of other more northern provinces. This may be due to ecological differences between these areas that influences the species composition, distribution, and resin production, or due to cultural differences. There is a significant knowledge gap concerning the extent of resin producing trees in the Cardamom landscape and the market potential of those trees. Thus, any investment in this market would first require on-the-ground assessments of the species distribution of resin producing trees, the chemical constituents of the resin from the trees there (to understand the market potential), and an assessment of the local people's knowledge and skill in resin collecting. There still seems to be major knowledge gaps in the market potential of resin both nationally and internationally. A better understanding of the chemical composition of the resin and collaboration with chemical engineers and other private enterprises would help to clarify the full potential use of the resin.

If the research showed that investing in resin was worthwhile, then significant community engagement would be essential in developing a fair and equitable tenure system for the resin trees and for the revenue. Because intact forests are a basic need of resin trees, products resulting from the resin would benefit from marketing as sustainable and supporting conservation. This may include some form of certification (fair trade, wildlife friendly, sustainable, etc) that can add further value to the products.

## Bamboo

Bamboo is a widely traded international commodity. In addition to the aggregated estimates for rattan and bamboo in the Rattan section of this report, the International Network of Bamboo and Rattan (INBAR) report provides the following insights into bamboo trade in 2014:

- The EU was the main importer of bamboo raw materials, importing \$64,754 worth in 2014 – the main producer was China
- Japan was the top importer of bamboo shoots, importing US \$142,618 worth in 2014 – the main producer was China
- The EU, USA, Japan and Russia in that order were the top importers of woven bamboo products – the main producer was China
- The EU was the main importer of bamboo flooring, plywood, charcoal, furniture – the main producer was China
- Engineered bamboo products were the major products exported in 2014, with a global export value of \$548 million, accounting for 30% of total bamboo exports

Cambodia has reasonably large resources of both wild (Khmer names *russei prei* and *russei klei*) and domesticated (*russei srok* and *russei ping pong*) bamboo. Bamboo has an extensive root network that can prevent soil erosion and store carbon and is fast-growing (growing up to 30 meters in six months). Widely considered an alternative to timber, bamboo is broadly distributed in Cambodia (Lugt et al. 2009). A 2006 study by Oxfam Hong Kong and International Finance Corporation (IFC)/ Mekong Private Sector Development Facility (MPDF) suggests the provinces with the largest reserves of bamboo include Preah Vihear, Battambang, Koh Kong, Siem Reap, Kampong Thom, Mondulhiri, and Kratie. Provinces with smaller, but significant, areas of bamboo included Pursat, Steung Treng, Prey Veng and Svay Rieng. However, the study also states that there has been a considerable decrease in wild bamboo resources, due to over-exploitation (largely for export), land encroachment, land grabbing and land conversion.



The Forestry Administration reports that between 2000 and 2006, approximately 12,157 tons of bamboo was collected for trading both within the country and for export to other countries (Table 2). There is significant export of unprocessed bamboo to Vietnam and Thailand which may account for much of Cambodia's production. Large numbers of utilitarian bamboo baskets are exported to Thailand and some to Vietnam, through informal border trade.

Domestically, bamboo provides a wide range of materials and is a significant source of income for local communities and the Cambodian economy. It has been used for hundreds of years in food, house construction, equipment and handicrafts (Meng 1998; Meas et al. 2007). The most popular products made from bamboo in Cambodia are: chopsticks, toothpicks, bamboo mats, barbecue sticks, incense sticks, and handicrafts (baskets) ([www.aha-kh.com/bamboo](http://www.aha-kh.com/bamboo)). These types of products are small, but they are widely used across Cambodia (GIZ 2013; Meas et al. 2007). Specific studies have been found which document the chopstick and basket processing streams in particular, described as follows.

### **Chopsticks**

Disposable bamboo chopsticks are commonplace in Cambodian restaurants (totaling several thousand tons per year); however at present they are mostly imported from Vietnam and China. Domestic production is relatively modest: Cambodia produces 3-4 tons per year of chopsticks (GIZ 2013). Although figures on Cambodian exports of, or earnings from, this commodity are not available, it could be assumed that those produced are consumed domestically. However, in 2010 the Phnom Penh Post reported that a Hong Kong company, Greenfield Investments, was investing \$5 million to build a factory in Kampong Speu to produce chopsticks for export to Japan, including those made from bamboo (Phnom Penh Post 2010). The article implied that many other firms had previously attempted to export chopsticks only to suffer from a lack of buyers. It is not clear whether the venture went ahead or what level of success it had.

The Angkor Handicraft Association state that *Russei Prey* is the predominant suitable material for chopstick production in Cambodia. The Association states, for the benefit of potential investors, that:

A small workshop with a low technology production line, producing 30 tons/year of finished products, will consume about 300 tons/year of fresh bamboo culms...while a high technology factory for with an output capacity of 250 tons/year of finished products will need 1,000 tons/year (Angkor Handicraft Association 2018).

The international market for bamboo chopsticks was estimated to be about \$300 million in 2006 (GIZ 2013). China is the main consumer and producer of chopsticks: in 2011 China produced between 60 and 80 billion sets of bamboo chopsticks, 40 percent of which have been used within the country, and 60 percent exported to Japan and South Korea (GIZ 2013). Japan is second largest consumer of disposable chopsticks, using 23-25 billion pairs annually, which is equivalent to 200 pairs for each person each year, and importers have begun to favour bamboo over timber in response to a government tax on wooden chopsticks (GIZ 2013). Other major consumers and producers are South Korea, Taiwan, Vietnam, Cambodia and Laos PDR. Cambodia uses approximately one to two million pairs per year, and currently imports most chopsticks from Vietnam and China (GIZ 2013).

### **Baskets**

Exports of bamboo baskets from Cambodia range from \$300-\$317 million per annum (Oxfam 2006; Meas et al. 2007), mostly to Thailand. Basket weaving is done at home in free time by both men and women (Meas et al. 2007).

About 35 percent of the labour involved in basketry is splitting, trimming and other preparation of the bamboo stems (culms) prior to weaving. These processes are currently undertaken with hand tools but can be very easily mechanized with simple, hand-powered equipment (Meas et al. 2007). The value chain and process of producing these products from bamboos are varied across Cambodia, but a 2006 Oxfam study provides some insight into the harvest and processing of bamboo in Pursat and Kampong Chhnang province. The study found that the five months during the dry season is a period of

intensive production of bamboo products by women and there is a decline of products and number of producers during the seven months of the rainy, rice cultivation season. In the peak season, women can produce around 80 baskets each per month and around 20 baskets per month in the off season.

The value chain involves a range of actors, typically as follows:

Producers buy bamboo from growers directly and process the bamboo. The collectors buy products (e.g. baskets) from producers, sometimes providing cash advance to ensure supply. The collectors then continue to sell these products to wholesalers, who distribute them for sale in local markets in Kampong Chhnang and other provinces in Cambodia, or export to Thailand (Meas et al. 2007).

Overall, bamboo has a strong potential as an NTFP of high-value for communities given the large global and national market demand. The fact that bamboo is extremely fast growing means it is ideal for production in small areas and can sequester a lot of carbon. Sustainably harvested bamboo can be considered a more environmentally friendly alternative to traditional wood products, but careful management and compliance systems must be followed.

There are significant knowledge gaps pertaining to bamboo in the Cardamom Mountains; in particular, there appears to be very little known about the commercial value of the species that are native to the area. Any investment in the development of bamboo enterprises in the Cardamom landscape must conduct significant baseline assessments to identify the species native to the area and their commercial potential. Introducing non-native bamboo species can have significant negative impact on native species and habitats and should be avoided, especially adjacent to protected areas.

If native species prove to have commercial value, local communities will need significant technical support in sustainable harvesting and management practices. There will need to be strong management and compliance systems to ensure that wild populations are not negatively impacted, and that protected areas are not cleared or degraded to increase bamboo production. As with the other NTFPs, these environmentally focused management schemes should allow for a higher price point. Post-harvest processing techniques show significant promise of value addition, also helping to generate more income for communities.

## Agarwood

Agarwood is dark resinous heartwood from roots, stems, and branches of the *Aquilaria* species tree (Blanchette et al. unknown). There are two species of *Aquilaria* in Cambodia, *Aquilaria crasna* and, to a much lesser extent, *Aquilaria baillonii*. *A. crasna* is listed on the IUCN Red List as Critically Endangered, while *A. baillonii* is data deficient, but both species are listed in CITES Appendix II (cited in Jensen and Meilby 2008). Agarwood is one of the most expensive woods in the world. The essential oil derived from agarwood has been commonly used for luxury perfume (Akter et al. 2013). It can be also used as a fragrance in soaps and shampoos (Kadir et al. 1997 cited in Akter et al. 2013; Jensen and Meilby 2008) and to make incense sticks (Akter et al. 2013). Previous studies have suggested that agarwood has bioactive products that function as effective anti-microbial compounds, making it useful for medical purposes, but due to the shortage of supply and high price, there has been limited scope for further research (Blanchette et al. unknown).

The price of agarwood depends on a range of factors including the quality, source, and fragrance, and whether it was harvested from the wild or from a plantation. High quality plantation agarwood can sell in the international market for \$10,000/kg (Blanchette et al. unknown), and anecdotally, wild harvested wood for much more, although prices are hard to verify without primary investigation. There is substantial demand in the international market, particularly in developed nations and Arab countries. High quality agarwood oil can be sold in these markets for \$20,000 to \$50,000/liter (Blanchette et al. unknown). Although there is little documented about the trade of agarwood in Cambodia, Cambodian agarwood is reputed to have the highest quality globally. Cambodia has companies working in agarwood, but some of them are collecting wild agarwood without CITES permits and are thus not registered or legal (CI unpublished data). The products are exported via the black market to Thailand

and then to other countries. There are also legal businesses trading agarwood from plantations. Most people in Koh Kong province have *A. crassna* plantations; according to a survey from Conservation International (CI unpublished data), approximately 80% of farmers in Thmar Baing district, Koh Kong have planted *Aquilaria crassna* at a small scale. But they do not treat their trees themselves, instead selling the rights to private companies for \$10 to \$15 a tree, who will then treat the trees, and harvest, process and sell the semi and final products (CI unpublished data).

There is very little known about the value chain of agarwood in Cambodia. However, it is assumed that it may be similar to that of Lao PDR. Agarwood products in Laos are categorized into four classes: pure agarwood, high quality essential oil, medium quality essential oil and low quality essential oil (Table 4).

Table 4 The value chain of agarwood and essential oil in Laos PDR

| Value chain                  | Raw materials   | Processing (Domestic)   | Processing (Overseas)   | End-product                                     | End-use  |
|------------------------------|---|---|---|---|--|
| Agarwood                     | Small and large pieces of heavy, fragrant and resinous wood in black or brown colour from a few cm up to 2m | Carving out the coloured and fragrant wood from the white wood (cleaning) | Carving out the coloured and fragrant wood from the white wood (cleaning) and/or spitting into flakes and chips | Large pieces of flakes and chips                | Medicinal, ceremonial, religious and incense preparation |
| High quality essential oil   | Chips 5 – 10cm of whitest wood with spots of black and brown colours  | Distillation of essential oil   | Packaging perfume products  | Heavy oriental perfumes pure agarwood oil       | Perfume for use on cloth and body                        |
| Medium quality essential oil | Chip 5 – 10cm of whitest wood with spots of brown colour  | Distillation of essential oil   | Adulteration, mixing with other agarwood oils. Packaging perfume and incense products                           | Heavy oriental perfume Various incense products | Perfume for use on cloth and body Incense preparation    |
| Low quality essential oil    | Chip 5 – 10cm of white colour or reddish wood   | Distillation of essential oil   | Adulteration, mixing with other agarwood oils. Packaging perfume and incense products                           | Heavy oriental perfume Various incense products | Perfume for use on cloth and body Incense preparation    |

Source: Jensen 2009

Trees cannot be treated unless they have a diameter at breast height (DBH) of over 11cm, usually at about five years old. The agarwood is ready for harvesting 12 months after the trees have been treated.

Summary: Agarwood is one the most expensive woods in the world and market (international) is available for agarwood and its products in Cambodia. However, investment in agarwood should be considered.

- Make sure agarwood is collected only from plantations as wild agarwood is almost extinct and illegal to collect.



- Plantation of *Aquilaria crassna* needs large areas and is expensive, but this can be done on a local scale whereby community just plant trees according to available space.
- Although the report mentions that about 80% of local communities planted this tree species, all are local scale (not farming or plantation).
- The trees (*Aquilaria crassna*) cannot be treated unless they are five years old, with a diameter of at least 11 cm. Treatment is expensive and requires technical skills as well as takes a very long time. Nonetheless, if this has been done properly, local communities can earn a lot of money with the good quality of agarwood.
- Two legal companies are located in Koh Kong (Malaysian investments), but they collect agarwood from plantations by buying the trees (\$10- \$15 per tree) from local people. It seems that the trees (untreated) can be sold for very low prices, which is not equivalent to the effort of planting.
- Although it seems that agarwood is not a good investment, particularly if we focus on alternative livelihood for local communities, investment for private companies may be possible (more study should be conducted on the real value chain).
- CI currently has treated 16 trees in Thmar Bang district. The results from these treatments can be helpful in contributing to the final decision making.

Agarwood is an attractive NTFP for investment and expansion at the community level. Being one of the most valuable NTFPs in the world, people can make considerable income with very little land. This is important, as a major driver of forest clearance is to expand farming to meet economic needs. Therefore, a properly managed agarwood trade could significantly reduce the need to expand agricultural land into protected areas. *A.baillonii* and *A. crassna* are both native to the Cardamom Mountain landscape, and therefore a well-designed and monitored management and compliance structure could help preserve the few remaining wild trees, and even develop a program to restore the species in the wild. The extremely high value of agarwood means that the market connections exist in all the communities in the landscape. However, they tend to be outside of the legal system (Sherchan personal communication). Any project focused on agarwood would need to be conscious that it is competing with the black market in which wild-cut trees carry a significant premium. Seeking markets that value social and environmental safeguards will be important for any management compliance as the market for trees with no management is quite strong. As long as these risks are well understood and there is significant engagement with the communities, there is significant potential to generate substantial income for communities by only using a small amount of land.

## Challenges for Communities Reliant on NTFPs

It appears that all four of the NTFPs outlined above have potential for further development as tools to help alleviate poverty in the target areas. For this to happen, however, there are a number of challenges that will need to be overcome. These have been summarized in a briefing document compiled by Mulchay and Boissière (2014). Although their research was based in Kampong Chhnang, Kampong Thom, Ratanakiri and Mondulkiri, the lessons can likely be applied across Cambodia:

- Some communities close to markets lack the raw materials to produce commercial products as the forests were already severely degraded.
- Other communities have the raw materials, but transport to market is either costly or non-existent.
- Information on current prices and market trends is lacking among NTFP collectors.
- Those seeking access to NTFPs through registration of Community Forests found the process too long and complicated; and CF registration did not give communities the ability to combat encroachment and the harvest of their NTFPs by outsiders.
- Local communities who collect and sell NTFPs from State Forests under customary user rights, as per Article 53 of the Forestry Law (2002), are not required to pay royalties or premiums for commercial or subsistence use. However, the Sub-Decree on Community Forestry Management (article 12), passed in 2003, states that the royalties and premiums, in terms of the right to harvest, process, transport and sell NTFPs, are payable as outlined in article 55 of

the Forestry Law. Law enforcement institutions at the numerous checkpoints have used this ambiguity to their advantage.

- The informal fees, royalties and the cost and difficulty of obtaining transport permits have encouraged many traders and collectors to avoid the regular routes to market, instead they transport their products illegally and the trade is not officially documented.
- There is also limited infrastructure for transport at competitive prices, particularly for those in remote areas.
- The profit margin for the collectors is minimal.

In addition to these issues, a lack of skills and capital to invest in value adding processing is keeping return for producers minimal. This situation is compounded by the fact that most wholesalers act as traders with very little interest in value-added processing, which means they are limited in their ability to dictate prices. Lastly, a CI associate with expertise in this area suggests that the current tax regime is problematic. Presently the farmers and collectors bear the brunt of government tax – re-allocating the tax burden as a VAT to the end user would make NTFP businesses more viable and contribute better to poverty alleviation objectives.

It is clear that policy work is needed to protect community rights to NTFPs, and to both facilitate and regulate improved trade. Investment in the equipment, technical knowledge, finances, networking and business negotiation skills required for successful value adding would also help poor producers get more return for their efforts.

Investing in the development and growth of NTFP production and enterprises in the Cardamom Landscape does show potential for supporting sustainable income generation for local communities and protecting natural resources. But there are significant risks that must be appropriately mitigated. A large portion of the communities in this landscape live adjacent to protected areas; therefore, most of the initiatives must focus on the efficient use of the currently available cultivated land, rather than require expansion into natural areas. This requires extensive community land-use planning, monitoring, and setting up systems of compliance such that any products from areas illegally converted or degraded cannot have access to the market. Additionally, reliance on wild-harvested NTFPs also requires a significant management scheme to ensure no negative impact on wild-harvested species or their habitats. Rattan and bamboo may be able to be cultivated in forested areas under some form of agroforestry management, but again, there needs to be clear conservation provisions to avoid natural areas being degraded to support the production of these plants. Within many communities in this landscape scaling up production will be difficult, and thus price competition from industrial agriculture will be nearly impossible to overcome. Therefore, we recommend that any investment initiatives in this landscape be conducted under a sustainable framework which provides incentives for social and environmentally responsible practices which increases the value of the products. Strong technical support, oversight, and advice from conservation, agricultural, economic, and social organizations will be essential to mitigate risks and ensure sustainability.

## Ecosystem Services in Cambodia

### Ecosystem Function

Ecosystem services are generally defined as the benefits, direct or indirect, that people receive from well-functioning natural ecosystems. De Groot et al. 2002 describe four main categories of ecosystem functions:

1. regulation functions such as water, fresh and clean air, soil nutrition, pollination, and other biological control.
2. natural functions play very important roles for habitat to flora and fauna, therefore preserving biological and genetic diversity, and maintaining the evolution processes of that species.

3. production functions such as the production of food, energy, genetic, and medical resources.
4. information functions, such as cultural value, science, and education.

This section will examine the extent to which these ecosystem services have been studied, quantified and economically valued in Cambodia.

## Measuring Ecosystem Services in Cambodia

One group of researchers from CI (Bottrill et al. 2015) measured natural capital in Cambodia by focusing on those areas that have protection status. Four main ecosystem attributes and functions were combined to calculate the natural capital: natural capital for biodiversity (mainly terrestrial biodiversity) (Fig. 5); climate mitigation (areas with high biomass carbon stock) (Fig. 6); fresh water (quality, quantity, and flow regulation) (Fig. 7); and food security (inland fisheries, NTFPs, coastal mangrove and coral reefs) (Fig.8). The finding was that 39% of the total area of Cambodia comprises areas featuring essential natural capital. The study also calculated the extent of natural capital found in protected areas, and the result revealed that 53% of all biodiversity is contained in protected areas: 39% of carbon stock, 33% of high potential emission, 37% of fresh water, 73% of freshwater fisheries (Tonle Sap and Mekong), 60% of mangrove fisheries, 0.4% of marine fisheries (corals), and 34% of NTFPs.

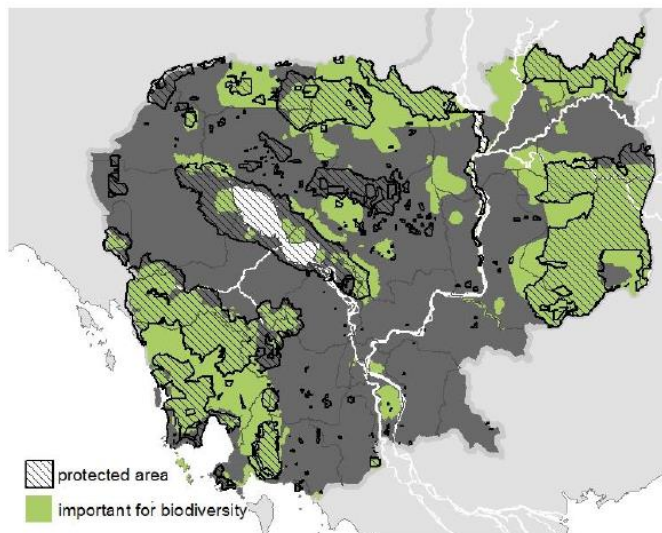


Figure 5: Map showing where important areas of biodiversity overlap with existing protected areas and community forests in Cambodia.

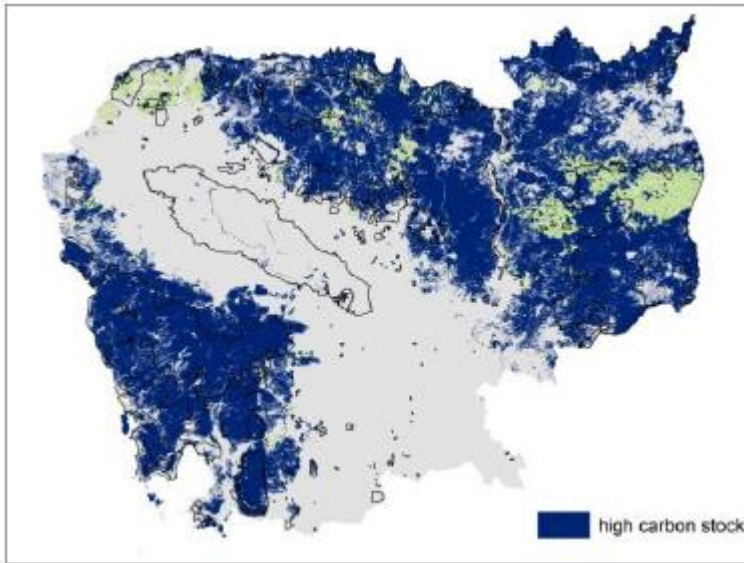


Figure 6: Map showing high carbon stock in Cambodia

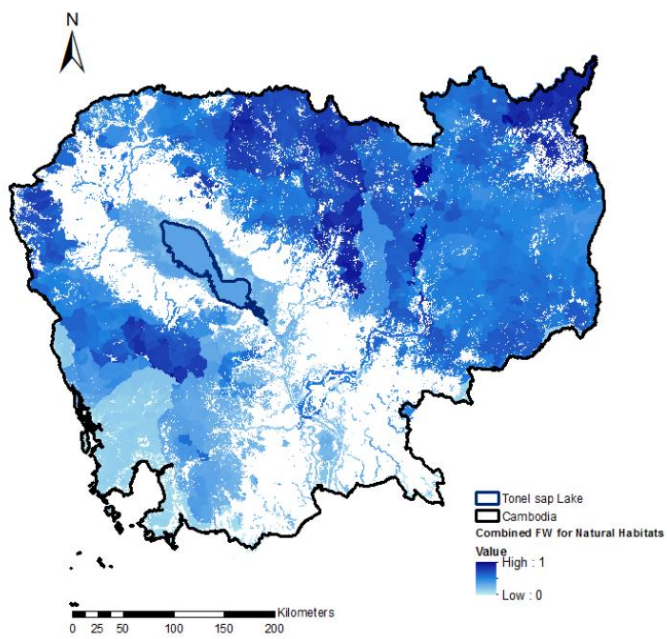


Figure 7: Important freshwater natural capital areas in Cambodia



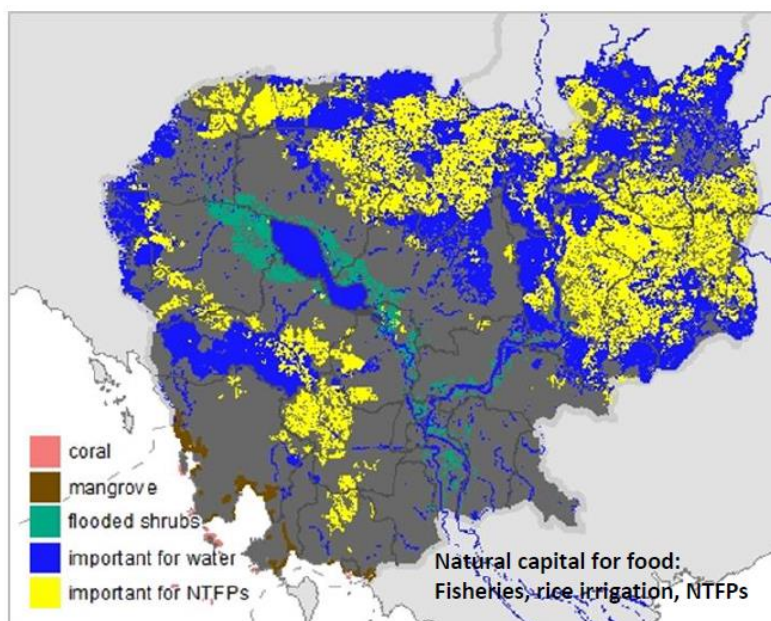


Figure 8: Areas of natural capital in Cambodia important for non-timber forest products and ecosystem services which support production of two key food items: rice and fish.

Persson et al. 2010 conducted research in three provinces, Kratie, Kampong Thom and Battambang, to find evidence of the connection between ecosystem services and the livelihoods of Cambodian people. Their findings revealed that 85-90% of household income for the selected study areas depended directly on ecosystem services (fisheries, timber, wild food, crops and firewood). Fish is a major component of Cambodians' overall diet, and it provides 76% of animal protein to the population (IFReDI 2013). Another important ecosystem that supports the livelihoods of people in the three provinces is forest. Forest products collected frequently were timber, bamboo, rattan, other edible plants, and wild food such as snails, frogs, eels, and crabs for household consumption and sale.

Kapos et al. 2010 measured the carbon stock of the forest in Cambodia by using forest cover in 2005/2006 obtained from the Forestry Administration as summarized in Table 5. It can be seen that evergreen forest, Cambodia's second most abundant forest type after deciduous, contains the highest carbon stock per hectare, indicating that Cambodia is quite rich in this ecosystem service.

Table 5 Total carbon (C) and total carbon density (t/ha) for different land cover in Cambodia. Source: Kapos et al 2010.

| Land cover                 | Area[km <sup>2</sup> ] (%) | Total C stock [Mt](%) | Biomass carbon density (t/h) |
|----------------------------|----------------------------|-----------------------|------------------------------|
| Evergreen forest           | 37228(20)                  | 1022(34)              | 191-211                      |
| Deciduous forest           | 47070(26)                  | 880(30)               | 114-126                      |
| semi-evergreen forest      | 13617(7)                   | 324(11)               | 161-178                      |
| Bamboo and other forests   | 2998(2)                    | 36(1)                 | 25-92                        |
| Bamboo                     | 257(<1)                    | 4(<1)                 | 49                           |
| Grasslands                 | 10774(6)                   | 99(3)                 | 10                           |
| Shrublands/flooded forests | 14851(8)                   | 134(5)                | 11-13                        |
| Flooded forest             | 143(<1)                    | 3(<1)                 | 129                          |
| Evergreen wood/shrublands  | 960(1)                     | 8(<1)                 | 14                           |
| Mangrove forest            | 334(<1)                    | 8(<1)                 | 142                          |
| Mixed forest               | 169(<1)                    | 4(<1)                 | 161-178                      |
| Riparian forest            | 144(<1)                    | 4(<1)                 | 191-211                      |
| Dry wood/shrublands        | 371(<1)                    | 3(<1)                 | 11                           |
| Degraded mangrove forest   | 176(<1)                    | 3(<1)                 | 85                           |
| Dry deciduous forest       | 3(<1)                      | 1(<1)                 | 78                           |
| Plantation (rubber)        | 854(<1)                    | 15(1)                 | 102                          |
| Agricultural land          | 46001(25)                  | 399(13)               | 5                            |

Various assessments of biodiversity have been undertaken, usually at a protected area or other site-specific scale. At a national level, Cambodia sits within the Indo-Burma biodiversity hotspot (Myers et al. 2000 cited in Kapos et al. 2010), there are 2308 vascular plant species (31 are threatened), 123 mammals (37 are threatened), 545 birds (24 are threatened), 63 amphibians (3 are threatened), and 874 fish (28 threatened) (IUCN 2010, WSC Cambodia cited in Kapos et al 2010).

Watkins et al. 2016 conducted a study on ecosystem services in Mondulkiri province, which revealed that the area has very high levels of carbon storage, NTFPs, and wildlife habitats. The area is a good source of freshwater and retains nutrients, in particular nitrogen, phosphorus and potassium and sediment (Fig.9). This study used three development scenarios to predict the future change of ecosystem services in this province from 2010 and 2030. The business as usual scenario used continued high deforestation rates. This scenario is predicted if the development plans (road construction, Economic Land Ecosystems, Agricultural areas and settlements) by the Cambodian government would be implemented. The conservation scenario focused on conservation of natural resources in this province under economic development activities. Last, the green economy scenario used moderate deforestation rates, with a balance between economic development and conservation. Under the business as usual scenario, the total forest cover in this province in 2030 reduced to 34%. Predicted high deforestation from Economic Land Concessions and road construction was expected to negatively impact water regulation (increasing floods), and result in 62% loss in availability of NTFPs, 33% loss in carbon storage, and significant decrease of sediment and nutrient retention. In contrast, under the conservation scenario, the total forest cover in this province would remain approximately at 85%. The carbon storage in this scenario also increased due to increased rubber plantations growing outside protected areas. This scenario saw no loss of forest cover inside the protected areas, and the ecosystem services remained the same. The Green Economy scenario projected that the total forest cover in this province would decrease to only 53% in 2030. However, under this prediction, there was an increase in protection of areas with high biodiversity through sustainable finance mechanisms. The development activities under this scenario aligned to the National Strategic Development Plan 2014-2018, as well as the National Green Growth Roadmap. This scenario promoted sustainable land use and natural resources management, and green investment to ensure green development in Cambodia.

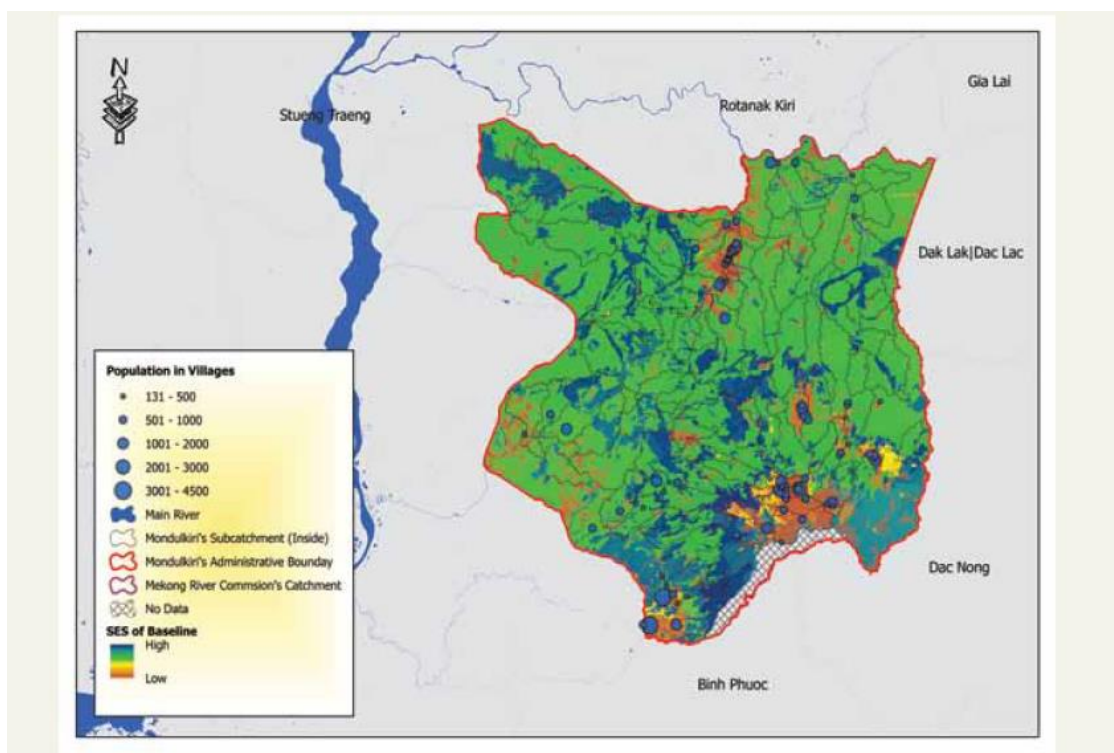


Figure 9: Baseline map showing combined ecosystem services in Mondulakiri province (Source: Ministry of Agriculture, Forestry and Fisheries 2011 cited in WWF, 2016).

## Valuing Ecosystem Services in Cambodia

Some work has been done to assess the value of ecosystem services in Cambodia, but these assessments have generally been site specific and, given the diversity of ecosystems represented in the country, not easily aggregated to a national level.

A 2014 study on the value of ecosystem services in the Central Cardamom Mountains (Ou 2014; Soussan and Sam 2011) argues that in total the ecosystem services in the Central Cardamom Mountains contribute about \$4 billion/year to the national GDP (Fig. 10). including:

1. \$441 million/year from timber and crops<sup>5</sup>
2. \$3,669 million of carbon sequestration<sup>6</sup>.
3. \$1.36 billion/year from biodiversity<sup>7</sup>.
4. \$76 million/year of watershed function<sup>8</sup>

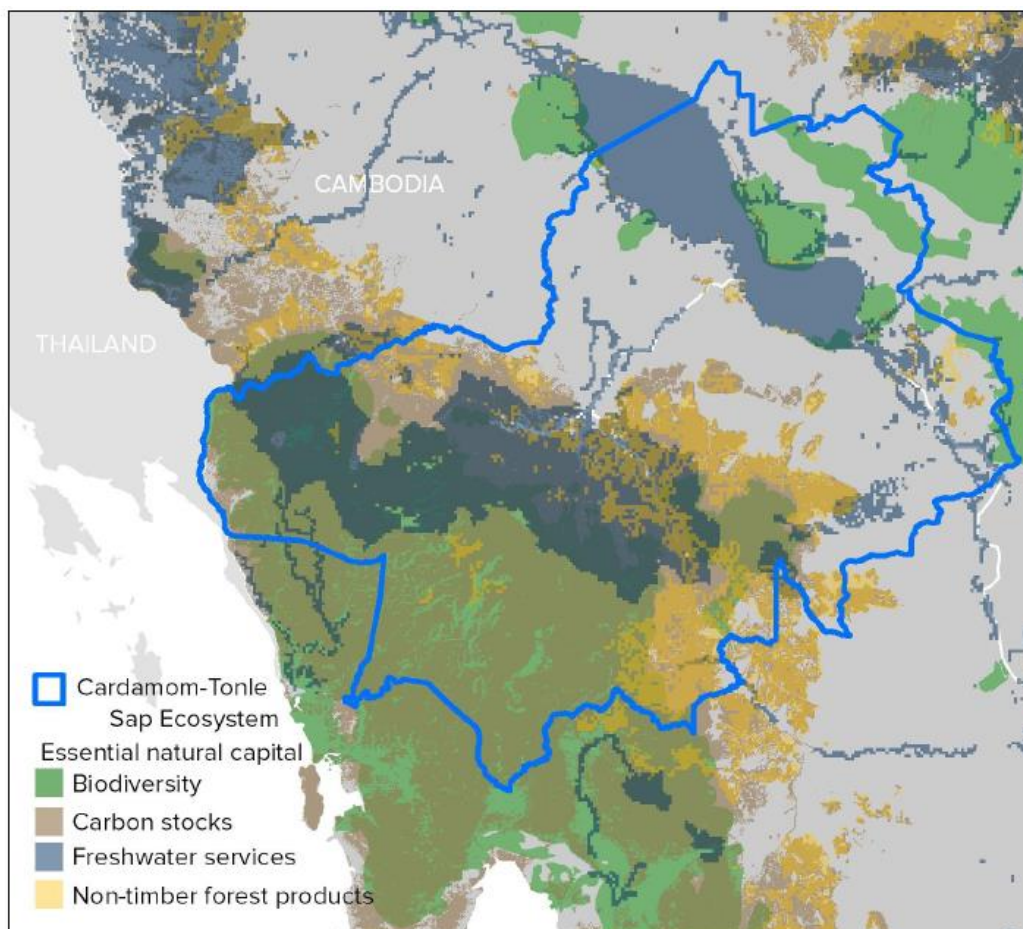


Figure 10: Essential natural capital (priority areas for biodiversity and ecosystem services) within the Cardamom Mountains-Tonle Sap Lake ecosystem (CI, 2015).

<sup>5</sup> The value of timbers was calculated based on two categories: the value of the stock of timbers available if forests were cleared; and the values of timbers in the forests, but collected through sustainable harvesting techniques over a longer period. For crops, there were two methods to calculate the value: market price of rice was used multiplied by quantity of rice produced to give the overall value of the rice in the area; and another method was to estimate the value of rice production as a proportion of house income.

<sup>6</sup> The value of carbon sequestration was calculated based on the carbon stored in the forests multiplied by the market price.

<sup>7</sup> The value of biodiversity was based on a benefit transfer approach, derived from a study on the value of biodiversity for high quality forests.

<sup>8</sup> This was calculated based on a benefit transfer approach, from a recent study of the value of watershed function in relation to hydropower in Vietnam.



Kibria et al. 2017 calculated the values of four main ecosystem services provided by Veun Sai-Siem Pang National Park (VSSPNP). The study regarded food, water, NTFPs and timber as production functions; water purification and soil erosion as regulation functions; recreation, education, traditional ethno-culture belief as information functions; and nutrient improvement as a natural function. The total value of ecosystem services in VSSPNP was estimated at about \$130 million/year. The highest proportion of this was air purification<sup>9</sup> at \$56.21 million/year (43%), followed by water storage<sup>10</sup> at \$32.31 million/year (25%), soil erosion reduction<sup>11</sup> at \$22.21 million/year (17%), soil fertility improvement<sup>12</sup> at \$9.47 million/year (7%), carbon sequestration<sup>13</sup> at \$7.87 million (6%), and provisioning services<sup>14</sup> at \$1.78 million/year (7%).

The World Wide Fund for Nature (WWF) 2013 gathered available information about the ecosystem values in four categories – regulation, natural, production and information functions – in lower Mekong countries including Cambodia. However, only two ecosystem service functions have been estimated specifically for Cambodia:

5. Regulation function: The value of carbon sequestration of deciduous forest in Cambodia was estimated at \$34/ha, for semi-evergreen forests \$40/ha, and for evergreen forests \$62; while the value of soil and water for deciduous forests was estimated at \$75/ha, semi-evergreen forests \$131, and evergreen forests \$131 (Hansen and Top 2006 cited in WWF 2013).
6. Production functions: Most studies calculate this function mainly from NTFPs. For example, Hansen and Top 2006 (cited in WWF 2013) show that the value from NTFPs in Cambodia is between \$280- \$345/household per year.

Brander (2018) conducted a valuation of the change in forest ecosystem services in Cambodia for 2010-2030. Brander predicted the economic value of the change in ecosystem services from forests in Cambodia over the period 2010-2030 based on the current trends of land use change. The results showed that in 2010 the total forests in Cambodia covered 10,456,032 ha, while in 2030 the forest would be only 9,236,913 ha (1,219,119 ha lost). The changes of this forest cover over the period 2010-2030 is equivalent to a loss of \$-3.2 billion in carbon emissions and \$1.6 billion in other ecosystem services, at 2007 prices.

## Ecotourism Stocktaking

With its large swaths of rainforest, dramatic waterfalls, wildlife, and picturesque rivers, the greater Cardamom Mountain-Tonle Sap landscape has significant potential as an ecotourism destination. Ecotourism provides a clear economic incentive to protect nature when properly managed. But years of unsustainable hunting have had a significant impact on the wildlife here, making the prospects for tourism centered around wildlife far inferior to destinations such as Thailand and Indonesia. Hunting and illegal logging are still problems in the landscape. The most successful ecotourism ventures in the region and the country are largely supported by conservation NGOs (e.g. Wildlife Alliance and Wildlife Conservation Society) and have very strong law enforcement and protected area management support complementing community benefit sharing mechanisms.

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<sup>9</sup> Air purification was calculated by two main functions, the absorption of harmful gases and the reduction of particulates of the air.

<sup>10</sup> The rainfall storage method was used to calculate the value of water storage at the area.

<sup>11</sup> To calculate the value of soil erosion prevention, this study uses the soil erosion in on-forest area and the cost of removing sediment in the area.

<sup>12</sup> The forest helps to maintain fertility since soil erosion may result in losses of N, P, K and other organic materials. Then the values of those nutrients were used to calculate the value of soil fertility improvement.

<sup>13</sup> The average net carbon sequestration rates of logged evergreen and semi-evergreen forest were used for this study, and carbon tax of South Korea was used.

<sup>14</sup> Timbers, and other NTFPs (resin, malva nut, bamboo, mushroom, and wild animals) were used to calculate the value of production function by interviews with 35 indigenous communities.



In the table below, we present an inventory of the established ecotourism enterprises within the Cardamoms-Tonle Sap (Prek Toal) landscape. These can be divided into basic, quite rustic tourism options; to community-based models where communities provide the management and receive the benefits from tourism revenues; to enterprises where the primary purpose is for conservation benefits (e.g., Prek Toal); to very high-end tourism enterprises. A brief description of five of these models, along with their structure, is presented below.

1. Chi Phat Community-based ecotourism (CBET): This CBET have been supported and established by the NGO Wildlife Alliance. The first three years of establishment, there was 100% support from the NGO, and the total income was \$17,717 (Wildlife Alliance 2014, cited in Tieng 2016). All CBET funds were kept in a bank account. Incentives for CBET committee members and salaries for staff were supported by Wildlife Alliance (Tieng 2016). Although Chi Phat has its own structure and management system (Fig 10), the CBET is still supported by Wildlife Alliance. It is not clear how the benefit sharing mechanism works. All decision making has to be passed through an advisory board. ([www.chi-phat.org](http://www.chi-phat.org)).

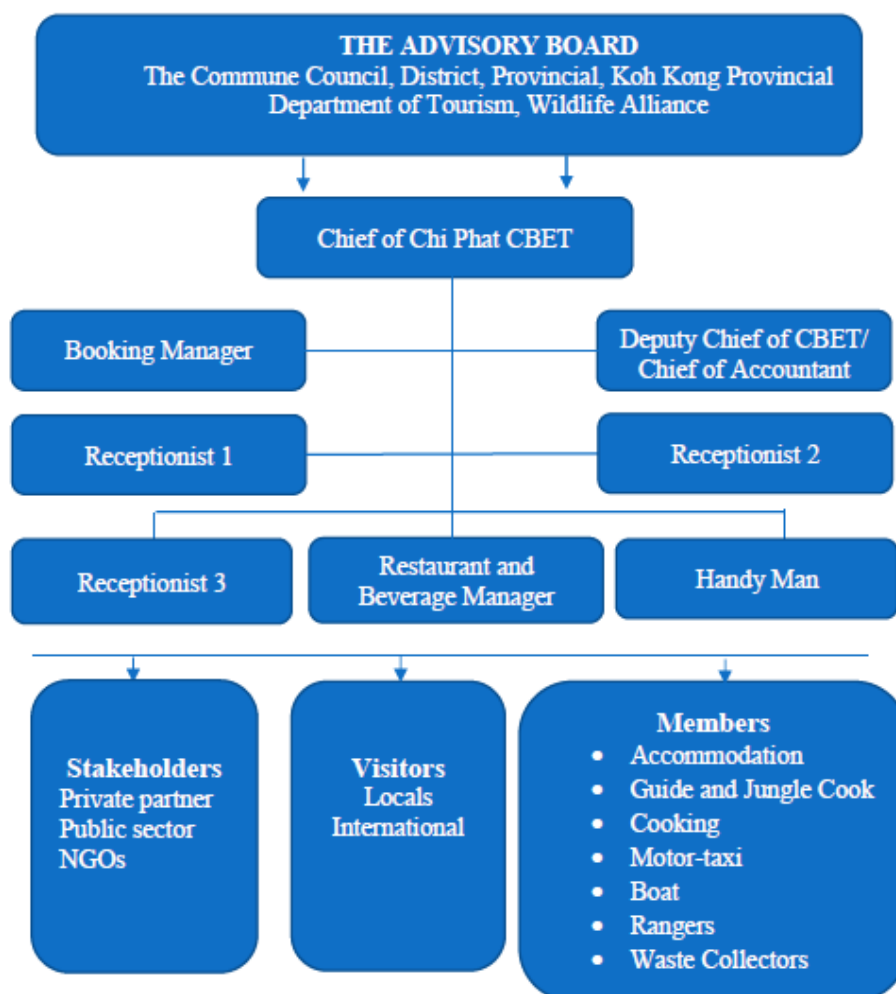


Figure 10: The current management structure of Chi Phat community-based ecotourism

2. Cardamom Tented Camp: This project was granted as a concession by the Royal Government of Cambodia in 2009 to run ecotourism, establish an ecolodge and undertake conservation in Botum Sakor National Park. Wildlife Alliance cooperated with other two institutions, The Mino Group, and YAANA Venture to develop this project. The revenues from the venture go directly to Wildlife Alliance for its conservation efforts in the park. Additional profits go to local communities ([cardamomtentedcamp.com](http://cardamomtentedcamp.com))

3. **Shinta Mani Wild:** The project is under construction, and it was expected to open in November 2018. The area is located in unprotected area between Kirirom and Bokor National Parks. This project presented itself as a partnership with Flora and Fauna International, Wildlife Alliance, the Cambodian Government, and Royal University of Phnom Penh. The rooms start from \$1900/night, and the minimum of three-night is required. Shinta Mani planned to have a permanent research facility and food production system there. The main objective is to have sustainable development and create jobs for local communities.
4. **Gibbon Community-based Ecotourism:** The project was established and supported by Conservation International (CI) and the Department of Environment in 2011. The community has its structure with advisory boards including Veun Sai authorities, the Department of Environment, the Department of Tourism, and CI (Fig. 11). It is located inside Veun Sai-Siem Pang National Park. The benefit sharing mechanism has been set up to serve all relevant stakeholders including a CBET saving fund (35%), CBET committees (6%), service providers (51%), and the Department of Environment (8%). The CBET saving fund is kept at the bank and is designed to fund village development and support conservation efforts. A tour itinerary has been designed to attract high-end customers, with tourist numbers limited to only six per day. This number has been determined by the appropriate carrying capacity to minimize negative impacts on the park and on the gibbons, which are the main tourist attraction of the area.

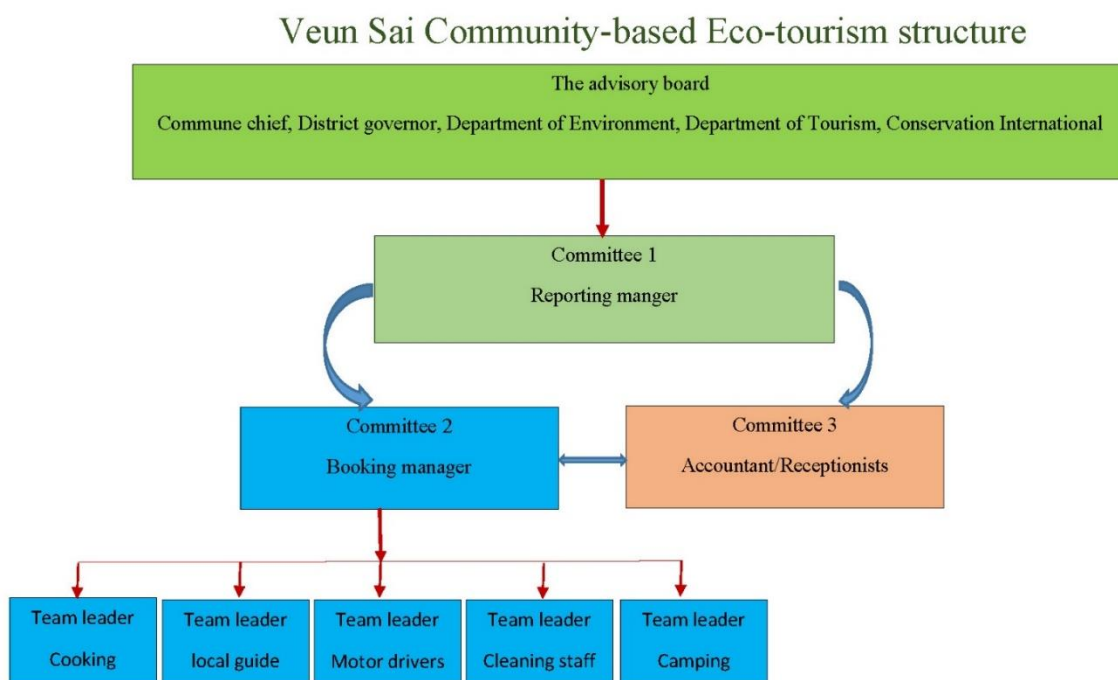


Figure 11: The management structure of Gibbon Community-based Ecotourism

5. **Prek Toal** is a core zone and Ramsar site of the Tonle Sap Biosphere Reserve: Ecotourism activities in Prek Toal have been supported and established by Ministry of Environment (MoE) and the Wildlife Conservation Society (WCS). WCS has supported conservation activities while ecotourism activities have been mostly managed and coordinated by MoE and PDoE. Before July 2017, the income of \$38 obtained from each visitor has been divided into three parts; \$30 for boat fee; the boat owner distributes \$3 to an ecotourism development fund for micro infrastructure development in the community, and \$5 is the entrance fee that is managed by MoE. But after July 2017, the process of national decentralization meant that the management of ecotourism activities in Prek Toal passed from MoE to PDoE. Since then the benefit sharing mechanism has been less clear. The Prek Toal trip is mostly run by Sam Veasna Centre, but the tours can be arranged through multiple tour companies.

### **Management Structure of Prek Toal**

| <b>Position</b>            | <b>Location</b>   | <b>Number</b> |
|----------------------------|---|---------------|
| Core Area Director         | MoE staff member based in Phnom Penh, with frequent travel to Prek Toal   | 1             |
| Core Area Deputy- Director | Battambang DoE staff member, based in Prek Toal   | 1             |
| Rangers                    | Prek Toal. Selected from local villagers and former bird collectors, with on-the-job training provided by WCS and TSCP  | 31            |
| Boat Driver                | Drives boats for ecotourists, official visitors, and research, survey and Ranger teams, and maintains boats as required | 1             |
| Cook/cleaner               | Prek Toal (local resident). Supervision provided by CoreArea Director and Deputy-Director                               | 1             |

*Source: Prek Toal management plan 2007-2011; MoE and MAFF, 2008-12 page 24*

6. Kompong Phluk community is an ecotourism association officially established in 2010 and registered in 2015 at the Ministry of Interior. The ecotourism activities are managed by the community and coordinated and advised by commune and district authorities. The income that community receives is \$1 from a foreign visitor and \$3, which is redistributed from the boat fee. The various boat fees are \$33, \$43 and \$53. The total annual income has been spent on three activities: 1. Community infrastructure development, 2. Supporting conservation activities of community fisheries and 3. Capacity building and incentive provision to the ecotourism committee. This annual meeting is held and coordinated by district authorities. The decision making needs to pass through district and commune authorities (Source: C.Om; vice chief of Kompong Phluk community fishery).

Table 6 Inventory of Ecotourism Businesses in Target Areas

| Name enterprises                   | Location  | Status                     | Physical access and attractions   | Core natural attributes                          | Environment sensitivity   | Source/partner  |
|------------------------------------|---|----------------------------|---|--|---|---|
| 1.Chipat                           | Chipat commune, Koh Kong Province. Southern Cardamom National Park        | Community-based ecotourism | -National Rout 4 into National Road 48.<br>-10km from Sre Ambel bridge, and second bridge at Andoung Teuk<br>- Day time waterhole, bat cave with waterfall, sunrise bird watching, ten rivers, and trekking in the jungle.<br>-Availability: electricity, phone, and clean water (if you stay at homestay, camping will not be available)   | -Evergreen forests<br><br>-Protection from winds | -Biodiversity hotspot<br>-Critical habitats for elephant and other species<br>-Critical watersheds<br>-Landslides<br>-Climate vulnerable area | <a href="http://www.chi-phet.org">www.chi-phet.org</a><br><br>Wildlife Alliance |
| 2.Mangrove Ecotourism              | Peap Krasaop district, Koh Kong Province. Peap Krosap Wildlife Sanctuary. | Community-based ecotourism | -20 minutes from Koh Kong town, Koh Kong Province.<br>-Boeung Kayak, community has built a one-kilometer mangrove walk that consists of a series of elevated walkway, picnic platforms, a suspension bridge and a 15-meter high observation tower offering panoramic views. Take a boat trip to see more mangrove forests and visit Tatai waterfall. Birds and sea organisms<br>- Electricity, phone, and clean water | -Mangrove forest and coastal area                |   | Ecotourism-cambodia.com<br><br>Supported by ADB and other NGOs                  |
| 3.Osoam community-based ecotourism | Pursat Province. Located between Central Cardamom                         | Community-based ecotourism | -Main road between Koh Kong city and Pursat town. There is no bus to Osoam, but if you want to travel from Phnom Penh for Siem Reap, you need to go to town of  | -Evergreen forests<br>-Protection from winds     | -Biodiversity hotspot<br>-Critical habitats for elephants and Siamese crocodiles.<br>-Critical watersheds<br>-Landslide                       | ecotourism-cambodia.com   |

| Name enterprises                  | Location   | Status            | Physical access and attractions  | Core natural attributes  | Environment sensitivity  | Source/partner  |
|-----------------------------------|--|-------------------|--|--|--------------------------|---|
|                                   | Mountain National Park and Phnom Samkos Wildlife Sanctuary |                   | Pursat and Koh Kong first, then take a share taxi to Osoam.<br>-Watching wildlife, birds, monkeys, fireflies, hiking, swimming, camping, motorbike adventure, trekking to see crocodile sanctuary, and enjoy traditional livelihood of local communities.<br>-Limited electricity, phone, and provide with drinking water.   |  | -Climate vulnerable area | Community-based ecotourism  |
| 4. Angtrapeang Thmor community    | Located in Banteay Meanchey province                       | Wetland ecosystem | It is about 100km from Siem Reap town. Going by car – Take road 6 toward the Thai border. Past Kralanh, there will be right turn option onto a Trapeang Thma Lake road. Take this turn, it will take you to Trapeang Thma Lake<br>-Electricity, phone, Wifi, and clean water   | -Wetland<br>-200 bird species including the endangered Sarus Crane |                          | <a href="https://ecotourism-cambodia.com/project/ang-trapeang-thmor-community/">https://ecotourism-cambodia.com/project/ang-trapeang-thmor-community/</a>   |
| 5. Kompong Phluk Floating Village | Siem Reap province   | Local community   | Depart Siem Reap and travel southeast through rural villages and rice fields to reach Tonlé Sap Lake. Go as far as you can by road to board a boat, and then sail down the Kompong Phluk River<br>- Visit a floating village of Tonlé Sap Lake<br>- Learn about the simple farming and fishing lifestyle of the locals<br>- Go to a few schools in the village and see the pagoda temple | Floating village   | Floating village         | <a href="https://www.getyourguide.com/siem-reap-1274/kompong-phluk-floating-village-half-day-special-tour-t75495/">https://www.getyourguide.com/siem-reap-1274/kompong-phluk-floating-village-half-day-special-tour-t75495/</a> |

| Name enterprises                      | Location                               | Status                      | Physical access and attractions   | Core natural attributes  | Environment sensitivity   | Source/partner  |
|---------------------------------------|--|-----------------------------|---|--|---|---|
|                                       |  |                             | Get rowed through the flooded forest by small boat  |  |   |   |
| 6. Prek Toal bird sanctuary           | Prek Toal village, Battambang province | Core zone Biosphere Reserve | - 13Km from Siem Reap town to Chong Kneas and then travel by boat around 1 hour or 23 km from Siem Reap town to Machrey and then travel about 45 minutes by boat  | -Birds<br>-Floating villages<br>-Flooded forests                 | Core Area and Ramsar Site of the Tonle Sap Biosphere Reserve      | WCS<br><br>MoE  |
| 7. Neptune Adventure                  | -Tatai village, Koh Kong Province      | Private enterprise          | -National Road 48 from Koh Kong.<br>-Waterfall, trekking, swimming, and river cruise.<br>-Electricity and clean water   | -Evergreen forests<br>-Protection from winds                     |   | Neptuneadventure-cambodia.com<br><br>Private  |
| 8. Rainbow Lodge                      | Tatai village, Koh Kong Province.      | Private enterprise          | -19km from Koh Kong town, National Road 48 from Phnom Penh.<br>-Hiking, trekking in the jungle, cycling, camping, river cruises.<br>-Electricity, phone, Wifi, and clean water  | -Evergreen forests<br>-Protection from winds                     | -   | <a href="http://www.rainbowlodgecambodia.com">www.rainbowlodgecambodia.com</a><br>Private |
| 9. Junglecross                        | Koh Kong town, Koh Kong Province.      | Tour operator /private      | -Koh Kong town<br>-Hire a guide and take a day trip to the Cardamom Mountains. Off-roading in the mountains wilderness experiences, rivers, forests, and wildlife. The trip can be arranged for up to 10 days. All trips travel by motorbike. | -Cardamom mountain (evergreen forests)<br>-Protection from winds | -General view, and motorbike experience, not a wildlife adventure | Junglecross.com<br>Private  |
| 10. Rithy Koh Kong Eco Adventure Tour | Koh Kong Province                      | Private enterprise          | -Koh Kong town<br>-Jungle trekking, jungle camping, island tour, island camping, fishing, kayaking, waterfall, Botum  | Provide general tours  |   | <a href="http://www.kohkongcoadventure.com">www.kohkongcoadventure.com</a><br><br>Private |

| Name enterprises            | Location  | Status   | Physical access and attractions   | Core natural attributes                         | Environment sensitivity  | Source/partner   |
|-----------------------------|---|--|---|---|--|--|
|                             |   |  | Sakor National Park, homestay, dirt bike to Cardamom Mountains.   |   |  |  |
| 11.Koh Andet Eco Resort     | Koh Andet village, Koh Kong Province.   | Private enterprise   | -18km from Koh Kong town, and then travel by boat about 20 minutes.<br>-Tatai waterfall, coastal mangrove forests, jungle trek, boat tour, and fishing.<br>-Electricity, phone, Wifi, and clean water   | -Island, with waterway surrounding.             |  | <a href="http://www.kohandetecoresort.com">www.kohandetecoresort.com</a><br><br>Private land |
| 12.Cardamom Mountain Resort | Koh Kong province   | Private enterprise   | -20-minute drive from Koh Kong town.<br>-Jungle trekking, mountain biking, kayaking, visit Tatai waterfall.<br>- Electricity, phone, and clean water  | -Resort/Hotel                                   |  | <a href="http://www.kohkong.com">www.kohkong.com</a><br>Private                              |
| 13.Tatai Resort and Marina  | -Tatai village, Koh Kong Province   | Private enterprise   | -19km from east of Koh Kong town on National Road 48<br>-Hiking, mangrove forests, waterfall, village walk, boat and sunset cruise.<br>- Electricity, phone, Wifi, and clean water  | -Evergreen forests<br>-Protection from winds    |  | Tatai-hotel.com<br><br>Private   |
| 14.Cardamom Tented Camp     | Trapeang Rung, Koh Kong Province. 18,073 ha of land concession. Botum Sakor National Park | Eco-tourism, eco-lodge, and conservation concession granted by the government in 2009. All revenue goes to | -Highway 48, road from Phnom Penh to Koh Kong. Get off the bus at Trapeang Rung River.<br>-Patrolling with forest rangers, setting up camera traps for wildlife survey, learning to survive in the rain forests, finding and recording wildlife footprint and trails, identifying flora and fauna, and exploring river system by kayak. | Evergreen forests<br><br>-Protection from winds | -Biodiversity hotspot<br>-Critical habitats for elephants and Siamese crocodiles.<br>-Critical watersheds<br>-Landslides<br>-Climate vulnerable area | Cardamomtentedcamp.com<br><br>Land concession Run by Wildlife Alliance                       |

| Name enterprises          | Location  | Status             | Physical access and attractions  | Core natural attributes                  | Environment sensitivity | Source/partner   |
|---------------------------|---|--------------------|--|--|-------------------------|--|
|                           |   | Wildlife Alliance. | -24-hour electricity and clean water.  |  |                         |  |
| 15.4 River Floating Lodge | Koh Kong Province.<br>Land concession (not sure if it is legalized by the government) | Private enterprise | -National Road 48 and continue to drive for over 130 km.<br>- Tatai waterfall, subset cruise, Koh Andet Island, jungle trek, Cardamom Mountain and rivers.<br>-Electricity, phone, Wifi, and clean water | -River with evergreen forest surrounding |                         | Ecolodges. asia<br>-Land concession<br>-Private                |
| 16. Shinta Mani Wild      | Corridor between Kirirom and Bokor National Park                                      | Private enterprise | -Access unclear.<br>Wildlife watching, trekking, resort amenities (not yet open)   | Evergreen forests                        |                         | www.lonelyplanet.com/news/2018/09/22/shinta-mani-wild-cambodia |



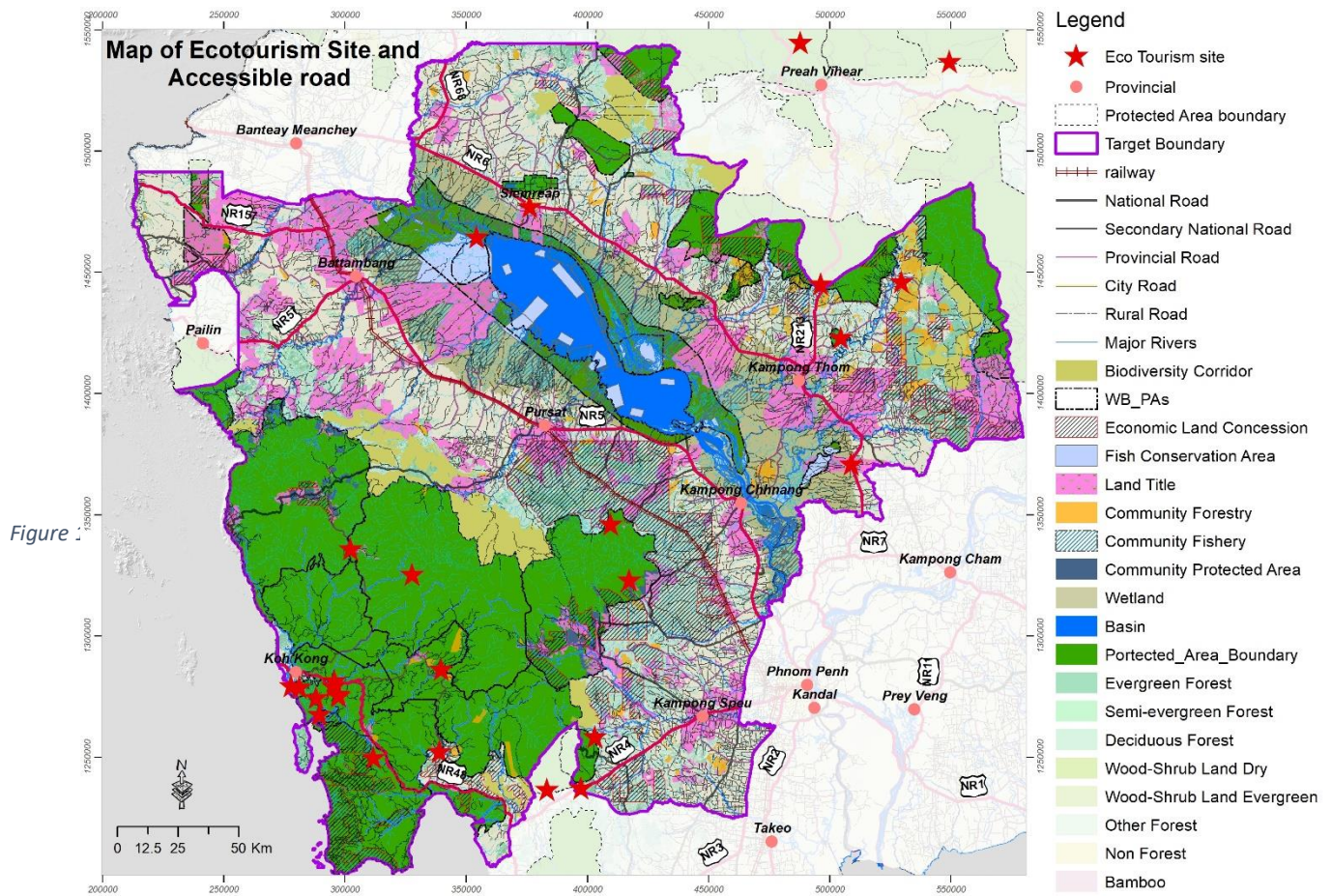
## Appendices

### Appendix 1: Summary Review of Studies Conducted in Cambodia on NTFPs

| Literatures                    | Year | Location   | Objectives  | NTFP   | Key results   | Recommendation  |
|--------------------------------|------|--|---|--------|---|---|
| Neang T. 2009.                 | 2008 | Phnom Samkos Wildlife Sanctuary, Cardamom Mountain, Cambodia                   | <ul style="list-style-type: none"> <li>-Species of resin trees</li> <li>-Resin collection</li> <li>-Protection of natural tree species</li> <li>-Production</li> </ul>                  | Resin  | <ul style="list-style-type: none"> <li>-14 resin species have been identified</li> <li>-2,083 trees have been used</li> <li>-30 trees provide 30 liters of resin</li> <li>-Collect almost year-round, not Mar-Apr</li> <li>-Villagers sell resin to middlemen</li> </ul>  | <ul style="list-style-type: none"> <li>-Only tree that have DBH larger than 60cm should be used to collected resin</li> <li>-Hold should be small (25-30%) of the total DBH</li> <li>-Tax on resin should be paid to community fund.</li> <li>-Tax should be removed from communities to increase profit</li> </ul>   |
| Charles M. P and Andrew H 2014 | 2014 | Cambodia, Laos and Vietnam   | Guide book about rattans  | Rattan | -Detail description of the species and some trade   | -Sustainable management of rattans depend on the willingness of communities.  |
| PromP and McKenney B           | 2003 | -Mondulkiri<br>-Preah Vihear<br>-Kompong Thom<br>-Oddar Meanchey and Siem Reap | <ul style="list-style-type: none"> <li>-Resin tapping methods</li> <li>-Tree tenure</li> <li>-Threats</li> <li>-Analyse resin production and marketing</li> <li>-Resin trade</li> </ul> | Resin  | <ul style="list-style-type: none"> <li>-Cutting a backward slope hole</li> <li>-Trees DBH large than 60cm</li> <li>-Larger trees yield more resin</li> <li>-Communities own trees, but not legalized by government</li> <li>-Quality of resin, quality of resin has been not tested.</li> <li>-Trade: Cambodia to Vietnam and then China</li> </ul> | <ul style="list-style-type: none"> <li>-Eliminate transport and other fees</li> <li>-Improve marketing</li> <li>-Remove all export tax and simplify expert license</li> <li>-Enforce law enforcement to protect resin trees</li> <li>-Establish resin/NTFPs as focal sector for pro-poor trade initiatives</li> </ul> |
| Meng Monyrak                   | 1998 | National   | Overview of bamboo stocks and trends in Cambodia  | Bamboo | <ul style="list-style-type: none"> <li>-Little data existed at time of report – more research needed and human resource capacity to support this</li> <li>-Bamboo has been neglected as a potential livelihood support</li> </ul>   | <ul style="list-style-type: none"> <li>-More research on bamboo stocks and trends in Cambodia required</li> <li>- Conservation plan needed to prevent overexploitation leading to resource depletion</li> </ul>   |

|                  |      |                            |  |        |  |  |
|------------------|------|----------------------------|--|--------|--|--|
|                  |      |                            |  |        | although has long history of subsistence use   |  |
| GIZ 2013         | 2013 | Siem Reap                  | -Provide information to investors, entrepreneurs and business with tailored information on bamboo sticks | Bamboo | -Small scale with simple products investment (chopsticks, and other sticks), but need national and international market.<br>-Risk management (increase or decrease price (raw material and products)). |  |
| Meas et al. 2007 | 2007 | Kampot and Kampong Chhnang | -Handicraft products and technology used<br>-Analysis of commodity chain and value chain of products     | Bamboo | -Small income for local communities<br>-Value chains differ among locations<br>-Use very simple technology in producing  |  |

## Appendix 2: Ecotourism Stocktaking - Map of Ecotourism Sites and Access Roads



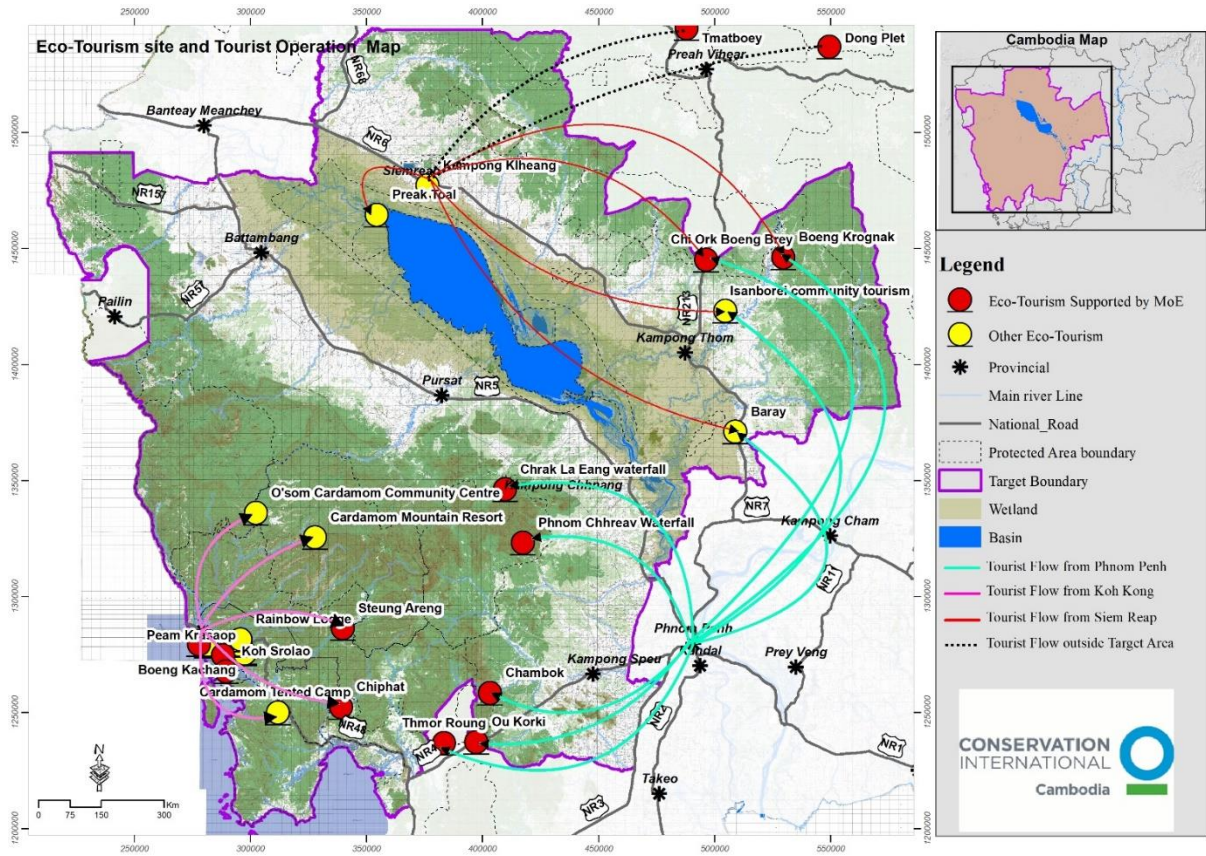


Figure 13 Map of Ecotourism Enterprises in Target Area



## Appendix 3: Companies that Partner with the Cambodian Rattan Association

| Name  | Source of products                            | Products  | Price/unite | Target   |
|---|---|---|-------------|--|
| Angkor Rattan Handicraft (based in Siem Reap) | Banteay Mean Chey<br>Presh Vihear<br>Koh Kong | Sofas, closets, hammocks, chairs, beds, tables, cupboards, and others<br>Total: 56,500 canes/year   | N/A         | Hotels, Quest houses, restaurants, supper markets, furniture stores  |
| Khmer Rajana Rattan Handicraft (Phnom Penh)   | Kampong Speu<br>Kampot<br>Koh Kong            | Semi-products: rattan cane webbing, rattan core, rattan peel<br>Finished products: sofas, closets, hammocks, chairs, beds, tables, cupboards, and others.<br>Total: 16,000 canes/year | N/A         | Hotels, Quest houses, restaurants, supper markets, furniture stores<br>International market: USA, Canada, and France |
| Khun Banlaing Rattan Handicraft (Phnom Penh)  | Presh Sihanouk                                | Semi-product: Rattan core<br>Finished products: sofas, closets, hammocks, chairs, beds, tables, cupboards, and others.<br>Total: 10-15 tons/year                                      | N/A         | Hotels, Quest houses, restaurants, supper markets, furniture stores  |
| Kong Chamnan Rattan Handicraft                | Presh Sihanouk                                | Finished products: sofas, closets, hammocks, chairs, beds, tables, cupboards, and others.<br>Total: 30 tons/year  | N/A         | Hotels, Quest houses, restaurants, supper markets, furniture stores  |
| Kuy Meng Rattan Handicraft (Presh Sihanouk)   | Komping Speu                                  | Sem-products: Rattan cane webbing, rattan peel, rattan core<br>Finished products: sofas, closets, hammocks, chairs, beds, tables, cupboards, and others.                              | N/A         | Hotels, Quest houses, restaurants, supper markets, furniture stores  |

|   |  |  |     |   |
|---|--|--|-----|---|
|   |  | Total: 60,000<br>canes/year  |     |   |
| Siem Reap Natural<br>Fiber Associate<br>(Siem Reap) | Siem Reap<br>Kom Pong Thom                           | N/A  | N/A | N/A   |
| Veng Hout Rattan<br>Handicraft<br>(Phnom Penh)      | Siem Reap<br>Kampot<br>Presh Sihanouk<br>Presh Vihea | Semi-finished<br>products: Rattan<br>cane webbing,<br>rattan peel, rattan<br>core<br>Finished products:<br>sofas, closets,<br>hammocks, chairs,<br>beds, tables,<br>cupboards, and<br>others.<br>Total: 40,000<br>canes/year | N/A | Hotels,<br>Quest<br>houses,<br>restaurants,<br>super<br>markets,<br>furniture<br>stores |
| Bopha Angkor Incense<br>Sticks                      | N/A  | N/A  | N/A | N/A   |
| Manava  | N/A  | N/A  | N/A | N/A   |

## Appendix 4: Ownership of Resin Trees

*Direct excerpt from Evans et al. (2003):*

- the first person to find and mark a tree is considered by village custom to be the owner of that tree. The owner typically starts tapping the tree straight away, but he doesn't have to. Other people may tap it only with permission of the owner.
- this ownership does not have a clear basis in national law but it is recognized by other village members and makes it possible for trees to be sold, bought, given or inherited within or between the villages.
- people from neighbouring villages also respect customary ownership. We were not told of any disputes over tree ownership, although there is a small amount of opportunistic theft of resin by other forest users.
- the trees grow in more or less well-defined groups, separated by areas of apparently suitable habitat where few, if any, grow. All the trees in one group tend to be found by the same person and so the group of trees is the natural unit to talk about when discussing tree locations.
- a family usually owns 1-5 groups of trees, often in widely separated areas that have to be visited on different days.
- almost 80% of groups of trees are tapped by the family that first found them, 11% are tapped by people who have bought the trees and the remainder by people who inherited the trees or were given them by relatives.
- the owner of a group of trees is also considered to own those trees in the group which are not being actively tapped, either because they are too young or they are being held in reserve. Exhausted resin trees are also owned in the sense that other people may not tap them, but the owner is also unlikely to use them again.
- other species present around the resin trees are not owned under this customary law.
- other forest products occurring amongst the resin trees are not owned by the owner of the trees – anybody is free to e.g. hunt, fish or collect rattan amongst the resin trees.
- a few groups are owned jointly between two families (because they found them jointly). They may take turns to visit the trees or go together and share the resin.
- trees are usually tapped by their owners in most parts of the study area, but the owner may occasionally let another person tap his trees, for example to pay off a debt, or to help a relative in need of extra cash. In Ph. Roka Thmei one or two tree owners actually live in Memong and employ a relative to tap the trees in return for a share of the resin.
- the trees in one area near Ph. Roka Thmei (1) are shared between six families. Each of these families has other groups of trees elsewhere which they own exclusively. Tapping of trees in the shared area is decided informally and is usually done by the family most in need of extra income that week.

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