CHAPTER 3 STUDY ON PRESENT CONDITION AND ISSUES

3.1 Forest Cover Map

3.1.1 Grasping of Forest Cover Change Transition

The Time Series Land Cover data was utilized in this study is mentioned in 2.4 section, and forest cover change was analyzed for 1987 to 2018 for the purpose of grasping the forest cover change situation. For change analysis, this study has considered the positive and negative points for utilization of the Time Series Land Cover data. Positive and negative points of using the Time Series Land Cover data are as listed in Table 3.1.

Table 3.1 Summary of Positive and Negative Points

Positive Points	Negative Points
・ Possible to utilize land cover data for 16 years from 2000 to 2015 ・ Using all satellite images of the same specifications and created by the same method. Therefore, it is possible to grasp objectively ・ Can be analyzed in combination with other statistical information and report contents of each country because the land cover data covers five countries in Lower Mekong Basin area	・ The data includes misclassification on a pixel basis due to the land cover data created by pixel-based classification ・ Unsuitable for position-specific analysis with land cover classification result at each pixel as pinpoint

In consideration to the negative points listed in Table 3.1, this project did not analyze pinpoint site basis forest cover change, but the analysis was conducted to understand trend of forest cover change as a main purpose. Therefore, this study had considered suitable method to avoid the effect of pixel-based misclassification. As a result, it was decided to utilize province basis counting of area size and statistical approach in this survey.

The classification items of utilized Time Series Land Cover data are shown in Table 3.2.

Table 3.2 Class Name and Code Number

Code	Class Name	Code	Class Name
1	Surface Water	10	Cropland
2	Snow and Ice	11	Rice Filed
3	Mangrove	12	Mining
4	Flooded Forest	13	Barren
5	Deciduous Forest	14	Wetlands
6	Orchard or Plantation Forest	15	Grassland
7	Evergreen Broadleaf	16	Shrubland
8	Mixed Forest	17	Aquaculture
9	Urban and Built Up	0	Unknown or No-Data

In the current project, the team focused on studying the changes of forest cover and agricultural area, especially regarding the relationship between deforestation and increase in agricultural area, in order to identify divers of forest cover change trends. For this reason, land cover classes were grouped into two categories: forest related area and agricultural related area. Subsequently, area size of each category was calculated at each province level. In addition, the classification items of forest relations on the Time Series Land Cover data is as “Tree Cover” and not the classification item based on the forest definition of each country.

Consolidating into these two groups has the merit of reducing the effect of misclassification for analysis. Normally, in the pixel-based land cover classification by satellite image, the misclassifications are among

different classes such as forest and cropland is smaller than misclassification between different forest types. Therefore, grouping into two categories, forest related area and agricultural related area can reduce the effects of misclassification between classes on similar color pattern of satellite image.

For area counting by each province, the integrated two categories of classification types land cover data were used by overlaying the administrative boundary GIS data. Under this study, area count at province level was calculated for land cover data of each year from 1987 to 2018, which resulted into 32 years of data sets.

The LANDSAT satellite image, which is the input source of the land cover classification data, is also affected by weather condition at the time of observation or at the previous day. This effect leads to variations of the data quality, and it also affects classification results by pixel-based processing. For this reason, there is a small variation in the result of area count between the years. In order to capture the area change trend of tree cover and agricultural land more precisely, smoothing by moving average of 3 years was applied to area count results.

Results of smoothing for each year after area aggregation are compiled by country and the entire Mekong Basin and the results for transition of tree cover and agricultural land area changes are shown as graphs in Figure 3.1. However, be noted that total area of each country was counted for each province area which is covered by Lower Mekong Basin.

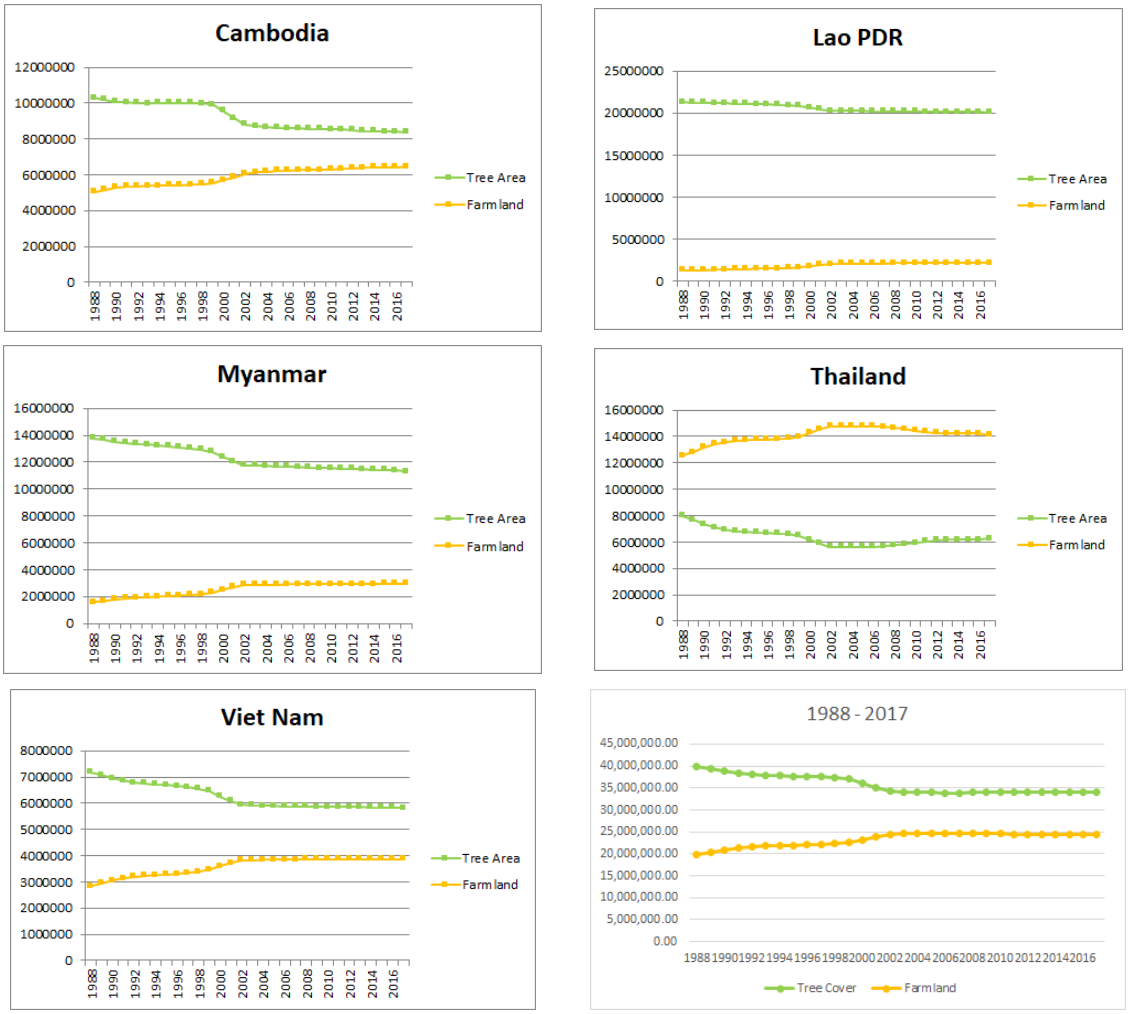


Figure 3.1 Graph for transition of tree cover area change and agricultural land area change

Figure 3.1 shows that there is a correlation between transition of tree cover area and agricultural land area in the entire Lower Mekong Basin as well as in each country. Also, in the entire Lower Mekong Basin, the tree cover area gradually decreased from 1988 to 1999, but it appears that it decreased rapidly from 1999 to 2002.

3.1.2 Extraction of Hot Spot-1

In this project, based on area count of the land cover data by province, tree cover area and agricultural land area changes were analyzed at province level separately. For the analysis, correlation coefficient was calculated of the transition of the tree cover area and the agricultural land area. Additionally, the calculation was performed for the remaining tree cover residual rate of the tree cover area between 1988 and 2017, tree cover decreasing rate and tree cover rate by province. In the result, the inverse correlation of tree cover and agricultural land area change was observed in many provinces, especially all provinces in Cambodia, Lao PDR and Thailand, and 60% province in Viet Nam had the inverse correlation. The summarized calculation result is shown in Annex 1.

For the extraction of hotspot-1, the calculation of each indicator was utilized such as correlation coefficient in individual province. The following condition of indicators was utilized for extraction of hotspot-1.

- Tree cover >= 50%
- Tree Cover Decreasing Rate <= 0.22% / Year
- Correlation Coefficient <= -0.7 for transition of tree cover area change and agricultural land area change

To set the criteria, JST used HFLD (High Forest Low Deforestation) definition. A developing country with more than 50% forest cover and a deforestation rate below 0.22% per year is considered to fall into the High forest cover and low deforestation category. JST defined Hotspot-1 as the area with High tree cover area but not Low tree cover decreasing rate. For correlation coefficient, JST used it less than -0.7. Normally, in case of more than 0.7 or less than -0.7 is a high correlation.

Based on the above criteria, for the deforestation Hotspot, which is thought to be caused by the increase of agricultural land area, the Hotspot province was extracted and compiled in the following Table 3.3. The location of Hotspot provinces is shown in Figure 3.2, and sample of graph for extracted Hotspot provinces for transition of tree cover area change and agricultural land area are shown in Figure 3.3 and Figure 3.4. All graphs for Hotspot province (Pink Color) are shown in Annex 2.

Table 3.3 Hotspot-1 Province

Cambodia		Lao PDR	
	Battambang		Savannakhet
	Kampong Thom		Vientiane city
	Kratie		Vientiane
	Mondul Kiri		Xaignabouri
	Otdar Meanchey	Thailand	
	Pailin		Chiang Mai
	Preah Vihear		Chiang Rai
	Pursat		Loei
	Ratanak Kiri		Mukdahan
	Siem Reap		Phayao
	Stung Treng		Phetchabun
Viet Nam			
	Dak Nong		Dien Bien
	Dak Lak		Gia Lai

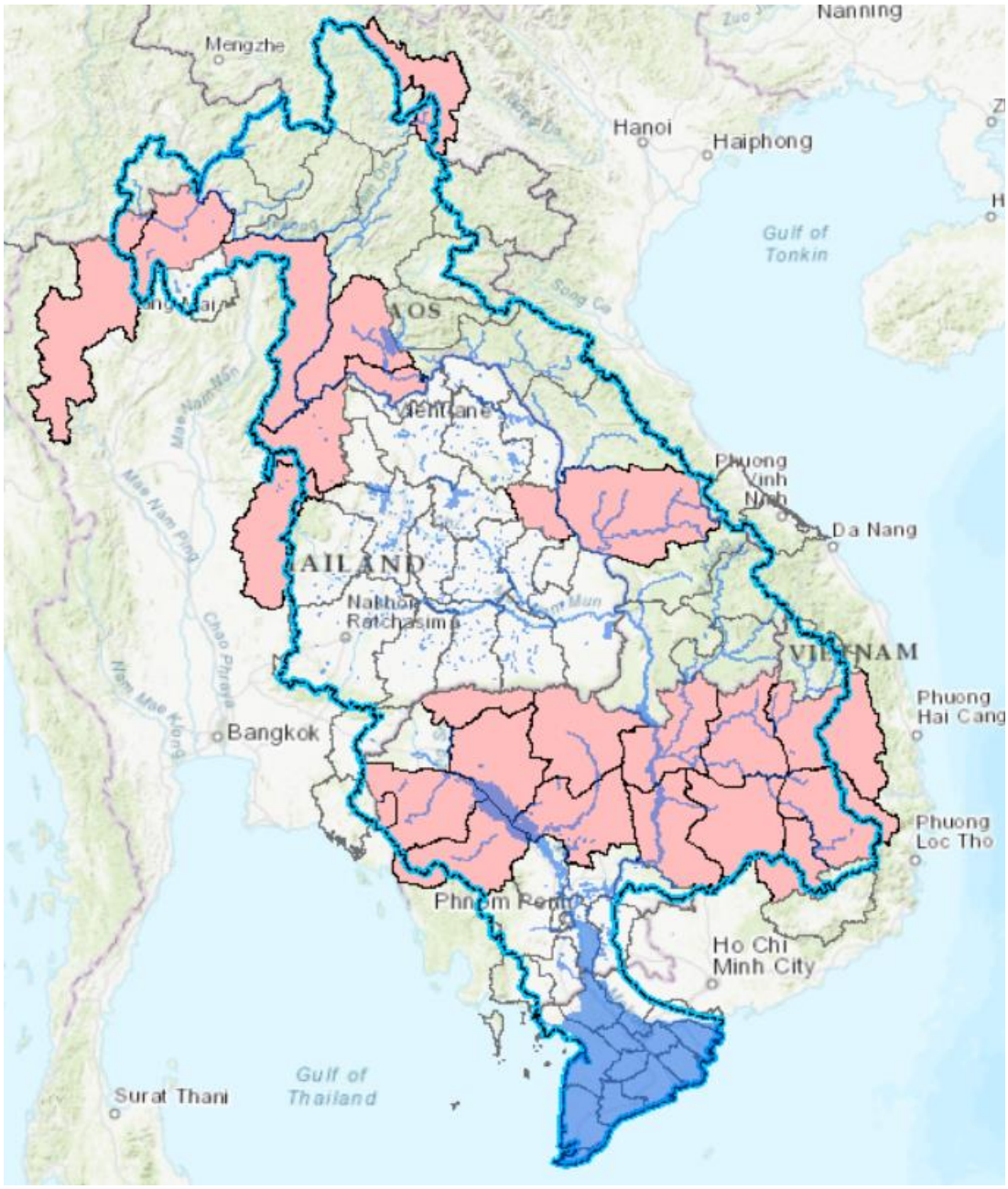


Figure 3.2 Hotspot 1 Province

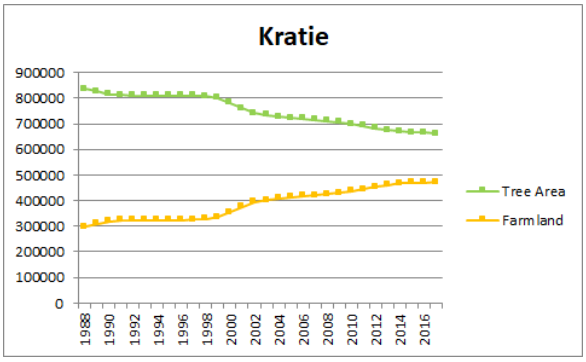


Figure 3.3 Transition of tree cover area change and agricultural land area

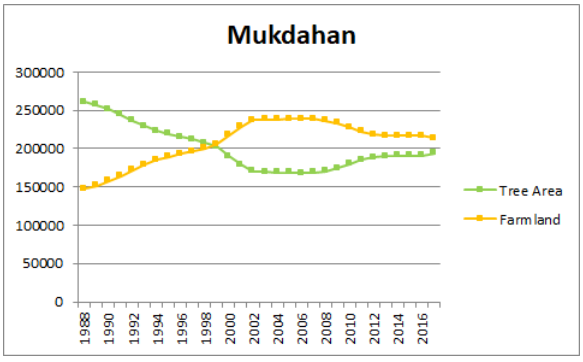


Figure 3.4 Transition of tree cover area change and agricultural land area

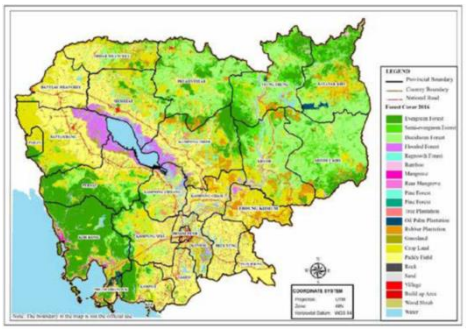
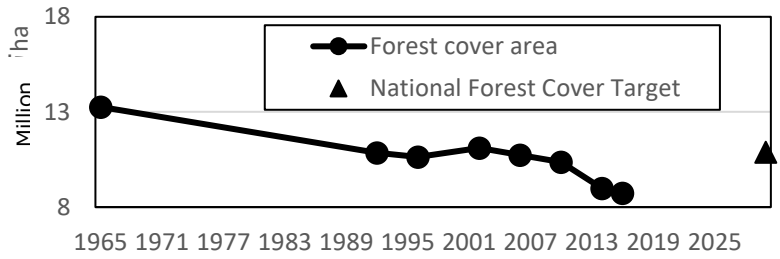
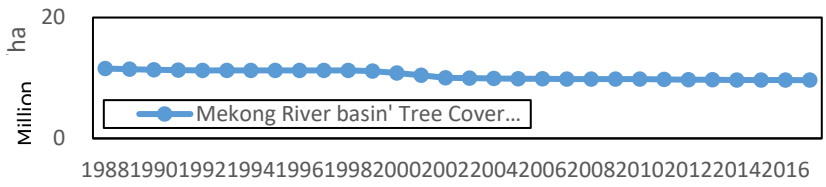
3.2 Factor Analysis Work on Deforestation and Forest Degradation

3.2.1 Status of forest in each country

This section summarizes the circumstances of forests in the four LMB countries of Cambodia, Lao PDR, Thailand, and Vietnam. This report organizes the forest-related circumstances of the four countries into a two-tiered structure consisting of a "Summary Sheet" summarizing the information of each country and a "text" organizing the detailed information. Note that the source reference materials for the numerical values and information shown in the Summary Sheet are presented in the footnotes to the text rather than in the Summary Sheet itself. In the case of Myanmar, JST organized a summary sheet without conducting a detailed survey.

3.2.1.1 Cambodia

(1) Summary sheet of Cambodia

National area	18,160,674 ha[1]	Forest cover in Cambodia (2016)[4]
Population	16,246,000 (2017)[2]	
Population growth rate	1.48% (2018)[2]	
GDP per capita	1,509 USD (2018)[3]	
Real GDP growth rate	7.25% (2018)[3]	
Forest area	8,742,401 ha (2016)[4]	
Forest area rate	48.14% (2016)[4]	
Forest targeted rate	60% (Including Natural Rubber and oil Palm)	
Forest definition	・Area: At least 0.5ha, Height: More than 5m, Canopy crown cover: More than 10% ・Included forest regrowth area and plantation area ・Rubber and oil palm plantation are classified as forest under the national forest definition, but are excluded under the REDD+ definition	
Forest classification and jurisdiction	・Permanent Forest Estate (PFE) : Forestry Administration, MAFF ・Inundated forest and mangrove outside of PAs : Fisheries Administration, MAFF ・Protected Area(PA) : General Department of Administration for Nature Conservation and Protection(GDANCP), MoE	
Change of forest area in Cambodia		
LMB area in Cambodia	16,457,410 ha	LMB area in Cambodia
Provinces which are in LMB area	Banteay Meanchey, Takeo, Khmum, Battambang, Kampot, Kampong Cham, Kampong, Kratie, Chhnang, Kampong Speu, Tbong, Kampong Thom, Kandal, Krong Pailin, Mondul Kiri, Otdar Mean Chey, Phnom Penh, Pursat, Preah Vihear, Prey Veng, Stung Treng Ratanak Kiri, Siem Reap,	
Tree cover area in the LMB area	8,384,248 ha(2017 年) (JST data)	Tree cover rate in the LMB area: 50.9 % (2017 年) (JST data)
Chage of the tree cover in LMB area in Cambodia (JSTdata)		

[1] FRA2015 http://www.fao.org/3/a-i4808e.pdf
[2] UN, Demographic Yearbook system, Demographic Yearbook 2017
[3] UN data https://unstats.un.org/home/

(2) Status of Forest

1) Forest Definition

Cambodia applies two definitions for forests: a national forest definition and a REDD + definition. The difference between the definitions lies in the handling of natural rubber and oil palm. The Cambodian forest definitions are summarized in Table 3.4

Table 3.4 Forest definitions in Cambodia

Definition	Area	Height	Canopy crown cover	Other
National Forest definition	At least 0.5ha	More than 5m	More than 10%	・Rubber, oil palm plantation, and teak, acacia, and eucalyptus and other kind of trees which fall under the beside criteria will also be classified as forests.
Forest definition (REDD+)				・Included forest regrowth and areas under afforestation or reforestation. ・Rubber, oil plantations and perennial crops are excluded from this definition.

Source: Based on Cambodia Forest Cover 2016[4], JST summarized

2) Forest classification and distribution

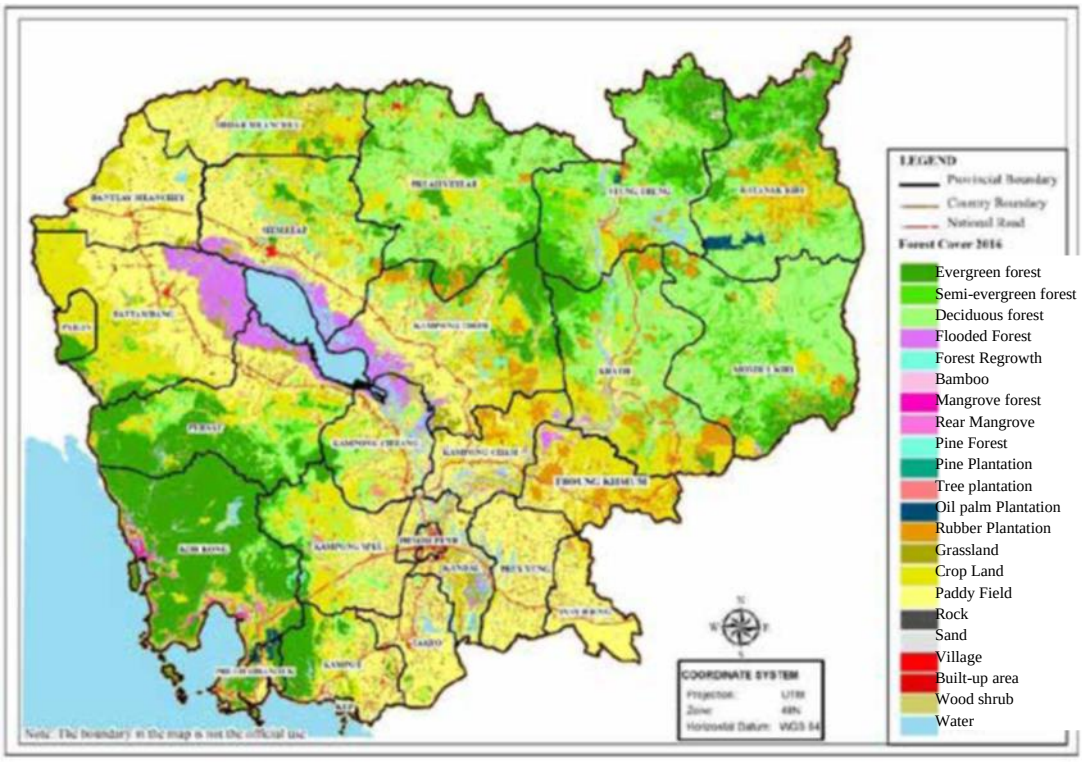
The vegetation of Cambodia is shown in Table 3.5. A map of the national land use/cover from 2016 is shown in Figure 3.5. The forest area by vegetation (REDD + definition, 2016) is shown in Table 3.6.

Table 3.5 The vegetation of Cambodia[4]

Land cover class	Description
Evergreen forest	Areas covered by trees maintaining their leaves during the whole year
Semi-evergreen forest	Contain variable percentages of evergreen and dry Dipterocarp forest
Deciduous forest	Comprised of dry mixed deciduous forest and dry Dipterocarp forests
Flooded Forest	This forest type is found in Tonle Sap Lake. Most of the forests are low and disturbed. In many cases, there is only a mosaic remaining.
Bamboo	Areas dominated by bamboo
Mangrove forest	Areas dominated by Mangroves i.e. coastal salt tolerant species
Rear Mangrove	Mostly growing in coastal zone after mangrove spp. Salt tolerant species but only infrequent floods
Tree plantation	This class includes the following type: teak, eucalyptus, acacia, jatropha and others

Source: Based on Cambodia Forest Cover 2016[4], JST summarized

[4] CAMBODIA FOREST COVER 2016（MoE, March 2018）
https://redd.unfccc.int/uploads/54_3_cambodia_forest_cover_resource__2016_english.pdf



Source: Based on Cambodia Forest Cover 2016[4]

Figure 3.5 Map of national land use/cover 2016[4]

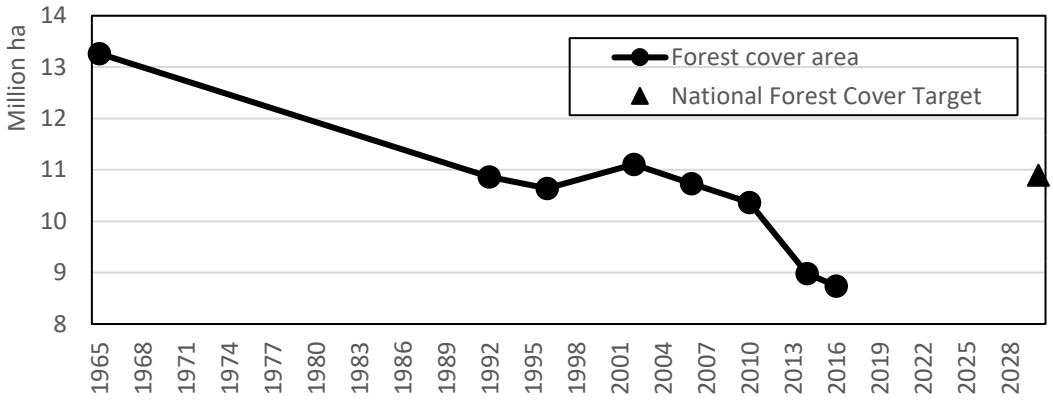
Table 3.6 Forest area by vegetation (REDD + definition, 2016) [4]

Land cover class	Area(ha)	Percentage (%)
Evergreen forest	2,861,233	15.76
Semi-evergreen forest	1,071,947	5.90
Deciduous forest	3,336,349	18.37
Flooded forest	477,813	2.6
Bamboo	125,398	0.7
Mangrove forest	31,226	0.2
Rear Mangrove	25,906	0.1
Tree plantation	43,122	0.2
Other Forest	208,907	1.2
Total	8,181,901	45.05

Source: Based on Cambodia Forest Cover 2016[4]*, JST summarized*

3) Changes in the forest area and underlying factors

Cambodia has declared a national goal of restoring the total forest area to 60% of the country's total surface area (including rubber and oil palm). As of 2016, the forest area of Cambodia was 8,742,401 ha[4], covering 48.14% of the national land of Cambodia. The change of the forest area in Cambodia is plotted in the graph in Figure 3.6.



Source: Based on Cambodia Forest Cover 2016[4], JST summarized

Figure 3.6 Change of the forest area in Cambodia

Although the rate of forest cover in Cambodia was recorded to be 73.04% in around 1965, the forest resources decreased sharply during the civil conflict from 1970 to 1993 (CAMBODIA FOREST COVER 2016[4]). Later, in the postwar period, deforestation and forest degradation progressed due to the expansion of agricultural land, improvement of infrastructure, removal of timber, and collection of fuelwood and other materials in step with the economic development and population growth of the country. According to the National REDD+ Strategy (2017-2027)[5], over the period between the end of the civil conflict and 2014, the government of Cambodia granted a total forest land area of about 2.02 million hectares for agribusiness development, as well as forest land in the form of concessions for natural gas and mining exploration. During the period from 2009 to 2013, a total forest area of 2.45 million hectares was allocated as social land concessions to poor households, to military households, and for the establishment of new villages. In 2014, the government de-gazetted 1.2 million hectares of forest land to issue land titles to landless communities.

The Cambodian government has responded to this rapid deforestation by issuing a declaration banning the exportation of exports of logs and rough timber in 1996, enacting a Sub-Decree on the Forest Concession Management in 2000, and enacting a logging ban within the Permanent Forest Estate in 2002. In 2012, the Cambodian government placed a moratorium on the granting of new ELCs and called for a review of existing ELCs under the Prime Minister's Order No.01. Since then, the issuance of new ELCs has been suspended. An export ban on all timber exports to Vietnam was also imposed in 2016.

4) State of forest degradation

Cambodia's REDD + strategy aims to reduce deforestation and forest degradation while promoting sustainable management, conservation of natural resources, and poverty reduction. The first priorities are to reduce deforestation and then to improve capacity for the reduction of forest degradation. For this reason, detailed data on the status of forest degradation in Cambodia are not available at present.

(3) Forest governance

The management of forests is under the general jurisdiction of the forestry administration (FA) and Fisheries Administration (FiA) of the Ministry of Agriculture, Forestry, and Fisheries (MAFF) and the General Department of Administration for Nature Conservation and Protection (GDANCP) under the Ministry of Environment (MoE). The classification and jurisdiction of forests are defined in the Forest Law revised in 2002. In September 2016, however, under Decree 69, the Protection Forests formerly under the jurisdiction of the FA were reclassified as one of the Protected Areas and placed under the jurisdiction of the GDANCP of MoE. The current classifications and jurisdiction of Cambodia's forests are shown in Table 3.7.

[5] National REDD+ Strategy 2017-2027 (2017)
http://www.cambodia-redd.org/wp-content/uploads/2017/09/1.-NRS-Final-Eng.pdf

Table 3.7 Current classifications and jurisdictions of Cambodia's forests

<table>
<tr><td rowspan="6">Ministry of Agriculture, Forestry and Fisheries (MAFF)</td><td rowspan="4">Forestry Administration (FA)</td><td rowspan="4">Permanent Forest Estate (PFE)</td><td rowspan="3">Permanent Forest Reserves (PFR)</td><td>Production Forest</td><td>-Forest Concessions
-Production Forests not under concession
-Forests rehabilitated
-Reserve Forestland for reforestation or tree plantation
-Reserved forestland for forest regeneration
-Degraded Forest land
-Community Forests under agreement</td></tr>
<tr><td colspan="2">Conversion Forestland</td></tr>
<tr><td colspan="2">Private Forests</td></tr>
<tr><td rowspan="3">Fisheries Administration (FiA)</td><td rowspan="3">Inundated forest and mangrove areas outside of PAs</td><td colspan="2">Community fisheries</td></tr>
<tr><td colspan="2">Fishing lots</td></tr>
<tr><td colspan="2">Fisheries protected and conservation areas</td></tr>
<tr><td rowspan="4">Ministry of Environment (MoE)</td><td rowspan="4">General Department of Administration for Nature Conservation and Protection (GDANCP)</td><td rowspan="4">Protected Area (PA)</td><td colspan="2">-Protected Areas-National Park,-Wildlife sanctuary-Protected landscape-Multiple use area-Ramsar site-Biosphere reserve-Natural heritage site-Marine park</td></tr>
<tr><td>Protection Forests</td><td>-Reserve Forests for special ecosystems
-Research forests-Forests for regulating water sources-Forests for watershed protection-Recreation forests-Botanical gardens-Religious forests</td></tr>
<tr><td colspan="2">Community protected areas</td></tr>
<tr><td colspan="2">Flood forests and Mangroves inside of Pas</td></tr>
</table>

Source: Based on Forest Law, Fisheries Law and Protected Areas Law, JST summarized

1) Ministry of Agriculture, Forestry and Fisheries (MAFF)

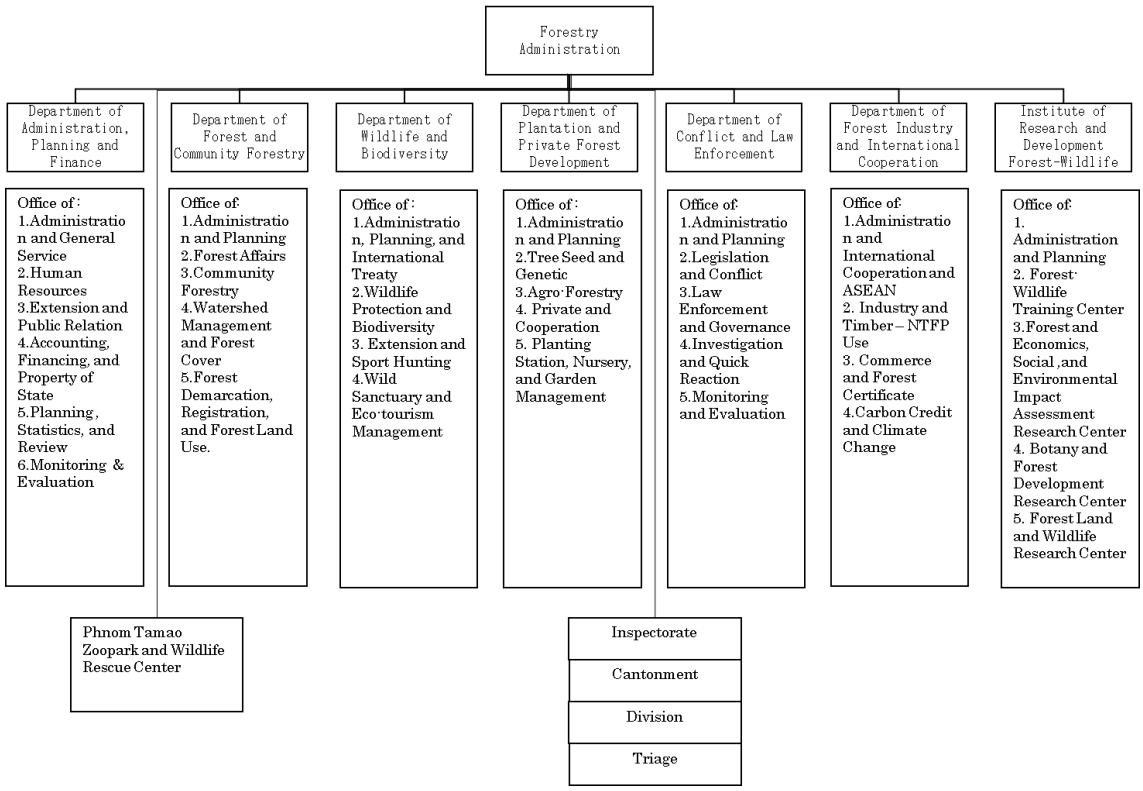
The MAFF is responsible for policies related to agriculture, forestry and fisheries, sectors that together contribute 30% of Cambodia's gross domestic product. Ten directly controlled divisions and 4 independent departments, such as the Department of Agriculture, Forestry, Fisheries, Natural Rubber, and Livestock Health, operate under the MAFF.

2) Forest Administration (FA)

The FA is positioned under the MAFF, and the Forest Law stipulates that the Permanent Forest Estate (PFE) is to be controlled by the FA. The PFE consists of Permanent Forest Reserves (PFR) and Private Forests. The private forests account for a small proportion of the forests administered under the FA. The PFE consists of both production forests and converted forests, but since the concessions have stopped the management of production forests has been the main component under the FA's jurisdiction. The FA engages about 360 staff members working in the central government and another approximately 900 in regional offices. The FA staff has decreased because some FA officers moved to MoE when the jurisdiction over the protected forests was transferred from the FA to the MoE in 2016. Cambodia is also decentralizing, so some local FA officers have moved to new positions in local government. The FA organization chart is shown in Figure 3.7.

The FA budget was 205 million riel in 2018, 345 million riel in 2017, and 262 million riel in 2016.

The annual budget has varied according to the activities conducted, but overall the budget is on a shrinking trend as the number of FA officials decreases.



Source: FA data

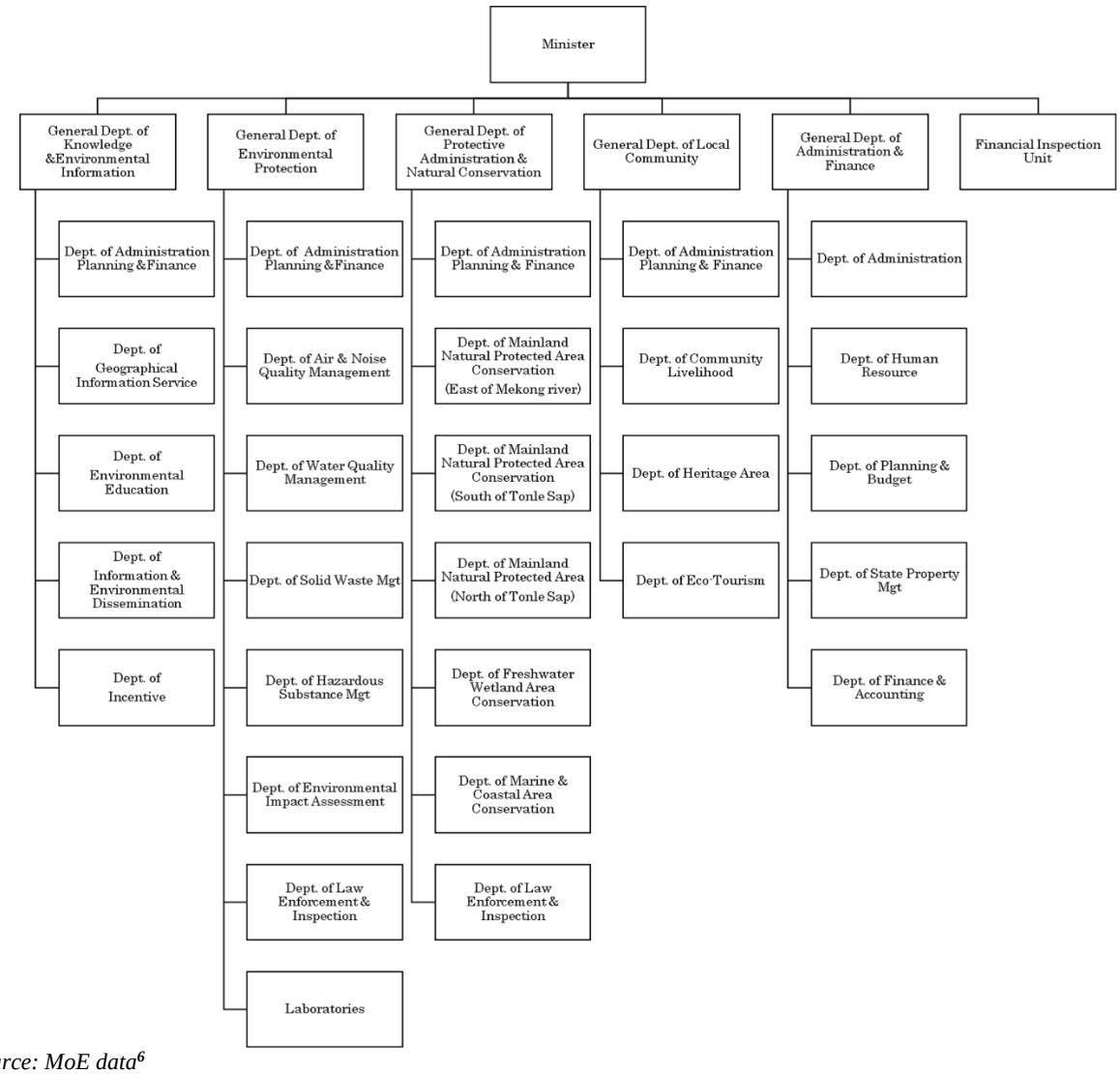
Figure 3.7 Organization chart of the FA

3) Fisheries Administration (FiA)

FiA is located under the MAFF. FiA is responsible for making and administering fisheries policies that contribute to the improvement of people's livelihood, economic development, social development, and national development through sustainable aquaculture management and conservation to contribute to securing food security. In forest management, FiA is responsible for the flooded forests around Tonle Sap Lake and the mangrove forests in coastal areas not designated as protected areas.

4) Ministry of Environment (MoE)

The MoE leads and manages environmental protection, biodiversity conservation and the appropriate and sustainable use of natural resources in order to sustainably maintain the long-term benefit of Cambodia and all of its people. According to Decree No. 135 in 2016, the MoE has a General Secretariat of four Ministries of Mines, a Secretariat and General Secretariat of the National Development Board of Sustainable Development (NCSD), and 35 specialized departments. Although the MoE managed Protected Areas (PAs) as natural resources, the Protection Forests under the jurisdiction of the FA were re-designated as protected areas under the jurisdiction of the MoE by Sub-Decree No.69 dated April 28, 2016 ("Transfer of the Protection Forest, Forest Conservation, and Production Forest Areas, and Economic Land Concessions between MAFF and MoE." The MoE has also been expanding the PAs since 2013 (expanded from 23 locations and 3.2 million ha in 2013 to 51 locations and 7.5 million ha in 2018) and is accordingly assuming greater responsibility over forest conservation and management in Cambodia. Figure 3.8 shows the organization chart of the MoE.



Source: MoE data[6]

Figure 3.8 Organization chart of the MoE

5) Department of Administration for Nature Conservation and Protection (DANCP)

The DANCP conducts nature conservation activities for protected areas and for biodiversity, as well as the management and coordination of the sustainable use of natural resources, under the MoE. After the areas managed by the FA were incorporated into the PA under the MoE by sub degree No. 69 in 2016, the organization expanded with the addition of staff moved from the FA.

6) Institute of Forest and Wild life Research and Development (IRD)

The IRD, established under the FA in 1999, leads research on forest resource conservation, livelihood improvement, and economic development in Cambodia. The IRD's main activities are focused on the restoration of degraded forests in the community forests and inactive ELCs, afforestation, and biodiversity conservation. The IRD operates four centers and one office and engages about 50 staff members.

(4) Forest Policy

1) Law

(a) Forest Law (2002)

The revised Law on Forestry issued in 2002 provides a framework for forest management,

[6] MoEWebsite http://www.moe.gov.kh/

harvesting, utilization, development, and conservation in order to establish sustainable forest management that brings social, economic and environmental benefits to Cambodia in the form of biodiversity conservation, cultural conservation, etc. The Forestry Law states that the management of forests is under the jurisdiction of the MAFF (excluding the management of flooded forests, which is covered by a different law). The law also delegates the authority to manage Protected Areas to the Ministry of Environment. The jurisdiction over Protection Forests, however, was transferred from the MAFF to the MoE by Sub decree No.69 in 2016.

(b) Fisheries Law（2006）

This law aims to ensure adequate fisheries and fishery resource management, enhance aquaculture development, ensure adequate management of production and processing, and promote the livelihood of people in local communities, in order to realize socioeconomic and environmental benefits, including sustainable conservation of biodiversity and natural culture heritages in Cambodia. The management of inundated forests and mangrove forests other than PAs is stipulated under this law.

(c) Protected Areas Law（2008）

This law, issued in 2018, defines the framework for the management, conservation, and development of the protected areas defined under the provisions of the Law on Environmental Protection and Natural Resources Management in 1996, in order to ensure the management, conservation of biodiversity, and sustainable use of natural resources in protected areas. The PAs are managed as four zones: core zones, conservation zones, sustainable use zones, and local community zones.

2) Strategy and Plan

(a) The Rectangular Strategy Phase Ⅲ

The Rectangular Strategy phase Ⅲ formulated in 2013 is the top national policy in Cambodia. Good governance is set as the core of the strategy. The strategy sets four Strategic Rectangles to further strengthen good governance: (1) Promotion of the Agriculture Sector, (2) Development of Physical Infrastructure, (3) Private Sector Development and Employment, and (4) Capacity Building and Human Resource Development. The strategy and plan address the forest sector with a focus on the key concept of "balance between development and conservation" in descriptions focused on the Sustainable Management of Natural Resources in node (1) of the strategic triangle, Promotion of the Agricultural Sector. According to the descriptions given, the national goal of establishing 60% forest coverage and 453 community forests was almost achieved during Phase II of the Rectangular Strategy. As the remaining issues are improved in Phase III of the Rectangular Strategy, the strategy calls for measures to increase the contribution of natural resources to the development of the agriculture sector by ensuring: (1) green cover, forest and wildlife conservation; (2) the sustainability of fisheries resources; and (3) the sustainability of the eco-system. Three approaches are taken to achieve these objectives: (1) clearly determining the ownership of natural resources; (2) developing an appropriate incentive scheme for the conservation of natural resources and empowering the sub-national government, communities and individuals to participate in their conservation by focusing on training and information-sharing, strengthening social capital, and improving institutional accountability and transparency; and (3) stepping up cooperation with concerned stakeholders under the framework of green growth and climate change. The following programs and laws have been given priority based on these approaches: the "National Forest Program 2010-2029," the "Law on Environmental Protection and the Management of Natural Resources," the "Law on Protected Natural Areas," the "National Policy on Green Development," the "National Strategic Plan on Green Development 2013-2030 of Cambodia," etc.

(b) National Strategic Development Plan (NSDP)

With regard to the forest sector, the NSDP (2014-2018) indicates the current status of achievement of the National Forest Program, together with related issues such as the lack of

laws and regulations, poor awareness of the importance of forest resources, lack of human resources and equipment, the spread of illegal logging, the difficulty in controlling land acquisition, weak cooperation with local authorities, the influx of domestic migrants to protected forestland and wildlife sanctuary, etc. In response, the NSDP will strive to implement the National Forest Program and associated action plan as a priority policy.

(c) National Forest Programme (NFP） (2010-2029)

The NFP (2010-2029) was formulated in 2010 as a long-term policy for the Cambodian forest sector. The NFP consists of the following six programs.

Programme 1: Forest Demarcation, Classification and Registration

Programme 2: Forest Law Enforcement and Governance

Programme 3: Conservation and Development of Forest Resource and biodiversity

Programme 4: Community Forestry Programme

Programme 5: Capacity and Research Development

Programme 6: Capacity and Research Development

An index established in the NFP (2010-2029) measures the degree to which various activities have been achieved, such as those undertaken to restore the forest cover rate to 60% in 2030. Given how circumstances in the forest sector have changed since the NFP (2010-2029) was formulated in 2010, it will be necessary to revise the NFP based on the progress made so far and on the changing social conditions surrounding forests. The current NFP, for example, offers few descriptions of the important program for forest management Cambodia is currently implementing under the REDD + framework.

(d) National REDD+ Strategy (NRS)

REDD + readiness is progressing in Cambodia. The National REDD + Strategy (NRS) 2017-2026 was approved by the Prime Minister at the end of 2017. The NRS has the following three strategic goals.

1. Improve management and monitoring of forest resources and forest land use
2. Strengthen implementation of sustainable forest management
3. Mainstream approaches to reduce deforestation, build capacity, and engage stakeholders

The NRS will be implemented in two phases. In Phase I (2017-2021) the action plan for NRS will be developed and institutional arrangements for NRS implementation will be finalized. The FRL, NFMS, and SIS will be established to complete the requirements of the Warsaw Framework. Then a mid-term assessment of the NRS will be undertaken to identify lessons and challenges and to address them during the next phase. The NRS focus during Phase Ⅱ (2022-2026) will be to complete the transition from readiness to implementation and prioritize the achievement of measurable results. The findings of the assessment of Phase I will be reviewed and appropriate steps will be taken. The forest and land cover change results of 2016, 2018, and 2020 will also be assessed to grasp the effectiveness of the NRS. A key milestone during this phase will be the establishment of a rigorous forest monitoring mechanism that can review policies and measures to address drivers of deforestation and forest degradation for effectiveness and efficiency. Meanwhile, the SIS will continue to be monitored and strengthened. The improved data and results from this phase will also lead to revised versions of the FRL and NFMS.

The formulation of an NRS Action Plan (NRSAP) is planned in response to the formulation of the NRS itself. The NRSAP is developed separately for each forest sector. (The PAs are under the jurisdiction of the GDANCP administered by MoE; the production forests are under the FA administered by MAFF; flooded forests and mangroves other than PAs are under the FiA administered by MAFF). So far, the National Protected Area Strategic Management Plan (2017-2031) and production forest strategic plan (2018-2032) have been formulated.

(5) Forest management and conservation efforts

1) Community Forestry (CF)

According to the Community Forestry Statistics in Cambodia[7], community-based forest management activities were started in Cambodia in the mid-1990s. Later, under the Sub Decree on Community Forestry Management[8] issued in 2003, CF activities were started as official projects focused on sustainable forest management by local people through livelihood improvement. The NFP, which was adopted in 2010, consists of six main programs. The CF program, positioned as the fourth of the six, formulates subprograms stipulating the objectives of identifying potential CF sites, establishing CFs at the sites, implementing community development and livelihood improvement activities, and providing services for CF development. As an indicator of what the program achieves, the program sets out to manage 2 million ha of forests as CFs by 2029.The current registration status of CF in Cambodia is shown in Table 3.8.

Table 3.8 Established status of CF

	Registered CF		Registered CF area	
	Number	Achievement rate	Area (ha)	Achievement rate
Registered (2016)	404	40.4%	341,191	17.06%
Registration underway	580	—	470,970	—
Targeted registration (2029)	1,000	—	2,000,000	—

Source: Based on result of the interview, JST summarized

2) Plantation activities

According to the FA, the NFP targets the planting of 50,000 hectares a year. The present levels of plantation are far lower, amounting to only 2,500 to 3,000 ha/year, most of which is natural rubber plantation on ELCs by a private company. One factor contributing to the low level of government's tree-planting activity has been the change of plantation species. While fast-growing species have been the main plantation species so far, the plantation of high-value native species is being attempted in recent years. The results of FA plantation activities are shown in Table 3.9.

Table 3.9 FA plantation activities

Year	Area (ha)	Species
2007	1,000	Acacia and Eucalyptus
2008	900	Acacia and Eucalyptus
2009	1,000	Acacia and Eucalyptus, native tree species
2010	1,020	Acacia, native tree species
2011	800	Acacia
2012	490	Acacia, Dalbergia coshinchinensis, Dipterocarpus alatus
2013	350	Dalbergia coshinchinensis
2014	400	Dalbergia coshinchinensis
2015	400	Dalbergia coshinchinensis
2016	350	Dalbergia coshinchinensis
2017	152	Dalbergia coshinchinensis

Source: Based on result of the interview, JST summarized

Cambodia has introduced a Private Public Partnership (PPP) initiative to promote plantation activities through private investment in production forests. This initiative started as a pilot program from 2011 to 2016. At present the FA is conducting PPP contracting with five companies, one of which is Korean. Under the PPP framework, 2,500 ha were planted in 2017.

3) Payment for Environmental (Eco system) Service

Some pilot PES projects have been conducted under the FA and in cooperation with MoE.

Table 3.10 summarizes the PES efforts that have been implemented in Cambodia.

[7] Community Forestry Statistics in Cambodia, June 2013
https://server2.maff.gov.kh/parse/files/myAppId5hD7ypUYw61sTqML/328730acb77a730e527af161d6f36731_1539244105.pdf

[8] Council for the Development of Cambodia (CDC) website
http://www.cambodiainvestment.gov.kh/ja/sub-decree-79-on-community-forestry-management_031202.html

Table 3.10 Activities related to PES

PES Type	Name of the scheme	Payee	Lead implementer	Payer	Target ES
Biodiversity PES					
1	Community-based Ecotourism in Preah Vihear	Village fund	WCS	Tourists	Protection of endangered bird species and their ecosystem
2	Agri-environment payments: Wildlife-friendly products（IbisRice） in Preah Vihear	Individual farmers	WCS	Urban consumers, hotels and restaurants	Protection of endangered bird species (e.g. Giant Ibis) and their ecosystem
3	A variety of direct payments schemes for bird nest protection, e.g. Preah Vihear and Kampong Tom（WCS）: Kratie and Stung Treng（WWF）:Ratanakiri（BirdLife International）	Individual villagers	WCS, WWF, BirdLife	NGOs (WCS, WWF, BirdLife)	Protection of specific endangered bird species
4	Direct contracts for turtle nest protection in Kratie and Stung Treng	Individual villagers	CI	NGO (CI)	Protection of specific endangered turtle species
5	Conservation incentive agreements in Ratanakiri	Village fund and individual villagers	Poh Kao	NGO (Poh Kao)	Conservation of forest
6	Conservation incentive agreements in the Cardamom Mountains	Commune fund and individual villagers	CI	NGO (CI)	Conservation of forest and critically endangered species like Siamese crocodile and dragon fish (Asian Arowana)
Watershed PES					
7	Payments for freshwater provision	Not determined	Wildlife Alliance/MoE	Luxury hotels in Siem Reap	Refilling ground water to tableland of Siem Reap
8	Sustainable Provision of Ecosystem Services (SPES) project, i.e. watershed protection for hydropower in Cardamom Mountains	Not determined	FFI/MoE and FA	Dam concessionaire (Chinese co.) and Electricity of Cambodia. A USA 3 million fund has apparently been committed by the concessionaire for "catchment management " It is still unclear if this can be used to finance PES.	Watershed service (sediment-free water flow into the reservoir).

Source: CIFOR9 Report

At the initiative of the National Council for Sustainable Development (NCSD) under the MoE, several PES pilot projects are underway at Phnom Kulen Mountain, the water source forest of Siem Reap, and at Kbal Chhay, a watershed forest that supplies water to Sihanoukville.

(6) Forest sector initiatives related to climate change

1) NDC

Cambodia submitted an Intended Nationally Determined Contribution (INDC) to the UNFCCC in September 2015. The INDC describes the following mitigation strategies to contribute to the forest sector: recovery of 60% of the forest cover by 2030 through the reclassification of forests to avoid deforestation, improved forest governance under the Forest Law Enforcement, Governance and Trade (FLEGT) program, and the international trading of legal timber.

2) REDD+

The progress of REDD+ in Cambodia is shown in

Table 3.11. The REDD+ Readiness phase in Cambodia is progressing well. The development of a BUR report and preparations for a proposal to the GCF towards a pilot programme for REDD+ results-based payments are now underway.

[9] A review of payments for environmental service (PES) experiences in Cambodia (2014) http://www.cifor.org/publications/pdf_files/WPapers/WP154CIFOR.pdf

Table 3.11 Progress of REDD+

NRS	NFMS	FRL	SIS
Developed (2017)[10]	Developed (2015)[11]	Submitted (2017)[12]	Under development

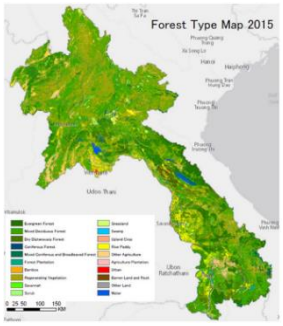
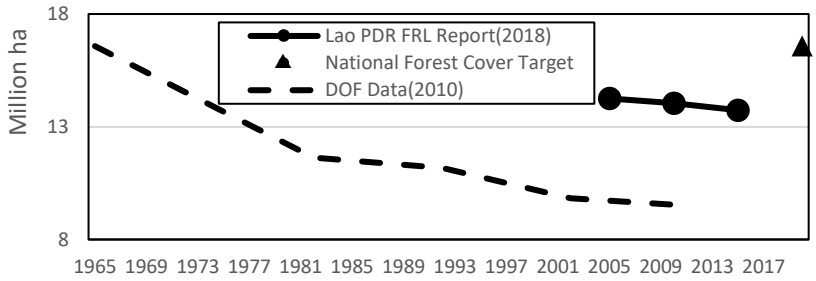
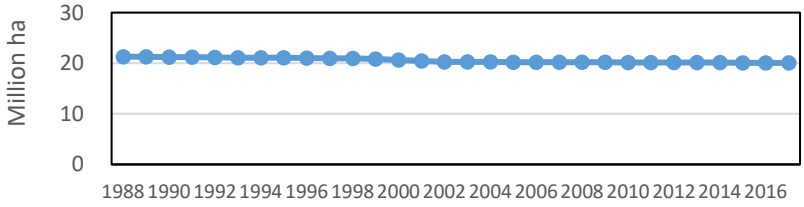
Source: JST

Project-based REDD activities have been implemented in advance in Cambodia. In particular, the REDD project implemented by the Wildlife Conservation Society (WCS) in Seima, Mondol Kiri Province has already obtained credits through VCS. In addition, Mitsui & Co. Ltd. is promoting an REDD project in the Playlong region in cooperation with Conservation International (CI). This project is considering the application of the Joint Credit Mechanism (JCM), a bilateral credit system promoted by the Japanese government.

[10] National REDD+ Strategy (2017－2026) https://redd.unfccc.int/files/20180813_national_redd__strategy_cambodia.pdf
[11] NATIONAL FOREST MONITORING SYSTEM OF CAMBODIA https://redd.unfccc.int/uploads/54_1_cambodia_nfms__sept_17.pdf
[12] Initial Forest Reference Level for Cambodia under the UNFCCC Framework https://redd.unfccc.int/files/camfrl_may_22_2017.pdf

3.2.1.2 Lao PDR

(1) Summary sheet of Lao PDR

<table>
<tr><td>National area</td><td>23,054,258 ha[15]</td><td>Forest Cover in Lao PDR(2015)</td></tr>
<tr><td>Population</td><td>6,858,000(2017)[2]</td><td rowspan="6"> 
</td></tr>
<tr><td>Population growth rate</td><td>1.47%(2017)[13]</td></tr>
<tr><td>GDP per capita</td><td>2,542USD(2017)[14]</td></tr>
<tr><td>Real GDP growth rate</td><td>6.9%(2017)[3]</td></tr>
<tr><td>Forest area</td><td>13,732,282 ha (2015)[15]</td></tr>
<tr><td>Forest area rate</td><td>58% (2015)[15]</td></tr>
<tr><td>Forest targeted rate</td><td>70% （Including Natural Rubber and oil Palm）</td><td></td></tr>
<tr><td>Forest definition</td><td colspan="2">・Area: At least 0.5ha, Height: More than 5m, Canopy crown cover: More than 10%
・Rubber and oil palm plantation are classified as forest</td></tr>
<tr><td>Forest classification and jurisdiction</td><td colspan="2">Protection Forests : Department of Forestry (DOF), MAF
Conservation Forests : Department of Forestry (DOF), MAF
Production Forests : Department of Forestry (DOF), MAF</td></tr>
<tr><td>Change of forest area in Lao PDR</td><td colspan="2"> 
</td></tr>
<tr><td>LMB area in Lao PDR</td><td>22,998,224 ha</td><td>LMB area in Lao PDR</td></tr>
<tr><td>Provinces which are in LMB area</td><td>Attapu, Bokeo, Bolikhamxai, Champasak, Houaphan, Vientiane, Khammouan, Louang Namtha, Louangphrabangm, Oudomxay, Phongsali, Saravane, Savannakhet, Vientiane city, Xekong, Xaignabouri, Xaisomboun, Xiangkhoang</td><td> 
</td></tr>
<tr><td>Tree cover area in the LMB area</td><td>20,044,620 ha (2017)
(JST data)</td><td>Tree cover rate in the LMB area</td><td>87.2 % (2017)
(JST data)</td></tr>
<tr><td>Chage of the tree cover in LMB area in Lao PDR (JSTdata)</td><td colspan="2"> 
</td></tr>
</table>

[13] World Development Indicators
[14] JETTRO World Trade Investment Report(2018) https://www.jetro.go.jp/ext_images/world/gtir/2018/13.pdf
[15] Forest Reference Emission Level and Forest Reference Level for REDD+ Results Payment under the UNFCCC May 2018 https://redd.unfccc.int/files/lao_2018_frel_submission_modified.pdf

(2) Status of Forests

1) Forest Definition

The Forest Law (2007) of Lao PDR stipulates that Forest is a precious natural resource of the nation consisting of biodiversity, water resources, and forestland with various tree species in protection forest zones, conservation forest areas, and production forest areas. The Land Law (2006), meanwhile, designates the nation's forest land as the total area of land parcels covered by forest or by land not covered by forest but otherwise determined by the State to be forest land. Table 3.12 shows the forest definition Lao PDR applies in the reports on Forest Reference Emission Levels and Forest Reference Levels for REDD Results Payment under the UNFCCC (FRL Report) submitted by Lao PDR to the UNFCCC in 2018.

Table 3.12 Forest definition in Lao PDR [15]

Area	DBH	Crown Density
Minimum of 0.5ha	Minimum of 10cm	Minimum of 20%

Source: Forest Reference Emission Level and Forest Reference Level for REDD+ Results Payment under the UNFCCC May 2018[15]

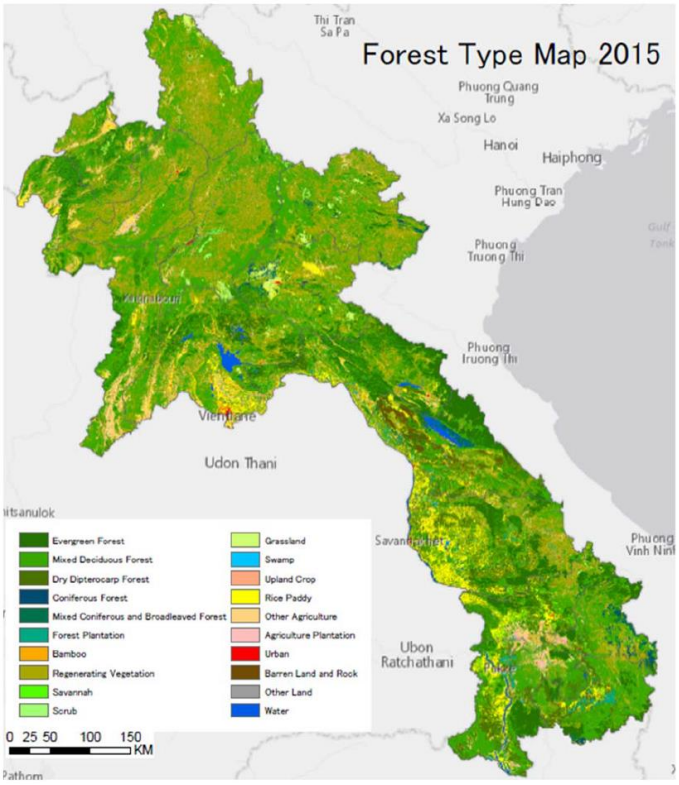
2) Forest classification and distribution

The forest classification system of the Lao PDR applies two levels of classification. The, 'Current Forest,' applies to areas that meet the forest definition of Lao PDR. The second, 'Potential Forest,' applies to areas that do not currently meet the forest definition but were forest in the past and have high potential for regeneration back into forest if the land will not be to be diverted to other land uses. "Current Forest" is classified into five types of natural forest and one type of forest plantation. "Potential Forest" is classified into another two types of vegetation. The land and forest classification system in Lao PDR is shown in Table 3.13. A map of forest types in the country is shown in Figure 3.9.

Table 3.13 The land and forest classification system in Lao PDR

Land/Forest classes		Area(ha)	% of total area	Strata
Level 1	Level 2			
Current Forest	Evergreen Forest	2,605,557	11.3	1
	Mixed Deciduous Forest	9,437,688	40.9	2
	Coniferous Forest			
	Mixed Coniferous and Broadleaved Forest			
	Dry Dipterocarp Forest	1,188,198	5.2	3
	Forest Plantation	6,300,445	27.3	4
Potential Forest	Bamboo			
	Regenerating Vegetation			
Other Vegetated Areas	Savannah	3,522,370	15.3	5
	Scrub			
	Grassland			
Cropland	Upland Crop			
	Rice Paddy			
	Other Agriculture			
	Agriculture Plantation			
Settlement	Urban Areas			
Other Land	Barren Land and Rock			
	Other Land			
Above-ground Water Source	Wetland (Swamp)			
	River (Water)			
Total		23,054,258	100	

Source: Forest Reference Emission Level and Forest Reference Level for REDD+ Results Payment under the UNFCCC May 2018[15]

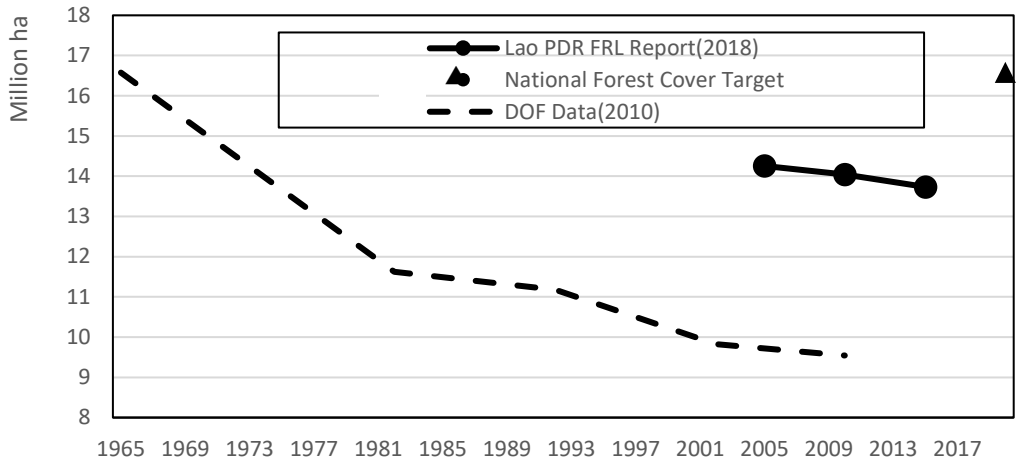


Source: Forest Reference Emission Level and Forest Reference Level for REDD+ Results Payment under the UNFCCC May 2018[15]

Figure 3.9 Forest Type Map 2015 of Lao PDR

3) Changes in forest area and its factors

According to the Forestry Strategy up to the year 2020 formulated in 2005, the National Forestry Conference convened in 1989 agreed that forest cover should be returned to 70% percent by the year 2020. The strategy specified that forest cover of Lao PDR had been more than 70% in the 1960s but dropped to 41.5% by 2002. In the forest area calculations for Lao PDR done by satellite image analysis for the FRL report, the forest cover was 60.2% (14, 252, 033 ha) in 2005 but retreated to 58% (13,732,282 ha) by 2015. The data presented in the forest strategy 2020 and the data in the FRL report were prepared by different calculation methods and are difficult to compare as consistent data. The overall trend of the data, however, suggests that the forest cover in Lao PDR has been declining since the establishment of the country in 1975. The change of the forest area in Lao PDR over the decades is plotted in Figure 3.10.



Source: Based on National Forestry Strategy 2020 and NAFRI data [16], JST summarized

Figure 3.10 Change of the forest area in Lao PDR

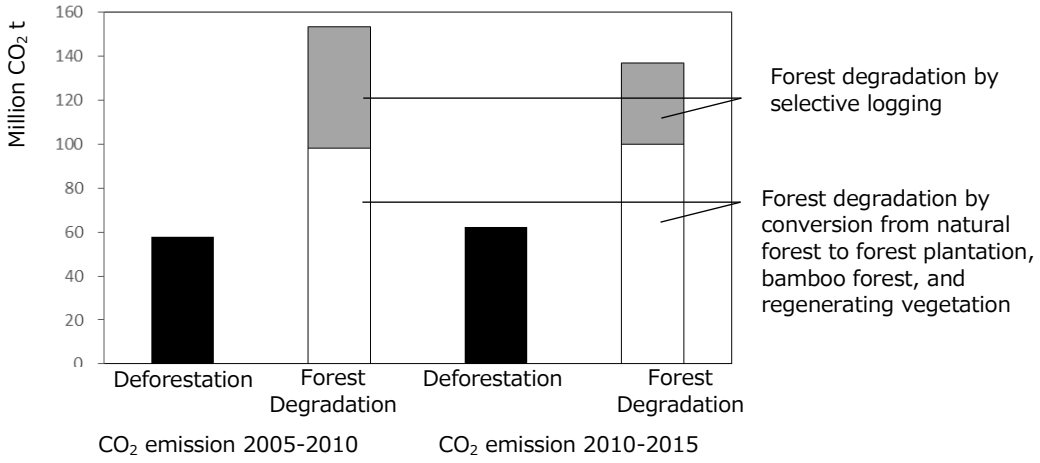
According to the Forest Strategy 2020, timber harvesting and shifting cultivation were pointed out as deforestation drivers before the year 2000. In recent years, agricultural plantations and development projects such as dam construction projects have also been pointed out as deforestation drivers. The National REDD + Strategy Draft analyzes recent deforestation drivers in Lao PDR according to regional patterns of the northern, central, and southern regions of the country. Illegal logging is a driver of forest degradation in all of the regions. On the other hand, the patterns of forest conversion vary between the northern, central, and southern regions. The forest land losses in the northern region have been mostly from slash-and-burn cultivation leading to the conversion of natural forest to potential forest. Only a small amount of forest, therefore, has been converted into permanent agricultural land and forest plantation in the northern region. The central and southern regions, meanwhile, have seen high rates of forest conversion to permanent agricultural land (almost 80% of the national total). In addition, about 48,000 ha of forest areas were converted to Forest Plantation mostly for rubber plantation in the southern region, and 35,000 ha of natural forest and 27,000 ha of Potential Forest were converted to water areas mostly as a result of the construction of Nam-Thuen II and other big hydro-power dams in the central region.

The unauthorized logging of timber and ban on the export of raw timber and all unprocessed timber products are now being implemented pursuant to Order No. 15 on "Strengthening the Strictness of Timber Harvest Management and Inspection, Timber Transport, and Timber Business" issued in 2016. The enforcement of this Order No. 15 is expected to curb illegal logging in Lao PDR.

4) Status of forest degradation

The FRL report submitted by Lao PDR to the UNFCCC reports on analyses conducted not only on deforestation, but also forest degradation. Figure 3.11 shows the amounts of carbon dioxide emission from deforestation and forest degradation in Lao PDR.

[16] Forest cover and land-use changes in Lao PDR according to the National Forest Reconnaissance Survey http://lad.nafri.org.la/fulltext/3959-0.pdf



Source: Based on Forest Reference Emission Level and Forest Reference Level for REDD+ Results Payment under the UNFCCC May 2018[15]FRL, JST summarized

Figure 3.11 CO_2 emission from deforestation and forest degradation

Over the two periods from 2005 to 2010 and from 2010 to 2015, the CO2 emission from forest degradation was double that from deforestation. In particular, the CO2 emission from conversion from natural forests to tree plantations, bamboo forests, and regenerating vegetation is large and still edging upward. The figures demonstrate that forest degradation is a serious problem in Lao PDR, along with deforestation.

(3) Forest Governance

The forest management function in Lao PDR was divided between two ministries under a ministerial reorganization in 2011: The Ministry of Agriculture and Forestry (MAF) was given jurisdiction over production forests, and the Ministry of Natural Resources and Environment (MONRE) was given jurisdiction over protection forests and conservation forests. Later, when the forest management system was reviewed in 2016, all forest management in Lao PDR was reintegrated into the MAF. Currently, under the MAF, the Department of Forest (DOF) and Department of Forest Inspection (DOFI) have jurisdiction over forest management in Lao PDR. In practical terms, some provinces (e.g., Luang Prabang province) have yet to reintegrate into the MAF in spite of the reunification carried out in 2016. There, therefore, the forest management function is still divided between the MAF and MONRE.

In addition, Chapter 2 of the Forest Law (2007) stipulates that the forest of Lao PDR is classified into three types: Protection Forest, Conservation Forest, and Production Forest. The forest classification of Lao PDR is summarized in Table 3.14.

Table 3.14 Forest Classification in Lao PDR

Protection Forests （Article 10.）	・ Protection forests are forests classified for the function of protecting waterresources, river banks, road sides, preventing soil erosion, protecting soil quality ,strategic areas for national defence, protection from natural disasters, environmental protection and so on.
Conservation Forests （Article 11.）	・Conservation Forests are forests classified for the purposes of conserving nature , preserving plant and animal species, forest ecosystems and other valuable sites of natural, historical, cultural, tourism, environmental, educational and scientific research experiments. ・ Conservation Forest consists of National Conservation Forest areas and Conservation Forest areas at the Provincial, District and Village levels which is described in the specific regulation.
Production Forests （Article 12.）	・Production Forest are natural forests and planted forests classified for the utilization purposes of areas for production, and wood and forest product businesses to satisfy the requirements of national socio-economic development and peoples living.

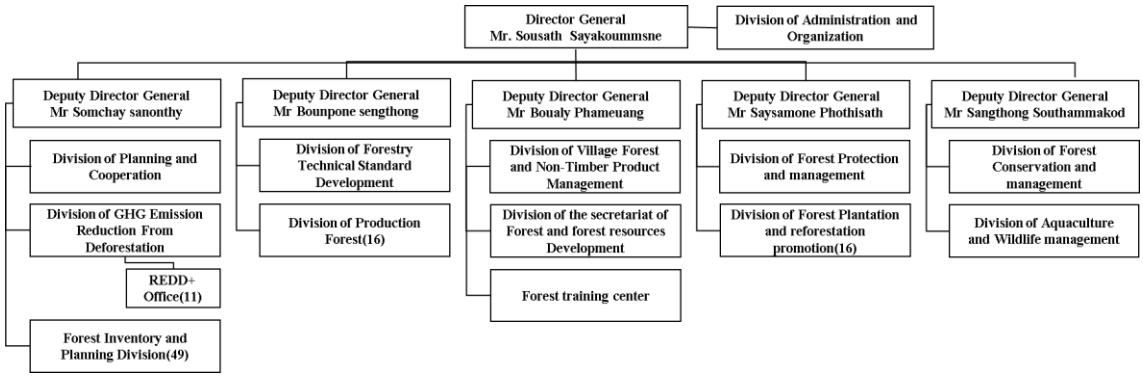
Source: Based on Forest Law (2007), JST summarized

1) Ministry of Agriculture and Forestry

The Ministry of Agriculture and Forestry was established with the aim of contributing to the development of Lao PDR through the management and promotion of agricultural and forestry production in the country. Eleven organizations are positioned under MAF: the Department of Agriculture (DOA), Department of Forestry (DOF), Department of Irrigation (DOI), Department of Forestry Inspection (DOFI), Department of Agriculture Land management (DOAL), Department of Planning and Cooperation (DOPC), National Agriculture and Forestry Research Institute (NAFRI), Department of Technical Extension and Agro-Processing, Department of Livestock and Fisheries (DLF), Department of Organization and Personnel (DOAP), Council for Science and Technology, and Poverty Reduction Fund (PRF).

2) Department of Forestry (DOF)

Five Deputy Directors, 12 divisions, and one training center operate under the Director of the DOF. The DOF organization chart is shown in Figure 3.12. A total of 189 regular staff members are engaged at the central level, 45 of whom are female.



Source: Based on result of the interview, JST summarized

Figure 3.12 Organization chart of DoF

The DOF is carrying out a wide range of forest management activities to achieve the national target of recovering the forest cover to 70% of the total area of the country. Lack of budget, however, has made it difficult to secure sufficient staff or to provide the necessary training.

3) Department of Forestry Inspection (DOFI)

The DOFI was established in 2008 as an organization to investigate and prosecute violators of the Forestry Law, Wildlife and Aquatic Resources Law, and Criminal Law as a body responsible for law enforcement. Six divisions operate within the DOFI: Administration and Organization Division (ADO), Planning and Cooperation Division (PCD), Aquatic and Wildlife Inspection Division (AWID), Forest Inspection and Forest Resources Division (FIFRD), Interrogation and Investigation Division (IID), and Legislation and Forest Inspecting Policy Division (LFIP).

(4) Forest Policy

1) Law

(a) Constitution（1991, revised in 2003 and 2015）

The constitution of Lao PDR was promulgated in 1991 and amended in 2003 and 2015. Article 17 of the Constitution provides the following regarding the description of forests:『The State protects the property right (such as the rights of possession, use, usufruct, and disposition) and the inheritance rights of organisations and individuals. All lands, minerals, water sources, atmospheres, forests, natural products, aquatic and other wild animals, and other natural resources are a national heritage, and the State ensures the right to use, transfer and inherit in accordance with the laws.』[17].

[17] Constitution of the Lao PDR 2015 http://www.na.gov.la/files/Constitution/Constitution%20(2015)%20Lao.pdf

(b) Forestry Law（1996, revised in 2007）

The present Forestry Law in Lao PDR was enacted in 1996 and revised in 2007. The revised Forestry Law of 2007 was implemented based on the Forestry Strategy 2020 formulated in 2005. The revised law determines the basic principles, regulations, and measures on the following: sustainable management; preservation, development, utilization and inspection of forest resources and forestland; promotion of regeneration and tree planting; and the increase of forest resources in the Lao PDR. The law aims to maintain a balance of nature, to make forests and forestlands stable sources of living and use for the people, to protect and ensure the sustainable conditions of the environment water resources, to protect against soil erosion and maintain soil quality, and to protect plants, tree species wildlife and aquatic life, as well as to contribute gradually to national socio-economic development. Regarding the ownership of forests and forestland, Article 4 stipulates: 'Natural forest and Forestland is the property of the nation community and The State manages through centralization and unity throughout the country'. Article 4 further provides, however, that trees planted by people or organizations in designated areas, either by their labor or by their funds, within the scope of recognition of the Forest and Forestland Management Organization, shall become the property of such individuals or organizations.

In addition, the revised Forestry Law of 2007 is now being revised again to reflect recent forestry conditions.

(c) Land Law (1997, revised in 2003)

Land ownership in Lao PDR is stipulated under Article 3 of the Land Law. This article mentions that the land of the Lao PDR is under the ownership of the national community as prescribed in Article 17 of the Constitution, the article under which the State is charged with centralized and uniform management throughout the country and with the allocation of land to individuals, economic organizations, etc. Article 11 of the Land Law classifies the land of Lao PDR into 8 categories: Agricultural land, Forest land, Water area land, Industrial land, Communication land, Cultural land, Land for national defense and security and Construction land. The classification of forest land described in detail in Chapter 3 'Management of Forest Land'. Article 20 of Chapter 3 stipulates that Forest land is to be managed by MAFF. Later, Article 21 on forest land use rights stipulates that forest land that is either unstocked or degraded land may be used by an individual or family in conformity with the individual's or family's objectives, in an area not to exceed three hectares per working person in the family. Article 11 further states that any person wishing to use forest land in a larger area has the right to apply to receive a lease or concession from the State.

Other laws related to the forest sector include the Wildlife Law (2007), the Botany Protection Law (2008), the Environment Protection Law (2013), the Water and Water Resources Law (1996, revised in 2017), etc.

2) Strategy and Plan

Lao PDR has been formulating a mid-term plan called the National Socioeconomic Development Plan (NESDP) every five years. When the Eighth NESDP (2016-2020) was formulated in 2016, Lao PDR also formulated Vision 2030 (2016-2030) and the 10-year Development Strategy (2016-2025), long- and medium-term strategic plans.

(a) Vision 2030**[18]**

Under Vision 2030 Lao PDR aims to become a developing country with an upper-middle income based on an innovative, green, sustainable social economy, and to produce a per capita gross domestic product four times that of 2015, by the year 2030. The conservation and efficient and sustainable use of natural resources is mentioned as one approach to achieving this target.

(b) Ten-year Socio-economic Development Strategy (2016–2025)[18]

[18] Vision2030 and-10-Year-SocioEconomic-Dev-Strategy-2016_2025-LAO
https://rtm.org.la/wp-content/uploads/2017/08/Vision2030-and-10-Year-SocioEconomic-Dev-Strategy-2016_2025-LAO.pdf

The 10-year socio-economic development strategy is a strategy for graduating from developing country status by 2020 and transitioning into the next stage by 2025. The strategy sets the seven specific sub-strategies shown below. The achievement of a 70% forest coverage rate is mentioned as one of the targeted values.

i. Strategies for quality, inclusive, stable, sustainable and green economic growth
ii. Strategies for the Outcome of LDCs by 2020 and Implementing Sustainable Development Goals (SDGs),
iii. Strategies for the development of human resources,
iv. Sustainable and environmentally friendly strategies that use natural resources effectively and efficiently
v. Strategies to strengthen the role of government in social management under effective law
vi. Regional and international integration strategy
vii. Strategies for industrialization and modernization

(c) The Eighth National Socioeconomic Development Plan (NESDP) (2016～2020)[19]

This plan sets three outcomes, one economic, one social, and one environmental, for graduation from developing country status through continuous, comprehensive, and sustainable growth by 2020.

Outcome 1: Sustained, inclusive economic growth with economic vulnerability (EVI) reduced to levels required for growth support.

Outcome 2: Human resources are developed, and the capacities of the public and private sectors is upgraded; poverty in all ethnic groups is reduced, all ethnic groups and both genders have access to quality education and health services; the unique culture of the nation is protected and consolidated; political stability, social peace and order, justice and transparency are maintained.

Outcome 3: Natural resources and the environment are effectively protected and utilized according to green-growth and sustainable principles; there is readiness to cope with natural disasters and the effects of climate change and for reconstruction following natural disasters.

The following items are listed as priority forest sector activities to achieve the targeted outputs for Outcome 1.

- Manage and use production forests and community forests effectively.
- Continue surveys and allocate at least 600,000 ha to forestry.
- Certify 30 percent of total production forest area and restore production forest of 500,000 ha.
- Promote cultivation of 500,000 ha of traditional plants and industrial crops.
- Develop forest allocation and management plans at village level in 1,500 villages.
- Improve mission on reducing emissions from deforestation and degradation (REDD+) by preparing readiness for carbon credit trading in 2020.
- Improve the Forest and Forest Resources Development Fund.

Three outputs are targeted for Outcome 3: environmental protection and sustainable natural resources management, preparedness for natural disasters and risk mitigation, and reduced instability of agricultural production. Regarding environmental protection and sustainable natural resources management, the following goal has been set for the forest sector.

- Develop forest management, protection and restoration plans for seven protected areas (Nam Ha, Laving-Lavern, Nam Att-Phu Leuy, Nakai-Namtheun, Hin Nam No, Dong Am

[19] 8th FIVE-YEAR NATIONAL SOCIOECONOMIC DEVELOPMENT PLAN (2016–2020) http://www.la.one.un.org/images/publications/8th_NESDP_2016-2020.pdf

Pam and Dong Hua Sao).

- Complete the reforestation to achieve forest cover over 70 percent of the total country area, by restoring natural forests on 1.5 million hand planting trees on 35,000 ha of protected and conservation forests.
- Complete the biodiversity list of Lao PDR and national list of rare species in the national protected and conservation areas.
- Complete the pilot on establishment of two model national natural parks (Nam Att-Phou Leuy and Nakai-Nam Theun) and propose to UNESCO that it includes Hin Nam No in the World Natural Heritage.
- Reduce illegal trade of wood products and wildlife trafficking by 5 percent.

(d) Forestry Strategy up to the year 2020

The National Forestry Strategy 2020 was formulated in 2005 as a long-term strategy for the forest sector in Lao PDR. The strategy sets the following objectives for forest sector development.

(i) To improve quality of existing forested area, which are about 70% of the total land area, by naturally regenerating up to 6 million ha and planting trees up to 500,000 ha in unstocked forest area as an integral part of a rural livelihood support system encompassing stable water supplies and prevention of natural disaster.

(ii) To provide a sustainable flows of forest products for domestic consumption and to generate household income through sale and export, thus contributing to livelihood improvement, fiscal revenue and foreign exchange earnings whilst increasing direct and indirect employment.

(iii) To preserve the many species and unique habitats, which are, for different reasons, threatened both within the country and elsewhere.

(iv) To conserve environment including protection of soil, conservation of watershed and climate.

The following programme and activities will be implemented to achieve these objectives.

<u>Land and Forest Use</u>

・Introduction of Land Use Planning

・Completion of the Forestry Law Implementing Regulations

・Clarification of Definition and Status of Village Forest

・Monitoring of Land Use Changes and Analysis of Causes for Forest Decline

<u>Production Forest</u>

・Production Forest Management

・Production Forest Certification

・Village Participation in Production Forest Management

・Control of Logging Outside of Production Forests

・Integrated Production Forest Management

<u>NTFPs</u>

・Improving basic Conditions for NTFP Development

・Improving Harvesting and Marketing for NTFP Development

・Capacity Building

Tree Plantation Development

- Formulation of National Tree Plantation Development Plan
- Improving Tree Plantation Profitability
- Improving Legal and Regulatory Framework
- Improving Funding and Incentives
- Marketing Development

Harvest / Logging plans and Royalty

- Shift from National Harvest / Logging plan Setting to Management Plan-based Harvesting
- Improvement of Royalty setting
- Improvement of Royalty Collection
- Improvement of Log Sales System

Wood Processing Industry (WPI)

- Simplifying Processes for Factory Operation
- Comprehensive Approach for Reduction of Processing Capacity
- Improving Efficiency in Wood
- Further Promotion of Export of Finished and Semi-finished Products

Bio-diversity Conservation

- Improving the legal and regulatory framework
- Improving NBCA development and management
- Controlling wildlife trade
- Enhancing education and public awareness
- Strengthening research

Protection Forest and Watershed Management

- There is no detailed description of the activity in the Forestry Strategy 2020

Village Land and Forest Management

- Legal framework
- Land and Forest Allocation
- Shifting Cultivation Stabilization
- Enhancement of Village Based Forest Management as an Integral Part of Rural Livelihood.

(e) National REDD+ Strategy

Lao PDR launched REDD readiness in 2008 by joining the Forest Carbon Partnership Facility (FCPF). Twelve drivers of deforestation and forest degradation were identified during the process of formulating the NRS. These twelve drivers and their underlying causes were discussed with all stakeholders and classified into five categories. Subsequently, five programs were set to effectively address the categorized drivers.

Table 3.15 summarizes the categorized drivers of deforestation and degradation and programs in

the NRS.

Table 3.15 Categorized drivers of deforestation and degradation and NRS programs

Categories		Program	
1	Expansion of agriculture land into the forests	1	Development of sustainable agriculture in coordination with forest protection
2	Conversion of forest land for infrastructure development and mining (including resettlement, mining, hydro-power, urban expansion)	2	Infrastructure (including resettlement and urban expansion) and mining development in coordination with forest protection
3	Forest degradation from unsustainable timber harvesting and NTFP collection	3	Sustainable timber harvesting (wood and forest products) and forest management
4	Shifting cultivation and forest fires	4	Turning pioneering shifting cultivation to sedentary cultivation, controlling forest fire and forest restoration (carbon stock enhancement)
5	Conversion of natural forest to commercial tree plantation area	5	Development of sustainable commercial tree plantation

Source: National REDD+ Strategy draft

The NRS calls for the completion of the REDD + readiness phase (phase 1) by 2020, followed by the implementation phase (phase 2) from 2021 to 2025, and full implementation (phase 3) from 2026 to 2030. While the NRS has been formulated as a full-fledged strategy only up to the end of Phase 2 in 2025, a review to update the strategy will be conducted at the end of Phase 1.

(5) Forest management and conservation efforts

1) Forest and Forest Resource Development Fund (FFRDF)

The Forest and Forest Resource Development Fund (FFRDF) was issued in 2005 by Decree No. 38/PM. According to this decree, it was stated that the funding for the FFRDF will be drawn from royalties and fees in the forestry sector and donations from related parties. Furthermore, Decree No. 333/PM issued in 2010 provides that developers of hydro-electric power construction, mining, road construction, other infrastructure, etc. must contribute funds for the management, protection, and conservation of the protection forests. Specific descriptions are given below.

Mining:	Fund for restoration of surface and landscape, and re-plantation
Road construction and other deployment project that change the forest lands permanently:	Funds for restoration and replantation based on the actual directly impact areas.
Hydroelectric power development:	The fund of 1% of total value of the sale of the electricity per annual
Eco-tourism:	Funds of 1% from their annual incomes of that eco-tourism

At present, however, very little funding for the FFRDF is drawn from the above activities. In effect, therefore, the forestry sector is the only source of funding. Although the FFRDF was established to support various forestry and forest management activities in the country, the scale of its budget is very small.

2) Environment Protection Fund (EPF)

The framework of EPF has been restructured by Decree No. 94/PM issued in 2017. This decree provides the following with regard to the EPF: (i) an inter-ministerial governance mechanism is to be created to manage the EPF operations and resources, (ii) revenues and expenditures must be operated by the National Treasury System, and (iii) the eligible revenue sources are to be specified. The funding sources for the EPF include the national budget, environmental payments based on concession contracts in accordance with the law, fines for violations of environmental protection regulations, and other donations. The use of the fund is described as the management of natural resources, including forest restoration. As the next process, it will be necessary to adjust the legal

system for the FFRDF operated under the MAF and the EPF operated under the MoE.

(6) Forest sector initiatives related to climate change

1) NDC

In September 2015, Lao PDR submitted the Intended Nationally Determined Contribution (INDC) to the UNFCCC. As the forest sector's contribution for mitigation, the INDC describes an increase emission reduction from 60,000ktCO_{2e} to 69,000ktCO_{2e} through the implementation of the Forest Strategy 2020 targeting a 70% rate of forest coverage by 2020. Promoting climate change resilience in forestry production and forest ecosystems and promoting improved forest management technology capabilities are mentioned with regard to the adaptation programs in the forest sector. In this INDC, forests are expected to benefit not only climate change mitigation but also adaptation functions such as flood mitigation, the prevention of soil erosion, etc. On the other hand, Lao PDR currently faces challenges in tree planting and forest management and expects to gain extensive support from international cooperation frameworks such as REDD+ and FLEGT.

2) REDD+

Table 3.16 shows the progress of REDD+ in Cambodia. The REDD+ Readiness phase in Cambodia is progressing well. Thus, a BUR report is being developed and preparations for the proposal to the GCF towards the pilot programme for REDD+ results-based payments are currently underway.

Table 3.16 Progress of REDD+

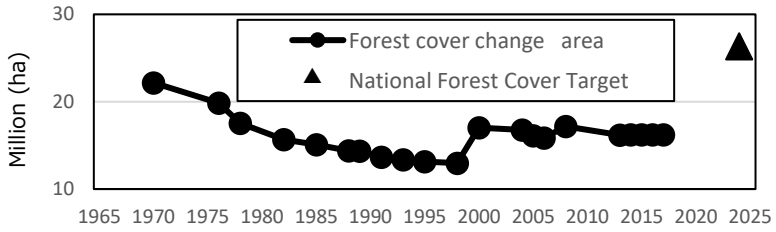
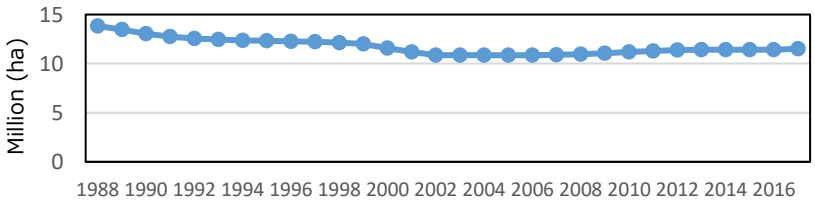
NRS	NFMS	FRL	SIS
The draft has been formulated	Released (MRV function centered, the functions are to expand gradually)	Submitted (2018)	Under Preparation

Source: JST

Regarding the REDD + implementation pilot activities, the FCPF's Emission Reduction (ER) Program document was adopted in 2018. The ER program will therefore start soon. Many project-level activities have been implemented, such as F-REDD by JICA, CliPAD by Germany, SUFORD-SU by Finland, the Forest Investment Programme by the World Bank and Asian Development Bank, etc.

3.2.1.3 Thailand

(1) Summary sheet of Thailand

National area	51,311,500 ha[20]	Forest Cover in Thailand(2017)
Population	69,038,000 (2017) [21]	
Population growth rate	0.29% (2018) [22]	
GDP per capita	6,591 USD[23]	
Real GDP growth rate	3.9%[22]	
Forest area	16,345,016 ha (2017)	
Forest area rate	31.58% (2017)	
Forest targeted rate	40% (25% Conservation Forest) (15% Economic Forest)	
Forest definition	・Area: At least 0.5ha, ・Eucalyptus, natural rubber and oil palm are non-forest, teak is forest ・Bamboo is classified as a forest if it is located in or around a forest	
Forest classification and jurisdiction	Economic Forest : Royal Forest Department (RFD), MONRE Conservation Forest : National Park Wildlife and Plant Conservation Department (DNP), MONRE Coastal Forest : Marine and Costal Resources Department (DMCR), MONRE	
Change of forest area in Thailand		
LMB area in Thailand	21,042,928 ha	LMB area in Thailand
Provinces which are in LMB area	Amnat Charoen,Bueng Kan, Yasothon, Buri Ram, Udon Thani Chaiyaphum, Chanthaburi, Chiang Rai, Kalasin, Khon Kaen, Loei Maha Sarakham, Mukdahan, Surin, Nakhon Phanom, Nakhon Ratchasima, Nong Bua Lam Phu, Nong Khai, Phayao, Phetchabun, Roi Et, Sa Kaeo, Sakon Nakhon, Si Sa Ket, Ubon Ratchathani	
Tree cover area in the LMB area	6,256,715 ha (2017 年) (JST data)	Tree cover rate in the LMB area: 29.7%(2017) (JST data)
Chage of the tree cover in LMB area in Thailand (JSTdata)		

[20] FOREST MANAGEMENT IN THAILAND, RFD http://www.forest.go.th/foreign/images/stories/FOREST%20MANAGEMENT%20IN%20THAILAND.pdf
[21] WB data https://data.worldbank.org/country/thailand?view=chart
[22] Central Intelligence Agency USA https://www.cia.gov/library/publications/the-world-factbook/geos/th.html
[23] IMF data https://www.imf.org/external/index.htm

(2) Status of Forest

1) Forest Definition

According to the Royal Forestry Department in Thailand, there are no clear definitions for forest at present beyond the specification that a forest is to have an area of more than 0.5 ha. But according to Department of National Parks, Wildlife and Plant Conservation, International Climate Change Office, the entity with jurisdiction over REDD + in Thailand, the Thai definition basically conforms with the FAO definition as "a tree covered area of >0.5 hectares, with an average tree height of >5 meters and >10 % canopy cover."

2) Forest classification and distribution

Table 3.17, Figure 3.13, and Table 3.18 respectively show the distribution of forests in Thailand, a forest cover map from 2016-2017, and the forest area by region.

Table 3.17 Forest distribution in Thailand[24]

Forest Type		Distribution Area
Tropical Evergreen Forest	Tropical Rain Forest	Mainly spread southern and eastern part of the country, and part of plain area 600m above sea level
	Dry Evergreen Forest	Spread between 100m to 800m above sea level around northern and east-north part
	Hill Evergreen Forest	Spread high elevation area throughout the country
Coniferous Forest		Distribute in the middle of the mountain area
Wetland Forest	Peat Swamp Forest	Mainly distribute around central and southern part
	Mangrove Forest	Distribute southern , central and eastern part
Beach Forest		Be formed on alkaline soil along coastal line
Deciduous Forest	Mixed Deciduous Forest	Distribute in northern, central and north-east part, and the area between 50m to 800m elevation in Prachuap Khiri Khan Province
	Deciduous Dipterocarp Forest	Spread between 50m to 1000m elevation around north-east part and appear Deciduous Mixed Forest alternatively.
	Savanna Forest	Be formed on deforestation sites and forest fire sites throughout the country

Source: Royal Forest Department(RFD) Web site

Source: Summary for the Forest Area Data Management Project Year 2016 – 2017 [24]

Figure 3.13 Forest cover map 2016-2017

[24] RFD Website http://www.forest.go.th/index.php?option=com_content&view=article&id=311

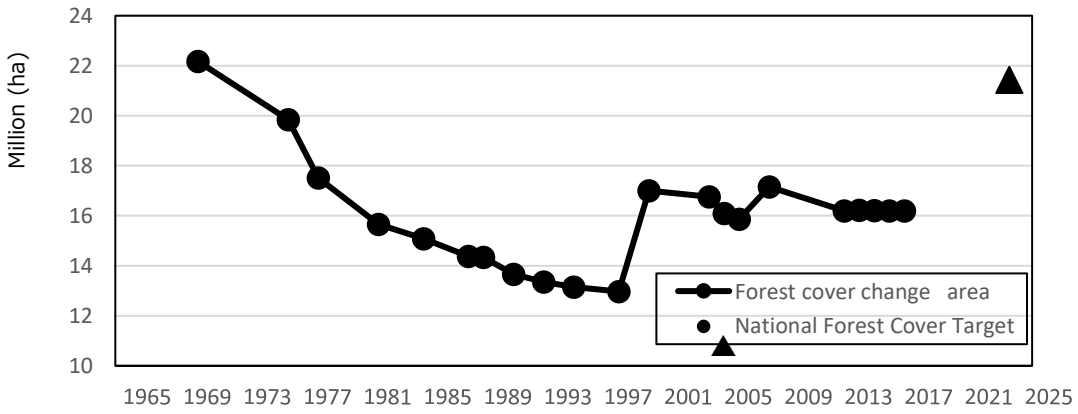
Table 3.18 Forest area by region

Forest Area	Area(ha)	Forest Area(ha)	Forest Cover Rate (%)
Central Region	9,106,023	1,926,263	21.15
North Region	9,607,736	6,169,152	64.21
North-Eastern Region	16,771,793	2,504,889	14.94
Eastern Region	3,448,141	753,887	21.86
Western Region	5,446,114	3,216,690	59.06
Southern Region	7,384,784	1,774,135	24.02
Total	51,764,592	16,345,016	31.58

Source: Summary for the Forest Area Data Management Project Year 2016 – 2017[24]

3) Changes in the forest area and underlying factors

As of 2017, the forest area of Thailand was 16,345,016 ha, covering 31.58% (conservation forests, 19%; economic forests, 14%) of the total country area. Thailand aims to restore the forest area to 40% of the country area (conservation forests, 25%; economic forests, 15%) as a national goal. According to FOREST MANAGEMENT IN THAILAND[20], the forest cover in Thailand was 53.33% in the 1960s, but sharply declined due to rapid deforestation caused by activities such as timber harvesting, agricultural land expansion, road network development, conversion of forest to develop resorts and urban areas, and mining activity inside natural forests. The worst losses occurred from 1976 to 1982, when a government programme encouraged people to settle in zones and supported the development of infrastructure. After a devastating flood in the south of Thailand in 1988, the government imposed a logging ban in natural forests (1989) and started to strengthen forest protection measures. Thanks largely to these moves, deforestation in Thailand has been gradually suppressed in recent years. The forest dynamics in Thailand have thus remained small and stable since 2013. Figure 3.14 shows the transition of the forest area in Thailand. Note that the sudden spike in the forest cover appearing in the figure between 1998 and 2000 is the result of a change in the assessment methodology, not an actual change in the forest cover.



Source: RFD data

Figure 3.14 Change of the forest area in Thailand

4) Status of forest degradation

According to FOREST MANAGEMENT IN THAILAND, the forest degradation in Thailand has partly resulted from phenomena such as forest fires, etc.

(3) Forest governance

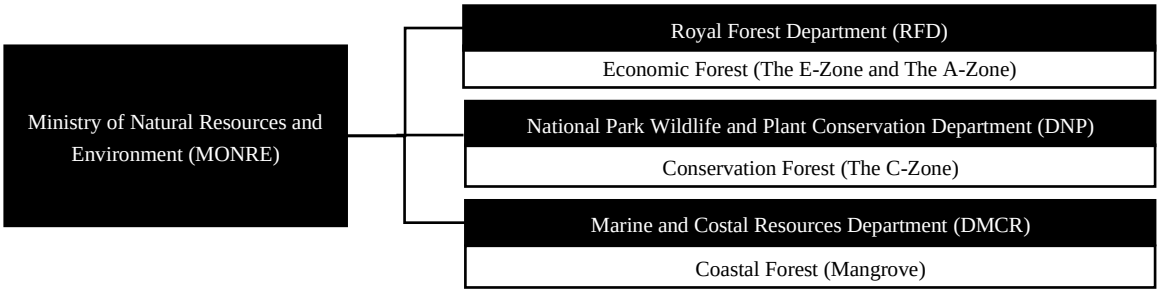
In 1989, 23.6 million hectares (45.9% of the total area) were gazetted as National Forest Reserves and classified into the following three zones:

・C-Zone: Conservation Forest made up of former protected areas consisting of class 1 watershed areas, national parks, wildlife sanctuaries, forest parks, non-hunting areas, biosphere reserves, botanical gardens, and arboreta.

•E-Zone: Economic Forest consisting of commercial plantations, production forests, community forests, agroforestry areas

•A-Zone: Forest for Agricultural Uses designated as suitable for agriculture and for allocation to landless farmers.

These forests were managed by the Royal Forest Department until the jurisdiction over these forests was separated into three agencies under the Ministry of Natural Resources under an organizational reform implemented in 2002. Figure 3.15 shows the forest management system in Thailand.



Source: JST

Figure 3.15 Forest Management System in Thailand

1) Ministry of Natural Resources and Environment (MONRE)

MONRE was established in 2002 to oversee the management of natural resources, environmental protection, and biodiversity and to makes policy decisions based on the principles of citizen participation and good governance. Eleven departments and 5 state enterprises operate within the ministry.

1. Office of the Minister;
2. Office of the Permanent Secretary;
3. Pollution Control Department;
4. Department of Marine and Coastal Resources;
5. Department of Mineral Resources;
6. Department of Water Resources;
7. Department of Groundwater Resources;
8. Department of Environmental Quality Promotion;
9. National Park, Wildlife and Plant Conservation Department;
10. Office of Natural Resources and Environmental Policy and Planning; and
11. Royal Forest Department.

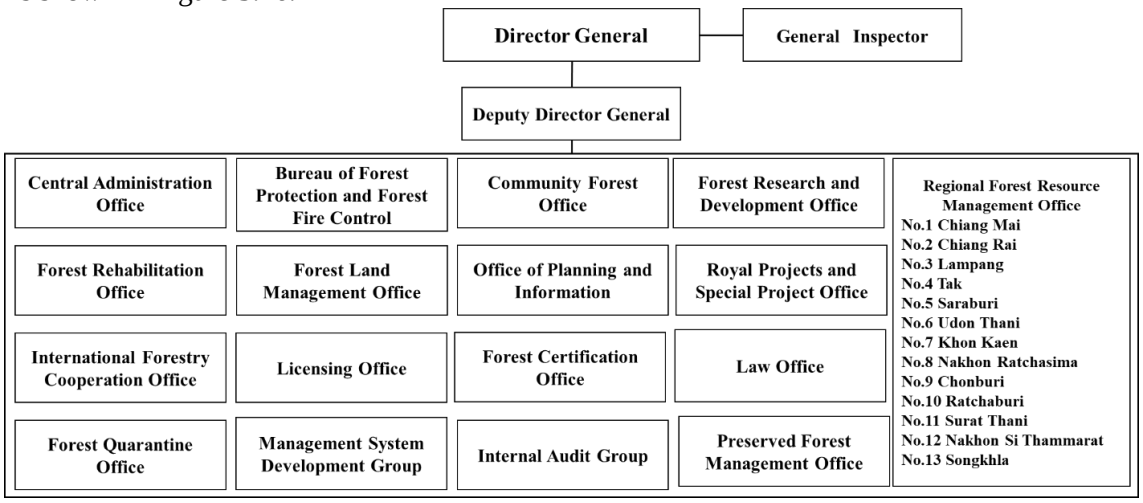
State Enterprises under MONRE include:

1. Zoological Park Organization;
2. Wastewater Management Authority;
3. Botanical Garden Organization;
4. Forest Industry Organization; and
5. Thai Plywood Company Limited.

2) Royal Forest Department (RFD)

The Royal Forest Department, established in 1896, has the longest-running history among the departments and offices that now make up MONRE. The RFD was formerly positioned under the Ministry of Agriculture and assumed responsibility for the whole of Thailand's forests. The present-day RFD was placed under MONRE when it was established in 2002. When forests in Thailand were divided into economic forests with an emphasis on economic activity and protected forests with an emphasis on

conservation, the RFD had jurisdiction only over the former. The current staff numbers about 500 in the central level and 12,314 in the regional offices across the country. The organizational structure of the RFD is shown in Figure 3.16.



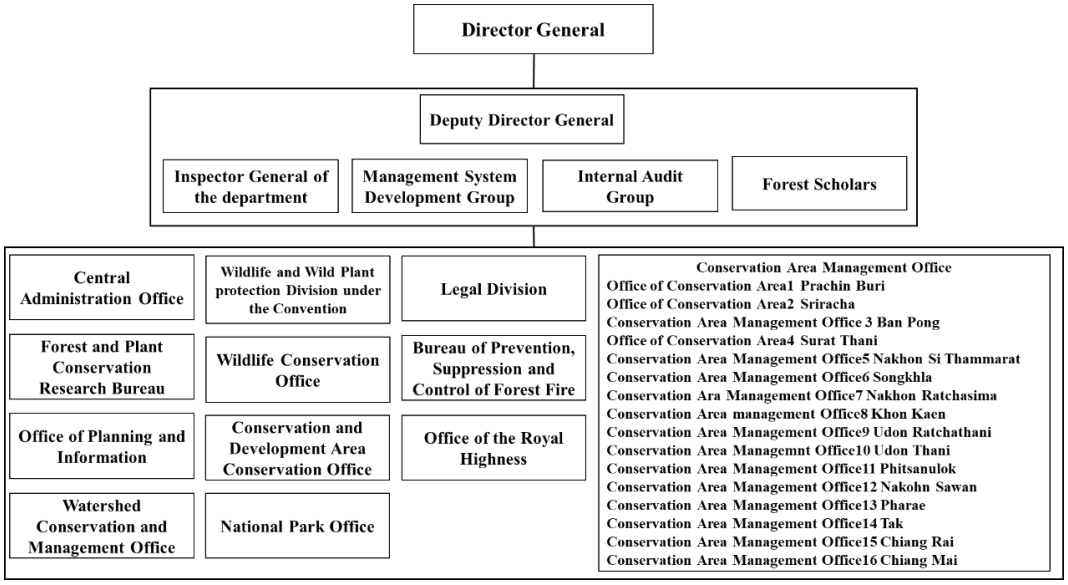
Source: Based on RFD Website, JST summarized

Figure 3.16 Organizational structure of the RFD

The budget over the three years from 2014 to 2016totaled 3,89,000 million THB in 2014, 3,890 million THB in 2015, and 4,460 million THB in 2016. The RFD is currently having difficulty controlling illegal logging and illegal slash-and-burn farming (especially in northern Thailand). Three factors have made it difficult to enforce the law developed to combat these practices: the existence of domestic and international illegal logging companies, the traditional activities of the indigenous people, and the activities of the poor.

3) National Park Wildlife and Plant Conservation Department (DNP)

In 2002, when the RFD was placed under the jurisdiction of the Ministry of Agriculture, the DNP was established under MONRE as an agency to promote the conservation of national parks and wild flora and fauna and restoration of forest resources on behalf of the RFD. The DNP is a large department with about 4,000 people at the central level (including about 1,000 regular staff members and 3,000 non-regular employees) and about 75,000 in the whole country (including about 3,800 regular staff members). The organizational structure is shown in Figure 3.17.



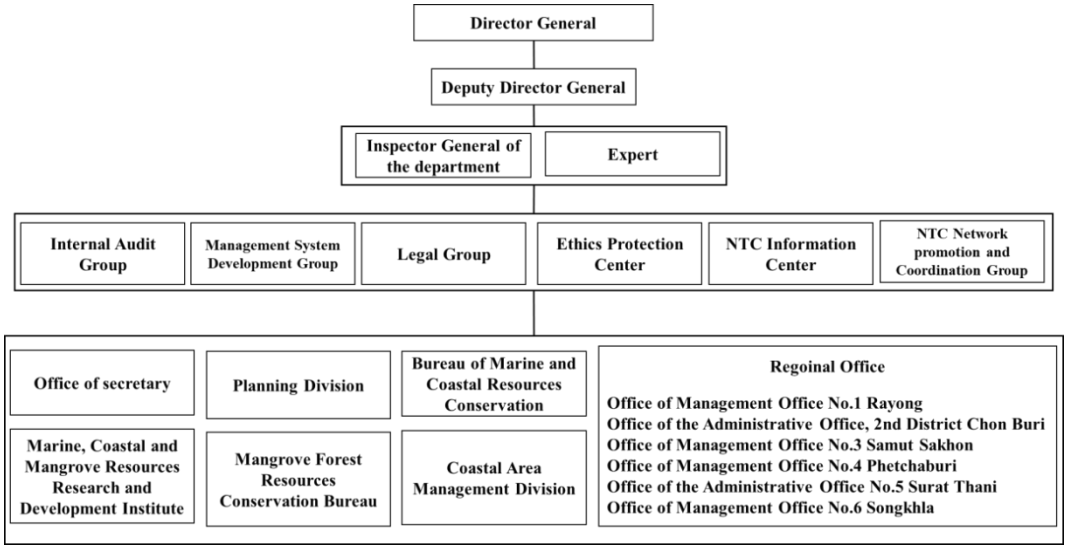
Source: Based on DNP Website, JST summarized

Figure 3.17 Organizational structure of the DNP

The DNP faces the pressing challenge of regenerating protected forests to a coverage ratio of 25% in order to achieve the national target of 40% forest cover (25% protected forest, 15% economic forest). The technologies and strategies to achieve the national target are clearly insufficient. Much will have to be done to improve them in the future.

4) Department of Marine and Coastal Resources (DMCR)

The DMCR was established for the purpose of preserving, restoring, and managing marine and coastal resources such as mangrove forests, coral reefs, seaweeds, and marine animals, with the aim of achieving sustainable social and economic development and the stability of the nation. When the forest management activities of the RFD were classified into three functions in 2002, the DMCR was established under MONRE as an agency responsible for coastal forests (mainly mangrove forests). In addition to forests, the DMCR is responsible for the conservation and management of coastal peatlands, marine organisms, and coral reefs. The organization chart of the DMCR is shown in Figure 3.18.



Source: Based on DMCR Website, JST summarized

Figure 3.18 Organization Chart of DMCR

5) Forest Industry Organization (FIO)

The FIO was established in 1968 with funds of 10 million THB from the government of Thailand for the purpose of establishing industrial plantations to meet the domestic demand for timber in Thailand and reduce the cutting pressure on protected forests. The government of Thailand grants FIO the right to use 19,200 hectares of land distributed among 245 locations (basically economic forests managed by the RFD, with some protected forests managed by the DNP also included). The land is mainly planted with teak, eucalyptus, rubber, etc. in the areas to produce timber and etc. The FIO owns a total 5 offices in Bangkok and the regions and 45 nurseries. The organization engages around 1,400 staff members across the country. The FIO already has income from forestry activities, so its current operation is completely independent. Since 2011, however, the government of Thailand has been promoting the acquisition of FSC certification and has been providing FIO with funds to support FIO certification.

(4) Forest Policy

1) Law

(a) Thailand's Constitution of 2017

The present constitution of Thailand was promulgated and enforced in 2017. The following summarizes the description of natural resources, including forests, in the 2017 Constitution.

CHAPTER III: RIGHTS AND LIBERTIES OF THE THAI PEOPLE (Section 43- 2)	A person and community shall have the right to: 2. manage, maintain and utilize natural resources, environment and biodiversity in a balanced and sustainable manner, in accordance with the procedures as provided by law;
CHAPTER IV: DUTIES OF THE THAI PEOPLE(Section 50 - 8)	A person shall have the following duties: 8. to cooperate and support the conservation and protection of the environment, natural resources, biodiversity, and cultural heritage;
CHAPTER V: DUTIES OF THE STATE (Section 57 – 2, Section 58)	The State shall: 2. conserve, protect, maintain, restore, manage and use or arrange for utilization of natural resources, environment and biodiversity in a balanced and sustainable manner, provided that the relevant local people and local community shall be allowed to participate in and obtain the benefit from such undertaking as provided by law.
	In regard to any undertaking by the State or that the State will permit any person to carry out, if such undertaking may severely affect the natural resources, environmental quality, health, sanitation, quality of life or any other essential interests of the people or community or environment, the State shall undertake to study and assess the impact on environmental quality and health of the people or community and shall arrange a public hearing of relevant stakeholders, people and communities in advance in order to take them into consideration for the implementation or granting of permission as provided by the law. A person and community shall have the rights to receive information, explanation and reasons from a State agency prior to the implementation or granting of permission under paragraph one. In the implementation or granting of permission under paragraph one, the State shall take precautions to minimize the impact on people, community, environment, and biodiversity and shall undertake to remedy the grievance or damage for the affected people or community in a fair manner without delay.

(b) The 1941 Forest Act (amended in 1948, 1982, and 1989)

The Forest Act (1941) is among the country's early pieces of legislation on forest management. The Act was enacted chiefly to control the harvesting of forest products and contained no measures for conservation. The function and activities of the RFD, which was founded in 1896, were mainly related to extraction. When enacted, the original Act reflected the healthy and abundant state of the country's forests. Not long after, however, from 1961, a succession of NESDPs took into account substantial declines that were occurring and the need to implement conservation measures.

(c) The 1960 Wildlife Preservation and Protection Act (amended in 1992)

The National Park, Wildlife and Plant Conservation Department administers this Act, which focuses on wildlife conservation through measures such as the establishment of special territories and regulations on the possession and trading of living wildlife and wildlife carcasses.

(d) The 1961 National Parks Act

This Act is also administered by the National Park, Wildlife and Plant Conservation Department. It provides for the determination, protection and maintenance of national parks and the establishment of a national park committee.

(e) The 1964 National Forest Reserve Act

This Act provides for the determination of national reserve forests and assigns the responsibility for their control and maintenance to RFD.

(f) The 1992 Reforestation Act

This Act was promulgated to support and encourage private sector investment in plantations, as

part of the RFD's goal to expand the planted area.

(g) Enhancement and Conservation of National Environmental Quality Act (1992)

This Act stipulates conditions and requirements regarding the performance of environmental impact assessment, zoning for environmental conservation, and environmental plans, in order to maintain the quality of the environment.

(h) The 1994 Tambol Council and Tambol Administration Organization Act

This Act was developed with a view to decentralizing natural resource and environmental management to local government. It also attempts to strengthen the role of villages in governing themselves and local natural resources.

(i) Plant Varieties Protection Act (1999)

This Act sets forth regulations on the conservation and use of plant biodiversity.

(j) Electrical Saw Act (2002)

This Act, which is under the jurisdiction of the RFD, provides guidelines for the proper use and management of the chainsaw as a tool for logging.

(k) The Community Forest Bill

The First Community Forest Bill in Thailand was submitted to the Cabinet in 1992.

There had to be a consensus throughout all of Thailand, however, on the usage of Conservation Forests as community forest. The community Forest Bill has been revised several times since 1992, and finally in it was approved in 2019.

The main thrust of the bill is to allow local residents living in the forests to work with the state to manage and use natural resources in a way that sustains the environment. However, community forests are defined as the forests outside the conservation areas governed by the state, such as national parks.

2) Strategy and Plan

(a) National Economic and Social Development Plan (NESDP)

Thailand has been setting a 5-year social and economic development plan since 1961. Announcements by the Office of the National Economic and Social Development Board describe the plan as the national medium-term development plan. The 1st NESDP aimed to maintain the forest cover rate of the country at 50% (the actual rate was 53% when the plan was announced). In ensuing years, however, deforestation and land use conversion rapidly progressed. The forest cover target was thus revised to 40% (15% for protected forest, 25% for economic forest) in the 5th NESDP, which commenced in 1982. In the 7th NESDP commenced a decade later, the overall target value of 40% was kept as is, but the rates of the component forest categories were changed (25% for protected forest, 15% for economic forest). The 40% target value has been maintained up to the current 12th NESDP (2016-2021).

(b) 20-Year Strategic Plan for MONRE (2017-2036)[25]

MONRE formulates this long-term strategic plan over a 20-year time frame. The management of forests and management of biodiversity are described as the first strategies in the plan, as shown below.

1. Forest	[Goal] 1) Protect forest areas. - Conservation Forest 12,941,000 ha - National Conservation Forest 8,608,000 ha - Mangrove Forest 245,000 ha 2) Increase forest and green areas with a target of the country's forest coverage to 40

[25] MONRE Website http://www.mnre.go.th/en/about/content/1065

	percent. - Increase Conservation Forest of 3,632,000 ha - Increase National Conservation Forest of 2,243,000 ha - Increase Mangrove Forest of 22,400,000 ha - Increase Economic Forest areas of 1,389,000 ha - Increase green areas by 20 percent in the communities of local governments [Work Plan] 1) Work plan for prevention of forest intrusion. 2) Work plan for restoration of forest and watershed resources. 3) Work plan for planting Economic Forest. 4) Work plan for management of people living in the forest sites. 5) Work plan for enhancement of increasing green areas in communities. 6) Work plan for the development of forest protection officers. (government, private, public sectors)
2. Marine and Coastal Resources	[Goal] Increase abundance of coastal areas, seagrasses, and marine ecosystems to achieve the 14 SDGs. 1) Increase seagrass areas of 320 ha 2) Increase natural coral reef resources of 57 ha 3) Determine marine protected areas to be not less than 10 percent
3. National Parks	[Goal] 170 National parks are managed effectively to provide ecosystem services and tourist attractions in the parks on the international quality level for the public and local communities.
4.Biodiversity	[Goal] Reduce loss of natural resources and biodiversity. 1) National Bio Resource Archives covering every province 2) 50 kinds of bio resources for economic use 3) Protected marine lives which are rare ensured survival rates by 10 percent 4) At least 1,300 kinds of rare conserved plants
5.Wildlife	[Goal] 1) Balance numbers and kinds of wild animal species with natural resources in the areas 2) Restore species of rare and near-extinct wildlife. (5,000 animals out of 40 species)
6.Land Management	[Goal] Manage National Conservation Forest lands, degraded Mangrove Forest, and other lands for providing the surrounding community sustainable human habitats and uses. 1) National Conservation Forest of 544,000 ha 2) Mangrove Forest of 8,000 ha 3) Other areas outside the forests covering 344,000 ha
7.Geological Resources	[Goal] Manage geological resources equally and sustainably.

(c) Strategic Plan of MONRE (2016 – 2021）

MONRE formulates this medium-term plan strategic plan every five years. The plan lists the following five strategic issues.

Strategic Issue 1:	Integrated management on protection, conservation and restoration, in response to sustainable use and development
Strategic Issue 2:	Integrated and efficient management of surface water and underground water
Strategic Issue 3:	Maintaining and restoring environmental quality with participation
Strategic Issue 4:	Prevention, mitigation and adaptation for natural disaster and climate change
Strategic Issue 5:	Enhancement of organizational management, and natural resources and environment management

This strategic plan lists 25 targets as the next strategic issues to be addressed. Forest-related targets include expansion of the forest area, the protection and conservation of forests and biodiversity, the sustainable use of natural resources, etc., but no specific target values have been

set. Another 64 strategies are shown after the target. The forest-related strategies include participatory sustainable forest and wildlife management, sustainable economic forest management, the promotion of ecotourism, the clarification of forest boundaries, and the suppression of encroachment, the illegal logging of high-value-added timber, and forest fires, among others.

(d) Forestry Master Plan (2014)

The Forestry Master Plan aims to reach the forest cover target of at least 40% within 10 years, to stop deforestation within 1 year, to recover illegally encroached forests, to establish efficient and effective sustainable forest management system within 2 years, and to restore the targeted forests within 2 to 10 years.

(e) Forest Department Strategy (2016-2021)[26]

The RFD formulated this five-year strategy based on the 12th NESDP (2016-2021) by organizing the current forest conditions and management and legal system of forest, etc. in Thailand and then conducting a SWOT analysis

(5) Forest management and conservation efforts

1) Community Forests

Activities in Thailand conducted under the name of Community Forests (CF) started from 1978. Earlier, however, from around 1941, the government of Thailand began supporting communities and residents through participatory reforestation activities and the establishment of multipurpose forest activities, etc. Thailand still has people living in and around conservation forests (1.2-2 million people) and national conserved forests (20-25 million people), so the operation of this CF system is emphasized for the implementation of sustainable forest management. The Bureau of Community Forest Management of the RFD is in charge of the CF programme operation. The RFD aims to register 2,650,000 ha of CFs at 21,850 locations nationwide. Table 3.19 shows the CF registration status so far. Once a CF has been approved and established, it will be recognized by the government and receive full RFD support in terms of budget, technical assistance, empowerment, and manpower.

The budget for the CFs, on the other hand, is insufficient, making it difficult at present to implement support and capacity improvement for all registered CFs.

Table 3.19 Status of CFs

Items	Registered CFs		Registered CF area	
	Number	Achievement rate	Area (ha)	Achievement rate
Registered (2018)	10,887	49.83%	961,781	37.57%
Target	21,850	―	2,560,000	―

Source: Based on the result of the interview, JST summarized

2) Conservation of watershed forests

Thailand has recognized the importance of watershed forests since around 1970 and continues to implement various activities to support them. Watershed forests are classified into five levels based on importance, and land use restrictions and conservation activities are prioritized according to each class. Deforestation and forest degradation due to logging, slash and burn agriculture, etc. are progressing, however, at the headwater streams. Soil erosion, depletion of water resources, water pollution by pesticides and factory water, etc. are thus occurring as a consequence of the deforestation and forest degradation. Based on these circumstances, Thailand aims to realize ecosystem-based water source management and is accordingly promoting research on basins and ecosystems, the participation of communities, and the introduction of PES. There are three components of the implementation approach, namely, the Promotion and Development of Community participation in Protected Areas Project (PPP), forest restoration using agroforestry systems, and the construction of check dams. Upcoming activities will include the plantation of

[26] RFD Strategy (2016-2021) http://forestinfo.forest.go.th/Content/file/forest%20strategy%2059_64.pdf

1,600 m^2 of land, the expansion of agroforestry, research on check dams focused on surrounding ecosystems, the promotion of community participation by subsidies and CSR activities, research on basins and ecosystems, and the application of PES to watershed forests.

3) Collaboration with private companies

Many reforestation projects have been implemented in Thailand. A reforestation project may be led by a public organization such as a government and/or state, by a company, by an NGO, or by a community. In addition to plantation for the purpose of timber production, the reforestation activities by a company may be conducted as a form of CSR or to provide reforestation resources to the government, etc. within a cooperative framework. Cooperative activities of this type account for a large proportion of Thailand's reforestation projects. The large and conspicuous presence of the Thailand's royal family is a factor behind company participation in reforestation activities. It will be possible to encourage companies to participate in reforestation and provide financial resources at the bidding of the royal family, who have a great interest in forest conservation. The government of Thailand is also making efforts to implement a campaign calling for funding through various media (TV, SNS, radio, etc.). The following shows an example of private sector collaboration.

Case studies of EGAT (The Electricity Generating Authority of Thailand_

- Started reforestation project in 1994 in cooperation with MONRE (before 1994 it was only funding)
- 80,000 ha of land has been reforested so far (including 6,400 ha of plantation for the restoration of degraded forest)
- 80% of the reforestation area has been established as forests (20% has been lost to forest fires and logging activities by local people)
- Reforestation of watershed forests, mangroves, CFs, wetland forests, etc. has been carried out. At least 5 native tree species are basically selected for plantation according to the area.
- The system for reforestation activities runs thus: EGAT provides funds, MONRE provides seedlings and grant permission to use the land, and the communities provide labor to hire with the EGAT funds.

-For a period of three years after the planting, the workers hired from the community maintain the planted trees and prevent forest fires, and EGAT conducts training for tree maintenance and forest fire prevention.

4) Payment for Environment (Ecosystem) Service

As for PES, no action has been taken at the national level. Tipco, a beverage maker, however, has been conducting "AURA PES" as part of its CSR activities in Chiang Mai in the north of Thailand since 2015. Aura which is the mineral water brand made by the company Tipco and the local community (Ban Pong Khrai community) have been engaged in the restoration and maintenance management of forests in the Pong Khrai sub-basin with plans to use the area as a watershed forest for Aura, a Tipco brand mineral water. Under the contract, Aura (Tipco) is providing funds for watershed forest conservation activities by the community. This effort also involves the RFD, DNP, and local governments. AURA PES is thus considered a model case for PES in Thailand. The "AURA PES" activities are summarized in Table 3.20.

Table 3.20 Summary of AURA PES activities

Members of AURA PES Committee	•Chief of TAO Pong Yaeng , Chairman •Head of Pong Yaeng Sub District •Head of Pong Khrai Community •Representative of Pong Khrai Community •Representative RFD (Chiang Mai Office) •Head of Mae Sa Watershed Unit (DNP) •Representative of FORRU, Chiang Mai University •Head of Nong Hoi Royal Project

	•Manger of AURA/ Tipco •LEAF Thailand Country Manager
Buyer of Ecosystem Service	Aura/Tipco
Provider or Seller of Ecosystem Service	Community Ban Pong Khrai
Period	First Period : May 2015 – April 2016 (2 years) Second Period: June 2016 – May 2018 (2 years)
Area	First Period : 1.6 ha Second Period: 3.2 ha
Budget	First Period : 7,000 USD Second Period: 14,000 USD
Activity	Establishment of Community plan Implementation of the Plan Submission of Community progress report

Source: Tipco data

According to AURA (Tipco), the company will secure a budget for AURA PES for the next 10 years. This activity will thus have the funds to continue in the future.

(6) Forest sector initiatives related to climate change

1) NDC

In the INDC, Thailand has stated that it will work on a 20% reduction from BAU emissions (555 MtCO2e) in 2030 compared to the 2005 level. With appropriate and enhanced access to technology development and transfer, funding sources, and capacity building support, Thailand has also stated that this reduction target can be increased to 25%.

In assessing the contribution of the forest sector to mitigation, MONRE will be investigating the potential emission reduction by REDD+. As a priority adaptation measure for food security through sustainable community forest management and the extension of ecosystem adaptability, the achievement of a forest cover rate 40%, inclusive of watershed forest and mangrove forest, is also described.

2) REDD+

Thailand is currently working at the REDD+ readiness phase. The progress of REDD + preparation in Thailand is shown in Table 3.21. Thailand submitted an R-PP to the Forest Carbon Partnership Facility (FCPF) in February 2013. A funding agreement was thereupon signed in 2016 to secure total funding of US $ 3.6 million for the promotion of REDD+ activities over the four years from 2015 to 2018. The REDD+ 4 requirements such as the NRS, FRL, etc. have not yet been completed and will require further work up to around a planned target of 2020. There are also 8 REDD+ demonstration activities in Thailand being implemented by Thai funding: (Tak (2014 ~), Chiang Mai (2014 ~), Chanthaburi (2014 ~), Kanchanaburi (2015 ~), Phitsanulok (2018 ~), Phatthalung (2014 ~), Udon Thani (2016 ~) and Phetchabun. Phase 1 will end by 2018, and phase 2 will be began after 2019.

Table 3.21 The progress of REDD + in Thailand

NRS	NFMS	FRL	SIS
No	No	No	No

Source：JST

When implementing REDD in Thailand, a crucial point to know is that the forest products in the Conservation Forests managed by DPN are strictly prescribed. This applies to the carbon stored in the Conservation Forests. There is also a view that carbon trade generated from the Conservation Forests violates regulations. The government of Thailand is planning to discuss suitable approaches for dealing with the carbon stored in Conservation Forests when developing the national REDD strategy. When promoting REDD + in the Conservation Forests in Thailand, it will thus be necessary to confirm the trends in how the carbon stored in the forests is handled.

3) T-VER

The Thailand Greenhouse Gas Management Organization (TGO) has been established under MONRE with a view to garnering effective management of Greenhouse Gas emissions to support the economy, environmental conservation and society. The TGO operates the Thailand Voluntary Emission Reduction programme (T-VER), an organization that promotes voluntary carbon trade. T-VER runs seven types of project, and one of which focuses on "Forest and Green Areas" using the three registered methodologies summarized in Table 3.22.

Table 3.22 Summary of the "Forest and Green Area'' methodologies

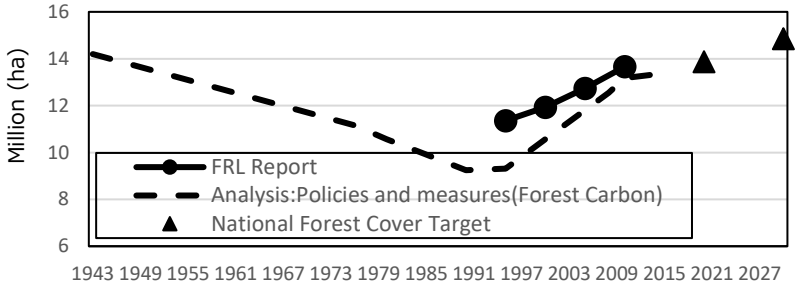
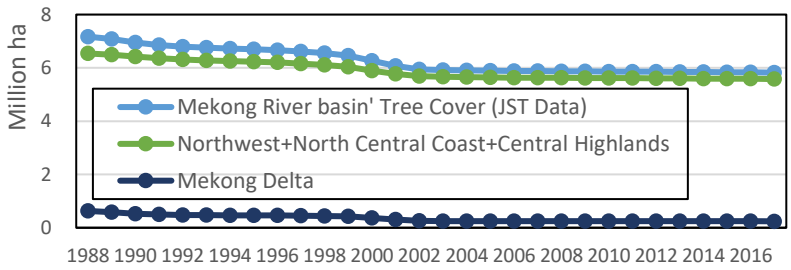
Code	Name	Issuance date of first version	Issuance date of latest version	Activity	Number of projects
T-VER-METH-FOR-01	Sustainable Forestation	September 2013	April 2019 (Version4)	Plantation	6
T-VER-METH-FOR-02	Deforestation and Forest Degradation and Enhancing Carbon Sequestration in Forest Area Project Level P-REDD+	June 2014	September 2016 (Version2)	REDD+	3
T-VER-METH-FOR-03	Large-Scale Sustainable Forestation Project	August 2015	September 2016 (Version2)	Large scale Plantation	1

Source: T-VER website

T-VER has registered 143 projects so far. Of these, 10 projects are registered as "Forest and Green Area" projects, of which two (each a T-VER-METH-FOR-01 methodology) have been issued credits.

3.2.1.4 Viet Nam

(1) Summary sheet of Vietnam

National area	33,017,000 ha[27]	Forest Cover in Viet Nam (2010)
Population	95,541,000[2]	
Population growth rate	1.02%[28]	
GDP per capita	2,354 USD[29]	
Real GDP growth rate	6.8%[29]	
Forest area	16,345,016 ha (2010)[27]	
Forest area rate	41.38% (2010)[27]	
Forest targeted rate	42% (2020) 45% (2030)	
Forest definition	・Area: 0.3 hectares or more ・Canopy cover: Minimum 10% tree cover ・Height: Above a certain tree height set for each vegetation zone ・Natural rubber is classified as forest	
Forest classification and jurisdiction	Protection forests Administration of Forestry (VN Forest), MARD Special Use forests Administration of Forestry (VN Forest), MARD Production forests Administration of Forestry (VN Forest), MARD	
Change of forest area in Viet Nam		
LMB area in Viet Nam	10,922,439 ha	LMB area in Viet Nam
Provinces which are in LMB area	Dong Thap, Dak Nong, Dak Lak, Dien Bien, An Giang, Bac Lieu, Ben Tre, Ca Mau, Can Tho, Gia Lai, Hau Giang, Kien Giang, Kon Tum, Lam Dong, Quang Tri, Soc Trang, Thua Thien Hue, Tien Giang, Tra Vinh, Vinh Long	
Tree cover area in the LMB area	5,821,167 ha (2017 年)	Tree cover rate in the LMB area: 53.3 %(2017 年)
Chage of the tree cover in LMB area in Viet Nam (JSTdata)		

[27] VIETNAM'S Modified Submission on Reference Levels for REDD+ Results Based Payments under UNFCCC (Final Version, 2016) https://redd.unfccc.int/files/vietnam_frl_modified__submission_final_for_posting.pdf
[28] World bank「World Development Indicators」
[29] JETRO Works Tread Investment Report 2018 https://www.jetro.go.jp/ext_images/world/gtir/2018/07.pdf

(2) Status of Forests

1) Forest Definition

The Forestry Law (Law No. 16/2017 / QH14) was approved in Vietnam in 2017 and has been in force since 2019. Article 2 of the law defines forest as an ecological system populated by forest vegetation, forest micro-organisms, and other environmental factors that fulfills the conditions shown in Table 3.23. A forest, according to the definition, consists mainly of timber trees, bamboo trees, or trees in the palm family, reaching certain minimum heights determined according to the terrains on which they grow (such as mountains, flooded lands, or sandy lands) or other typical fauna systems.

Before 2017, Vietnam's forests were defined by the Circular for Forest Identification and Classification (Circular No. 34/2009 / TT-BNNPTNT) issued by the Ministry of Agriculture and Rural Development in 2009. Circular No. 34 defines bamboo and palm as forests. In the FRL report submitted to the UNFCCC in 2016, emissions from deforestation and forest degradation were calculated based on this 2009 Circular No. 34 definition. The minimum area and average tree height prescribed as forest criteria have been changed from those given in the definition in the New Forestry Law (2017).

Table 3.23 Forest definition in Vietnam

		Area	Average Height	Canopy cover	Density
Forestry Law(2017)		0.3 hectares or more	Above a certain tree height set for each vegetation zone	Minimum 10% tree cover	—
Circular for forest identification and classification (2009)	Forest	0.5ha or more or forest tree strips at ;east 20meters in width and of at least 3 tree lines	5m or more	Minimum 10% tree cover	—
	Plantations		Fast growing plantations: 3m Slow growing plantations:1.5m		1,000 trees/ha

Source: Based on the Forestry Law and FRL Report[30], JST summarized

In addition, Vietnam defines a rubber tree as a multi-purpose tree and accounts for rubber plantations as forest under Decision 2855 (2008) on the Identification of Rubber as a Multi-purpose Tree.

2) Forest classification and distribution

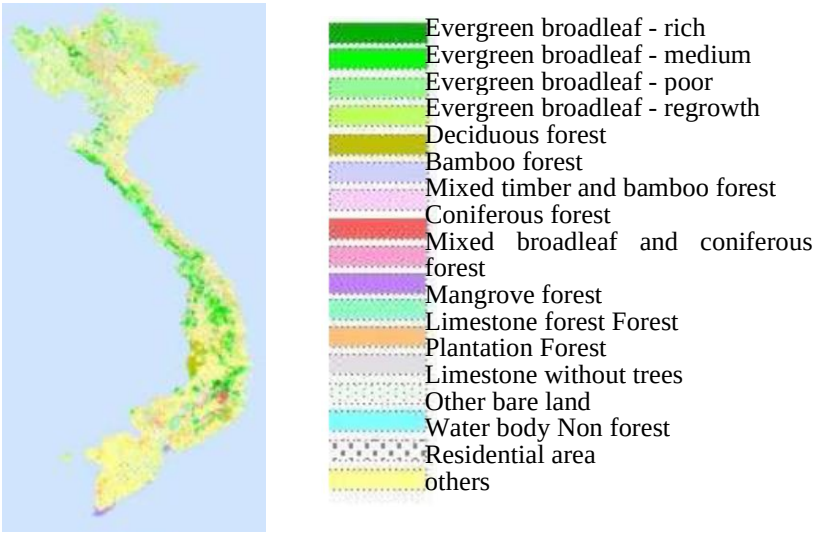
Vietnam's forest classification and forest distribution are described in the FRL report submitted to UNFCCC in 2016. Table 3.24 shows the forest classification and forest area of Vietnam. Figure 3.19 shows the forest distribution in Vietnam.

Table 3.24 Forest Classification of Vietnam

Forest Type	Area(2010)	Remarks
Evergreen broadleaf – rich	681,000ha	Average timber stock >200 m^3/ha
Evergreen broadleaf – medium	1,674,000ha	Average timber stock 100-200 m^3/ha
Evergreen broadleaf - poor	1,581,000ha	Average timber stock <100 m^3/ha
Evergreen broadleaf - regrowth	3,654,000ha	-
Deciduous forest	646,000ha	-
Bamboo forest	441,000ha	-
Mixed timber and bamboo forest	748,000ha	-
Coniferous forest	162,000ha	-
Mixed broadleaf and coniferous forest	53,000ha	-
Mangrove forest	142,000ha	-
Limestone forest	757ha	-
Plantation	3,122,000ha	-

Source: FRLReport[30]

[30] VIETNAM'S Modified Submission on Reference Levels for REDD+ Results-Based Payments under UNFCCC (Final Version, December 2016) https://redd.unfccc.int/files/vietnam_frl_modified__submission_final_for_posting.pdf

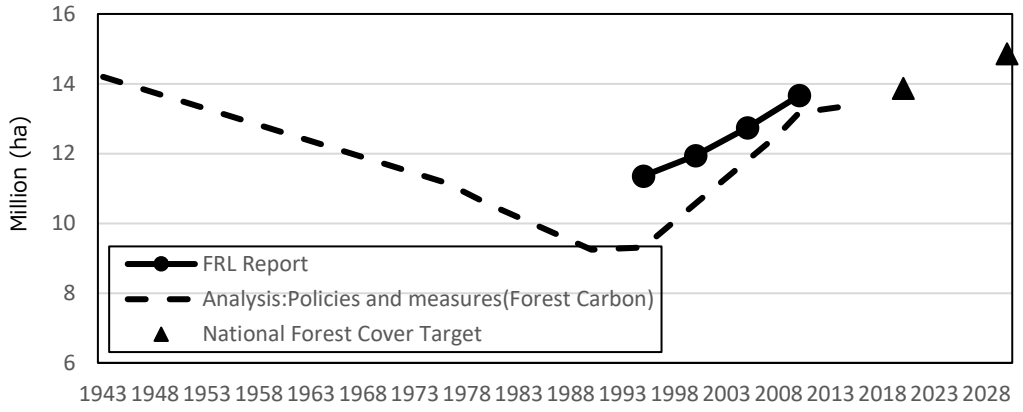


Source: FRLReport[30]

Figure 3.19 Forest Cover Map 2010[30]

3) Changes in the forest area and underlying factors

The forest area of Vietnam in 2010 was 16.345 million ha, accounting for 41.38% of the land area.[30] The forest cover in the country in 1943 was almost the same, at 43%.[31] In the intervening years, however, the forest cover drastically decreased to 27.1% and 26.2% (in 1980 and 1985, respectively) because of the Vietnam War, land use conversion to expand farmland after the war, unsustainable timber removal, forest fires, etc. (Nguyen Hoang Nghia, 2001). Vietnam recognized the need for policies to curb deforestation in the late 1980's and formulated the Law on Forest Protection and Development in 1991. Program 327, a plan aimed at reforesting 2 million hectares by 2010, was launched in 1992. In 1998, Program 327 was handed over to Program 661 (Decision 661/1998 / QD-TTg), a more ambitious plan to plant five million hectares of forest in order to restore the forest cover rate to 43% by 2010. The final report on Program 661 submitted by the Government of Vietnam in 2016 concludes that the main activities of the program had been implemented, culminating in target achievement with the successful restoration of 5 million hectares of forest. Through these programs, the forest area in Vietnam has been increasing since the mid-1990s. Targets are now set to achieve a forest cover rate of 42% by 2020 and 45% by 2030. The transition of the forest area in Vietnam is shown in Figure 3.20.



Source: FRLReport[30]and Analysis: Policies and Measures[32]

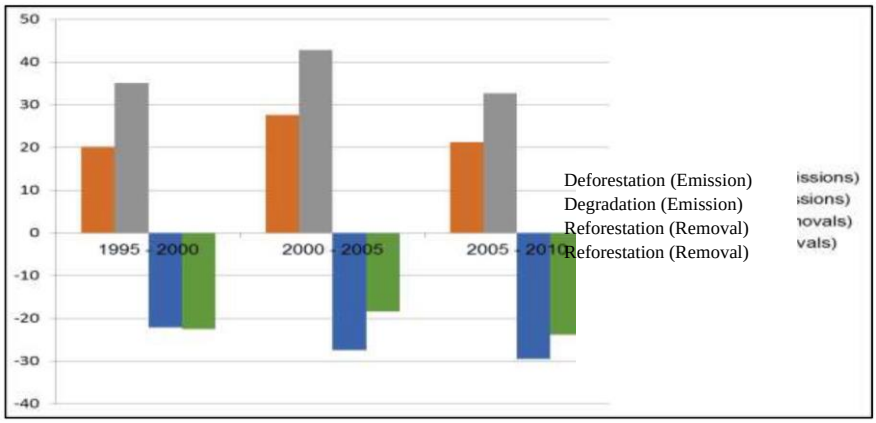
Figure 3.20 Transition of the forest area in Vietnam

[31] Nguyen Hoang Nghia (2001) Conservation of Forest Genetic Resources in Vietnam with reference to endangered tree species http://www.fao.org/3/ac648e/ac648e0g.htm

[32] Analysis: Policies and Measures (Forest Carbon 2016)

4) Status of forest degradation

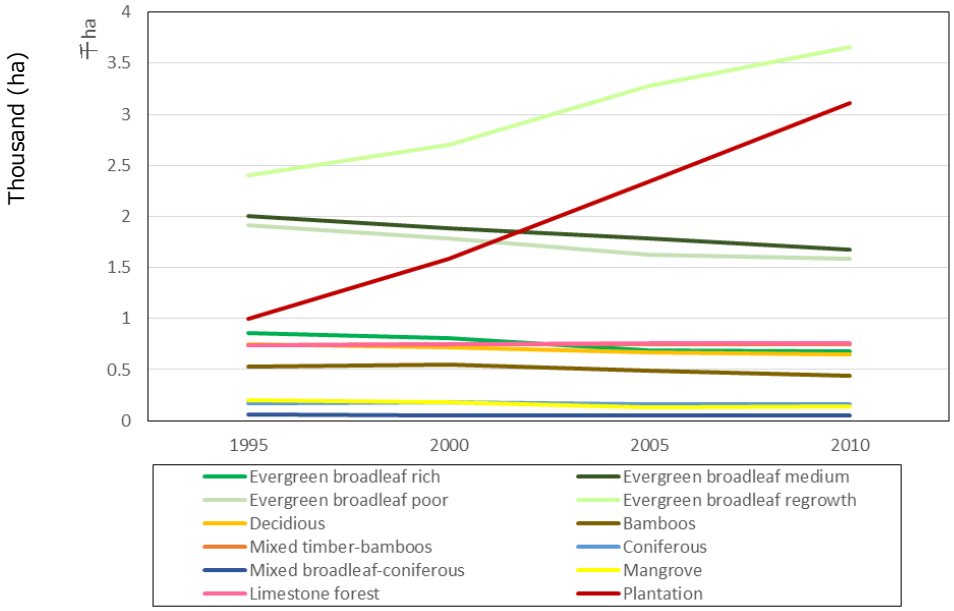
The FRL report submitted by Vietnam to the UNFCCC contains an analysis of not only deforestation, but also forest degradation. Figure 3.21 shows CO_2 emission levels caused by deforestation and forest degradation in Vietnam.



Source: FRLReport[30]

Figure 3.21 CO_2 emissions from deforestation and forest degradation in Vietnam

CO_2 emissions from forest degradation exceed those from deforestation over the three periods from 1995 to 2000, from 2000 to 2005, and from 2005 to 2010. Figure 3.22 shows the transition of the forest area by forest type in Vietnam. Although the forest area of Vietnam is increasing, we see from the figure that the increase is mainly due to reforestation by plantation and evergreen broadleaf regrowth. Natural forests, such as evergreen broadleaf rich and medium, are decreasing.



Source: FRLReport[30]

Figure 3.22 Transition of the forest area by forest type in Vietnam

(3) Forest governance

The Vietnam Administration of Forestry (VN Forest) under the Ministry of Agriculture and Rural Development (MARD) is in charge of forest governance in the country. Vietnam's forests are classified into three categories, namely, special use forests, protection forests, and production forests, under Article 5 of the Forestry Law (2017). Vietnam's forest classification is summarized in Table 3.25.

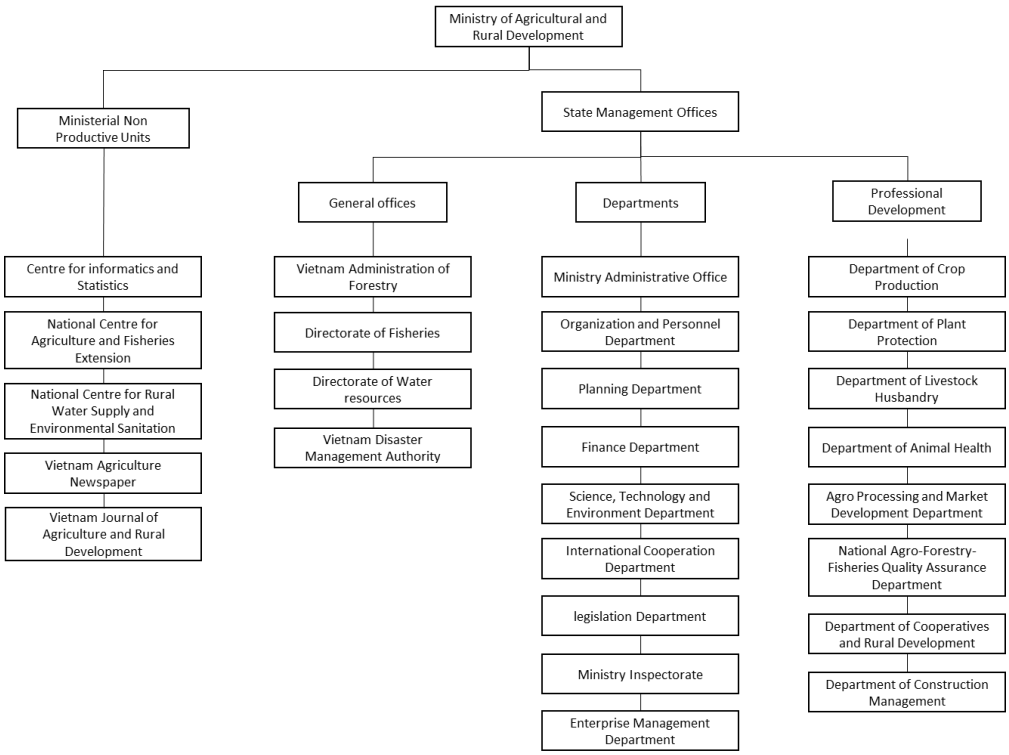
Table 3.25 Classification of the forest in Vietnam

Special Use forests (Article 5, Forestry Law)	Forests are used mainly to protect natural forest ecosystems and forest genetic sources, conduct scientific researches, conservation of historical, cultural and religious heritages, protect landscape and eco-tourism; provide areas for resort and recreation except the strictly-protected zones; and providing forest environmental services including: a) National parks; b) Natural reserves; c) Living landscape and species protection areas; d) Landscape protection areas
Protection forests (Article 5, Forestry Law)	Forests are used mainly for protecting water sources, soil, preventing erosion, flash floods and desertification, limiting natural disasters, regulating the climate, helping to protect the environment and national defense, combining with eco-tourism, resorts and recreation facilities, and providing forest environmental services including: a) Watershed protection forests; forests to protect water sources for people communities; and border protection forests; b) Sand, wind and sea wave shielding protection forests.
Production forests (Article 5, Forestry Law)	Forests are mainly used for providing forest products; forestry-agriculture-aquaculture production; eco-tourism, resorts and recreation, and providing forest environmental services.

Source: Forestry Law

1) Ministry of Agriculture and Rural Development (MARD)

MARD was established in 1995 by integrating the Ministry of Agriculture and Food Industry, the Ministry of Forestry, and the Ministry of Irrigation. In 2007, the Ministry of Fisheries was also incorporated under MARD. MARD currently manages agriculture, forestry, fishery, salt production, irrigation and water resource services and rural development in Vietnam. As such, MARD is the highest authority in charge of forest management in the country. The organizational structure of MARD is shown in Figure 3.23.



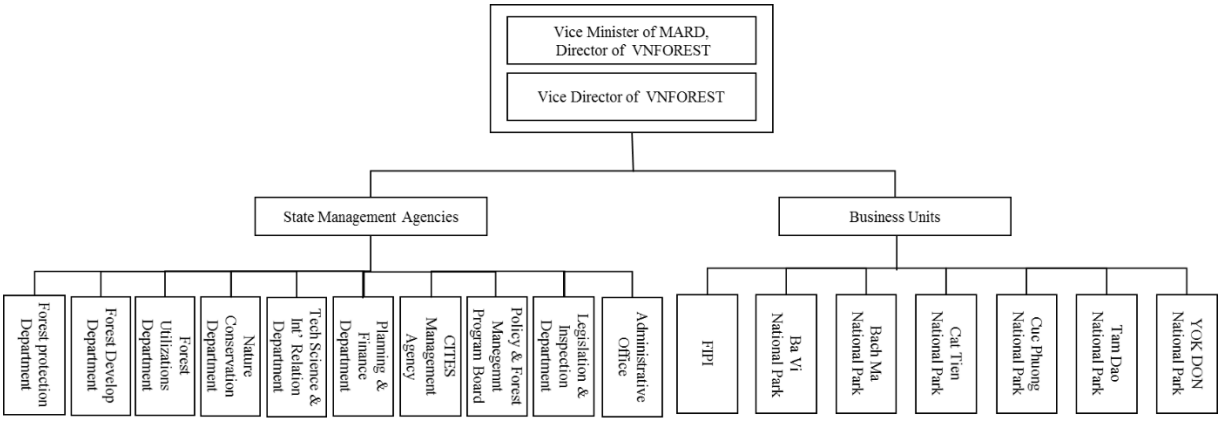
Source: MARD Website[33]

Figure 3.23 Organizational structure of MARD

[33] MARD Website https://www.mard.gov.vn/en/Pages/default.aspx

2) Vietnam Administration of Forest (VNFOREST)

VNFOREST manages forests in Vietnam under the direction of the MARD Vice Minister. The VNFOREST organization chart is shown in Figure 3.24.



Source: VNFOREST Website[34]

Figure 3.24 Organization chart of VNFOREST

3) Vietnam Forest Protection and Development Fund (VNFF[35])

VNFF is a financial institution established in 2018 by Decision No. 114/2008 / QD-BNN of MARD. The VNFF mobilizes, receives, manages, and uses funds for forest protection and development in order to effectively support the development of the forest sector.

The VNFF aims to become an advanced national financial institution by 2020.

(4) Forest Policy

1) Law

(a) The Constitution of the Socialist Republic of Vietnam (1946) (Amended in 1959, 1980, 1992, and 2013)

The present constitution in Vietnam was revised in 2013. There is no direct statement on forests in the current constitution. Regarding natural resources overall, Article 53 states that the land, water resources, mineral resources, resources in the sea and airspace, other natural resources, and property invested and managed by the State are public properties, coming under ownership of the entire people represented and uniformly managed by the State. Article 63 asserts the following policy agendas of Vietnam: to protect the environment; to manage and effectively and stably use natural resources; to protect nature and biodiversity; and to take initiative in preventing and resisting natural calamities and responding to climate change.

(b) Forestry Law (2017)

The mainstream of forest policy in Vietnam was formerly dictated by the Law on Forest Protection and Development, which was enacted in 1991 and amended in 2004. The Law on Forest Protection and Development classified forests in Vietnam as protected forests, special use forests, and production forests, and set the rules governing their management, protection, development, and utilization, and the rights and obligations of forest owners. The Law on Forest Protection and Development was prepared for revision from 2015 in response to new needs such as climate change countermeasures and was revised into the current Forest Act in 2017.

[34] VNFOREST Website http://formis.vnforest.gov.vn/en/web/home/home

[35] VNFF Website http://vnff.vn/

(c) Land Law (1997) (Amended 2003, 2017)

Article 4 of the Land Law declares that the land belongs to the entire people, with the State acting as the owner's representative and uniformly managing the land. The State shall hand over land use rights to land users in accordance with this law. The law also stipulates the rules on land use fees, land use periods, and land use conversion form forest land.

Other laws related to the forest sector include the Law on Environmental Protection (2005), the Biodiversity Law (enacted in 2008), the Law on Royalties (2009), etc.

2) Strategy and Plan

(a) VIETNAM FORESTRY DEVELOPMENT STRATEGY (2006-2020)[36]

This strategy is a long-term strategy of the forest sector in Vietnam formulated in 2007. The strategy pursues the following stated objectives: to sustainably establish, manage, protect, develop and use of 16.24 million ha of land planned for forestry; to increase the forest cover rate to 42 – 43% by 2010 and 47% by 2020; to ensure the wider participation of various economic sectors and social organizations in forest development; to increase their contributions to socioeconomic development, environmental protection, biodiversity conservation, and the supply of environmental services; to reduce poverty and improve the livelihoods of rural people living in the mountains; and to contribute to national defense and security. In order to achieve these goals, the implementation of the five programs in Table 3.26 has been defined.

Table 3.26 Programs under the Vietnam Forestry Development Strategy

Program	Tasks
Sustainable forest management and development program	· Establish the national permanent forest estate for three forest types, mapping and boundary demarcation, manage sustainably and effectively all stable production forest, including 3.63 million ha of natural forests and 4.15 million ha of plantation forests · All forests are allocated, or leased, to forest management entities before 2010. · Establish and implement plans of forest management and capacity building. · Stabilize wood production with timber production targets of 9.7 million m^3/ year by 2010 and 20 – 24 million m^3/ year by 2020 and develop NTFPs to meet demands for domestic consumption and export. · Provide small timber for pulp processing: 3.4 million m^3/year by 2010, and 8.3 million m^3/year by 2020. · Improve the productivity and quality of plantation forests, with an average annual increment of 15 m^3/ha · Enrich 0.5 million ha of degraded forest contributing to increase the quality of forests. · Afforest 1.0 million ha of new forests by the year 2010 and 1.5 million ha for the next phase, and harvested forest will be replanted at the rate of 0.3 million ha/year. · Annually plant 200 million scattered trees, equivalent to 100,000 ha of plantation forests, to serve local demands of wood and fuelwood for home consumption. · Undertake forest inventory periodically; consolidate and update database. · 100% of production enterprises will develop, implement, monitor and evaluate the forest management proposals (plans). · At least 30% of production forest areas are to be issued with certification on sustainable forest management by 2020. · Invest in equipment to modernize forest management work.

[36] Vietnam Forestry Strategy https://theredddesk.org/sites/default/files/viet_nam_forestry_development_strategy_2.pdf

Program	Tasks
Program on forest protection, biodiversity conservation and environmental services development	・Protect effectively 16.24 million ha of forest and forest land area. ・Regulation of forest protection are disseminated to forest owners and local people. ・The State will continue to allocate 1.5 million ha special-use and protection forests. ・Reduce by 80% the cases violating the forest protection and development law. ・100% of forest owners, villages, and communes having forests will arrange their forest protection forces and 100% forest rangers and forest protection forces will be trained. ・Invest to infrastructure, equipment, operational costs for protection, forest fire prevention and control, and pest and disease control. ・Develop and consolidate the protection forest system with a total area of 5.68 million ha and special-use forest system with a total area not exceeding 2.16 million ha. ・100% of protection and special forest areas will have their management owners and availability of planning, medium- and long-term forest protection and development plan. 0.25 Million ha of new protection and special-use forests will be planted by 2010. ・Continue to pilot and scale-up community-based forest management modalities. ・Study on the valuation of the forest environmental services. ・The Forest Protection and Development Fund will be established and implemented.
Forest products processing and trade program	a) Reorganize the wood and NTFP processing industries in order to match the production capability with the sustainable raw material supply sources. b) Strengthen the production capacity of forest product processing industry to meet the basic demands for domestic consumption and for export, which are: ・ Total capacity of sawn timber: 6 million m^3/year ・ Particle board: 320,000 m^3 of products/year ・ MDF board: 220,000 m^3 of products/year ・ Value of exported wood products: 7.0 billion USD (3.5 million m^3 of products) ・ NTFPs for export: 0.8 billion USD c) By 2020, NTFPs will become one of the main production commodities, accounting for more than 20% of the total value of forestry production, the average exported NTFP value will increase 15-20%, attracting 1.5 million laborers and incomes from NTFPs will comprise 15-20% of the rural household economy.
Program on Research, Education, Training and Forestry Extension (RETE)	・Focus research on bio-technology, refining technologies for NTFPs, high-yielding plantations, agroforestry, and rehabilitation of poor degraded natural forests. ・Improve technologies and equipment for the forest product processing industry ・An average of 5000 students/year will be trained regularly in the schools under MARD. ・Vocational training for 50% of farmers and craft villages with forest product processing. ・Environment and forest protection subjects will be introduced into the training curriculum for all primary and secondary schools from 2008. ・80% of local forest management staff will be trained ・Complete and update the training curriculum and textbooks ・Enhance the linkages between the forestry training and forestry extension systems. ・Improve the professional level on forest protection and management for 80% farmers. ・Attract 50% of forestry-related private sector to be involved in forestry extension. ・Forestry extension agent will be arranged for each commune having large forest ・Improve and update the issues and methodology for forestry extension to be suitable for the levels of the farmers.
Program on renovating the forest sector institutions, policy, planning and monitoring	・Promote the decentralization to develop the forestry sector sustainably ・Develop mechanisms and policies to create momentum to encourage the participation of various economic entities in forest sector. ・Reorganize and improve the effectiveness of the state management system in forestry ・Reorganize some forestry companies ・Develop, implement and scale-up of community forests. ・Establish the state forest extension system at different levels and provide ・Establish specialized units in monitoring and evaluation, to be linked with consolidation of the sectoral planning system at all levels.

Source: Forestry Law

(b) VIETNAM'S SOCIO-ECONOMIC DEVELOPMENT STRATEGY FOR THE PERIOD OF 2011-2020[37]

This important document was adopted at the Eleventh Congress of Vietnam Communist Party in 2011 to provide guidance on 10 years of socio-economic development in the country of Vietnam. Regarding forests, the strategy sets out the objective of increasing the rate of forest cover to 45% by 2020. With regard to the directionality of the strategy, the government will invest in and set policies for the management and development of protection forests and special use forests with the aim of improving the quality of protection forests, special use forests, and production forests for the sustainable development of forestry. The government will also encourage investment by organizations and individuals in production forests and aim to circulate and develop funds in the forest sector.

(c) Forest Protection and Development Plan for the period 2011-2020[38]

This plan was determined by Article 16[39] of the Law on Forest Protection and Development revised in 2004. The plan sets out to achieve the following through the effective and sustainable appropriate management of available forests: increase the forest cover to 42-43% by 2015 and to 44-45% by 2020; improve the productivity, quality, and value of forests; and create employment and improve livelihoods.

(d) THE FIVE-YEAR SOCIO-ECONOMIC DEVELOPMENT PLAN (2016-2020)[40]

The document, approved by the National Assembly in 2016, further embodies the above 10-year socio-economic development strategy. For the forest sector, the 2020 forest cover target has been changed to 42%.

(e) National REDD+ Action Programme on the REDD+ by 2030 (NRAP)

Vietnam announced its interest in REDD + to the UNFCCC in 2008 and is promoting REDD + with the support of various donors, including the JICA, the UN-REDD program, and the FCPF. The first National REDD + Action Program was approved in 2012 and a revision of the program was approved in 2017. This revised National REDD + Action Plan describes action programs up to 2030. Table 3.27 provides an overview of the revised plan.

Table 3.27 Summary of the National REDD+ Action Plan

Overall goal	Contribute to protecting and improving the quality of the existing natural forests, expanding the forest area and improving the quality of plantation forests and improving people's lives and the country's sustainable development.
Specific objectives for the period 2017 – 2020	・Contribute to reducing greenhouse gas emissions through REDD+ activities; expand the forest cover to 42% and reach 14.4 million hectares of forest by 2020; ・Meet the requirements of REDD+ readiness, ensuring there is capacity to access financial resources for results-based payments as per international requirements; ・Improve the quality of natural forests and planted forests to increase carbon stock and environmental forest services; replicate effective models of forest plantation; sustainable management, protection and conservation of natural forests; ・Contribute to improve forest governance, create jobs, improve the living

[37] VIETNAM'S SOCIO-ECONOMIC DEVELOPMENT STRATEGY FOR THE PERIOD OF 2011-2020 https://www.economica.vn/Portals/0/Documents/1d3f7ee0400e42152bdcaa439bf62686.pdf

[38] Forest Protection and Development Plan for the period 2011-2020 http://vietnam-redd.org/Upload/Download/File/QD_57.2012_cua_Thu_tuong_CP_-_English_3657.pdf

[39] LAW ON FOREST PROTECTION AND DEVELOPMENT http://vietnam-redd.org/Upload/CMS/Content/Library-GovernmentDocuments/29-2004-QH11.pdf

[40] THE FIVEYEAR SOCIO-ECONOMIC DEVELOPMENT PLAN http://pubdocs.worldbank.org/en/839361477533488479/Vietnam-SEDP-2016-2020.pdf

	conditions of the people associated with the New Rural Programme and ensure security and national defense
Specific objectives for the period 2021 – 2030	・Stabilize the natural forest area by 2030 at, at least, the same level as 2020, and increase forest cover up to 45% of national territory, contributing to realize the national target of reducing total greenhouse gas emissions by 8% by 2030 compared with business as usual (BAU) scenario as committed in the Paris Agreement on climate change. This contribution may increase to 25% if receiving international support; ・Replicate highly effective models on REDD+ and sustainable forest management, integrate fully REDD+ into sustainable forestry development programmes; ・Complete policies, laws and action framework of the REDD+ programme and access financial resources for results-based payments in accordance with international requirements.
Scope	This programme is to be implemented across the country, with priority given to hot spots of deforestation and forest degradation, and regions affected by climate change, as well as areas having the greatest potential for forest carbon stock enhancement
Implementation duration	From 2017 to the end of 2030
Main contents of the Programme	・Policies and measures to reduce deforestation and forest degradation - Continue the review and adjust the land use master plan and land use plans to ensure the target of 16.24 million hectares of forest land is achieved by 2020. - Promote sustainable and deforestation-free agriculture and aquaculture. - Improve forest governance and livelihoods for people living near and in the forest. - Strengthen law enforcement. ・Policies and Measures to conserve and enhance forest carbon stocks and sustainable management of forests - Evaluate and replicate enhanced forest production and long-term rotation timber plantation business models. - Pilot, evaluate and replicate sustainable models for natural forests enhancement, protection and conservation. - Enhance the economic and financial enabling environment for forests. ・Achieve full REDD+ readiness and engage in step-wise improvement - Finalize and upgrade the core REDD+ instruments, in accordance with step-wise principle, and in compliance with UNFCCC's provisions. - Set up and implement financial management mechanisms for REDD+. - Strengthen international and regional cooperation to promote REDD+ and mitigate risks of displacement. - Effectively coordinate, backstop, communicate, build capacities and monitor NRAP implementation.

Source: National REDD+ Action Plan

(5) Forest management and conservation efforts

1) Forest management system

In Vietnam, concerning the implementation of the participatory forest management, the forest is issued and leased based on forest classification. The following Table 3.28 shows the grant and lease rules for forest management.

Table 3.28 Forest use right and lease system

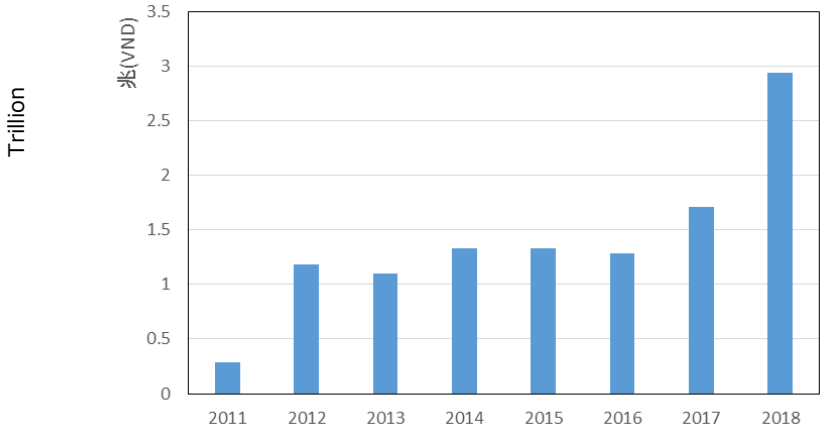
Special Use Forest	・The State shall allocate land with special-use forest to the special-use forest management organization for management and protection in accordance with master plans, plans on land use already approved by competent state agencies. These organizations may use the land for other combined purposes in accordance with the law on forest protection and development. ・The special-use forest management authority shall allocate under short-term contracts

		land with special-use forest in strictly protected forest areas to households or individuals that cannot move out of the area to protect the forests. ・The special-use forest management organization shall allocate under contracts land with special-use forest in eco-rehabilitation areas to households or individuals residing stably in the area to protect and develop the forests. ・Competent People's Committees shall decide to allocate and lease land in the buffer zones of special-use forests to organizations, households and individuals for the purpose of production, research or experiment on forestry or in combination with national defense or security tasks in accordance with the master plan for forest development of the buffer zone. These subjects may use the land for other combined purposes in accordance with the law on forest protection and development. ・Provincial People Committees shall decide to lease land with special-use forest in the area that is allowed to provide landscape and eco-environmental tourist services under the forest canopy to economic organizations.
Protected Forest		・The State shall allocate land with protective forest to the protective forest management organization for management, protection, zoning off for regeneration and afforestation in accordance with master plans, plans on land use already approved, by competent state agencies. These organizations may use land for other combined purposes in accordance with the law on forest protection and development. ・The protective forest management organization shall allocate land with protective forest under contracts to households or individuals that are living in the protective forest area for protection and development of the forest. District-level People's Committees shall allocate residential land and land for agricultural production to such households or individuals. ・Organizations, households or individuals that have demand and ability to protect and develop the forest and are living in the protective forest area for which no management organization has been established or in the area that is planned for protective forest, shall be allocated the land with protective forest for protection and development, and may use the land for other combined purposes in accordance with the law on forest protection and development. ・Provincial People Committees shall decide on the lease of land with protective forest to economic organizations in the areas where it is allowed to provide landscape and eco-environmental tourist services under the forest canopy. ・Communities that are allocated by the State protective forests in accordance with the Law on Forest Protection and Development, are entitled to be allocated land with protective forest for protection and development. The communities have the rights and obligations prescribed in the Law on Forest Protection and Development.
Production forest	Natural Forest	The State shall allocate land with production forest which is natural forest to the forest management organizations for management, protection and development.
	Planted forest	Allocation: The State shall allocate land to households and individuals (Maximum 25ha, in case of exceeds 25ha will be lease). They may use the land not covered with forest for planting forest or perennial trees. Lease : Lease of land to economic organizations, households, individuals, overseas Vietnamese or foreign-invested enterprises to implement afforestation projects. They may use the land not covered with forest for planting forest or perennial trees. Eco-tourism : Economic organizations, overseas Vietnamese or foreign-invested enterprises using land with production forest may concurrently provide landscape and eco-environmental tourist services using the space under the forest canopy. Remoted area : Concentrated land area with production forest which is far from residential areas and cannot be allocated directly to households or individuals, shall be allocated by the State to organizations for protection and development of the forest combined with agricultural production, forestry or aquaculture.

Source: Land Law

2) Payment for Forest Environmental Service (PFES)

The policy on payment for forest environmental services implemented nationwide (Decree No. 99/2010 / ND-CP) was issued in 2010. This provision mainly defines payments for forest environment services to the hydropower generators, clean water suppliers, and tourist service providers. PFES funds are paid to forest environment service providers (forest owners, management organizations, households, individuals and communities, etc.) through VNFF (national or state level) or directly as funds for forest management and protection. The payment criteria for the electric sector was changed by amendments to the PFES regulations (Decree 147 / ND-CP) in 2016. Decree No.156/2018 ND-CP describing the detailed provisions of the Forestry Law, formulated in 2018, applies new PFES to factory production and aquaculture. These efforts have increased the income of PFES in Vietnam every year. Figure 3.25 shows the transition of revenue by PFES.



Source: VNFF Website[35]

Figure 3.25 Transition of revenue by PFES

According to VNFF, the Vietnam collected VND 2,937.9 billion of PFES money in 2018, or 71% more than it collected in 2017. The increased amount was mainly derived from an adjustment of electricity prices from 20 VND/kWh to 36VND/kWh according to the provisions of Decree No. 147/2016/ND-CP. According to the source data, 5.986 million ha of forest were being managed and protected with PFES money (accounting for 42% of the total forest area nationwide) by the end of April of 2018. PFES money has helped bring in more income for 450,108 ethnic minority households, and thus has contributed to livelihood improvement, social stability, and the assurance of border security and national agricultural security. In addition, new types of PFES for industrial production and aquaculture have been institutionalized by Decree No.156/2018/ND-CP issued in November 2018. These new types of PFES will further grow PFES revenues in the year 2019. According to the CIFOR, PFES income in 2015 accounted for 22% of the total forest sector budget in Vietnam. Thus, PFES is positioned as an important source of forest management in Vietnam.

(6) Forest sector initiatives related to climate change

1) NDC

In September 2015, Vietnam submitted the UNFCCC Intended Nationally Determined Contribution (INDC). Under the INDC targets, GHG emission will be reduced by 8% relative to Business-As-Usual (BAU) as a country effort and by 25% if international support can be obtained by 2030. The restoration of forest cover to 45% is mentioned as a contribution by the forest sector. Mitigation activities under the INDC include sustainable forest management and development, carbon sequestration, increased environmental services, the introduction of private funds, the utilization of REDD + and PFES, and the strengthening of international cooperation.

2) REDD+

The progress of REDD + in Vietnam is shown in Table 3.29. Vietnam has developed a national road map for the pilot program for the results-based payments of the GCF. Work is underway to prepare a concept note and proposal in 2020.

Table 3.29 Progress of REDD+ in Vietnam

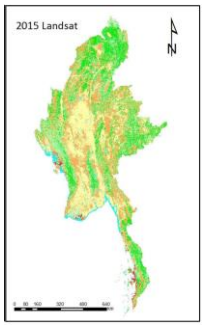
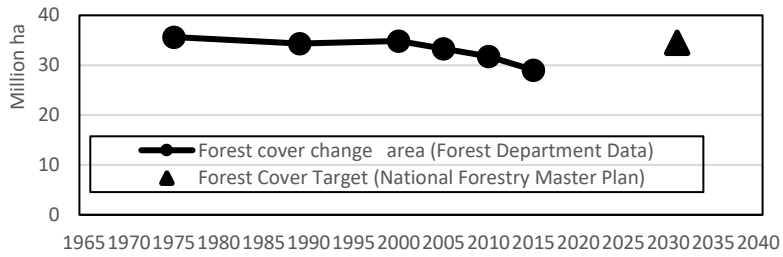
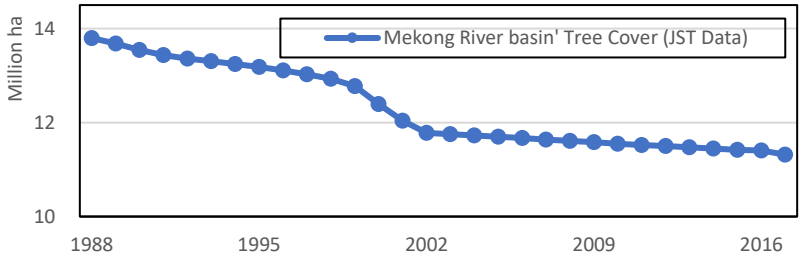
NRS	NFMS	FRL	SIS
Formulated (formulated in 2012, revised in 2016)	In preparation	2016 Submitted[30]	2018 Submitted[41]

Source: JST

Regarding REDD + activities, the FCPF's Emission Reduction (ER) Program Document was adopted in 2018. Further, the FAO is preparing an REDD+ project in the central highlands to apply the GCF. Various donor organizations such as JICA, GIZ, SNV, and FFI are also carrying out pilot REDD+ activities in various places.

[41] FIRST SUMMARY OF INFORMATION ON HOW SAFEGUARDS FOR REDD+ WOULD BE ADDRESSED AND RESPECTED IN VIETNAM https://redd.unfccc.int/files/4850_1_first_soi_viet_nam__28eng_29.pdf

3.2.1.5 Myanmar

National area	68,248,983.33 ha[42]	Forest Cover in Myanmar(2015)
Population	55,622,506()[43]	
Population growth rate	0.89%[43]	
GDP per capita	1,264USD(2017)[44]	
Real GDP growth rate	6.7%(2017)[44]	
Forest area	29,561,717.38 ha (2015)[42]	
Forest area rate	44.13% (2015)[42]	
Forest targeted rate	Permanent Forest Estate:30%[45] Protection Area:10%	
Forest definition	・Area: At least 0.5ha, Height: More than 5m, Canopy crown cover: More than 10%[42]	
Forest classification and jurisdiction	・Permanent Forest Estate（Reserved Forest and Protected Public Forest, included Community Forest and Planation）; Forest Department(FD）, Ministry of Natural Resources and Environmental Conservation(MONREC) ・Forest other tan PFE;FD, MONREC	
Change of forest area in Myanmar		
LMB area in Myanmar	15,767,588 Ha	LMB area in Myanmar
Provinces which are in LMB	Shan	
Tree cover area in the LMB area	11,317,152 ha	Tree cover rate in the LMB area: 71.8 %(2017)
Chage of the tree cover in LMB area in Myanmar (JSTdata)		

[42] Forest Reference Emission Level(FREL) of Myanmar (MONREC 2018)
https://redd.unfccc.int/files/revised-myanmar_frl_submission_to_unfccc_webposted.pdf
[43] CIA data https://www.cia.gov/library/publications/the-world-factbook/geos/bm.html
[44] JETRO Works Tread Investment Report 2018 https://www.jetro.go.jp/ext_images/world/gtir/2018/12.pdf
[45] 30 Year National Forestry Master Plan (2001-2030)

3.2.2 Understanding the drivers of deforestation and summarizing the results of provincial interviews

The 22 provinces shown in Table 3.30 were visited in this study. Interview studies on the forest status were conducted at the government agencies with jurisdiction over the local forest management. The 22 provinces were mainly extracted as hot spot provinces where interviews could be arranged with local government staff. This section summarizes the interview results returned in the format shown in Table 3.31.

Table 3.30 Provinces visited for interviews

Cambodia	Kompong Speu, Siem Reap, Otdar Meanchey, Preah Vihear, Kampong Thom, Kratie
LAO PDR	Savannakhet, Khammouan, Bolikhamsai, Vientiane Province, Luang Prabang, Oudomxay, Luang Prabang, Attapeu, Salavan
Thailand	Khon Kaen, Chaiyaphum, Mukdahan, Udon Thani
Vietnam	Ca mau, Lam dong, Kon Tum

Table 3.31 Compilation format for a provincial interview

① Country name and Province name						
② **Agriculture**	**Develop ment**	**Fire wood Charcoal**	**Forest fire**	**Illegal Logging**	**Increase**	**Other**
③ Outline of the Province						
④ Dynamics of Provincial Tree Cover			⑤ Provincial Tree Cover (2018)			
⑥ Status of Deforestation and Forest Degradation						
⑦ Issue(s)						
⑧ Countermeasure(s)						
⑨ Photographs from the field						

The information entered into the form in Table 3.31 uniformly conformed with the contents shown below. Data points without accompanying references are numerical values obtained by the local interviews.

① Name of the country and prefecture where the interview was conducted.
② Details on the main factors and drivers of deforestation and forest degradation in the province pointed out in the interview.
③ A summary of the numerical values obtained in the interview. Numerical values that could not be obtained through the interview are quoted from statistical data, etc. The data sources are shown at the end of this chapter.
④ Change of tree cover area in the province based on the basin Land Cover data developed by JST.
⑤ Data created from the Land Cover data developed by JST in 2018.
⑥ Activity related to deforestation, forest degradation, and increase in the forest area in the province, as pointed out in the interview.
⑦ Issues pointed out in the interview.
⑧ Countermeasures against issues pointed out in the interview.
⑨ Photos taken in the field.

The summary in this section is a compilation of interview results and is not a quantitative analysis based on actual numerical data.

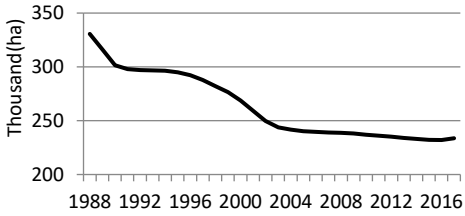
Kampong Speu Province, Cambodia

Agriculture | Develop ment | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

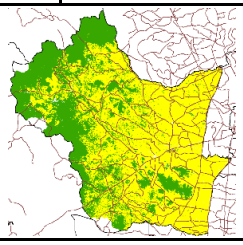
Outline of the Province

- **Provincial Area:** 696,471 ha[i]
- **Forest Type:** Deciduous Forest, Evergreen Forest
- **Forest Cover Area:** 235,507ha (Forest Cover Rate 33.8%) (2016) [i]
- **Forest Category:** Permanent Forest Estate(PFE); No data
  Protected Area(PA); 207,014 ha(3 sites)
  Flooded forest and Mangrove out of PA ; No data
- **Targeted Forest:** No data
- **Tree Cover Area:** 233,744ha(Tree Cover Rate 34.4%) (2017) [ii]
- **Population:** 716,517 (Population Density 102person/km^2) (2008)[iii]
- Locates at north-west of Phnom Penh. The royal palace was located in Udong Area up to 1866, it functioned as a capital.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

・Major deforestation factor is expansion of farmland with increase of population.
・Companies or rich people employ poor people to conduct illegal logging and field firing, then establishing the fact that the land is farmland. Vicious land use conversion has been created by occupation of the land after driving out the farmers. It is possible to control illegal logging directly if companies or rich people conduct it, but it is not easy to do so if the forest land has been converted to farmland by the poor people taking into consideration their lives.
・Due to high demand for charcoal in the capital area near Phnom Penh charcoal production is active. But fuel wood collection is carried out mostly in the natural forest of the protected area, and therefore fuel wood collection is the major factor of deforestation.
・In order to promote reforestation and activities of forest conservation reforestation species are selected for the purpose of fruit production or timber production for living improvement.

Issue

・Expansion of forest conversion to farmland and its expansion caused by population increasing in the protected area.
・Occupation of land by companies or rich people who use local people.
・Establishment of forest management system that involves local people.
・Limited number of forest rangers and equipment.
・Influence to the agriculture and infrastructure by increase of flood or draught.

Counter Measure

・Education to the local people (function of forest and necessity of its conservation)
・Strengthening of forest related laws.
・Increase of community protected forest (At present addition of two protected forests is considered)
・Strengthening of patrol plan (24 hours patrol by ranger)
・Establishment of forest protection system by introduction of private capital such as introduction of ecotourism in the protected area

Area decreasing the forests: changing to agricultural land (sugarcane)

Charcoal making in home yard

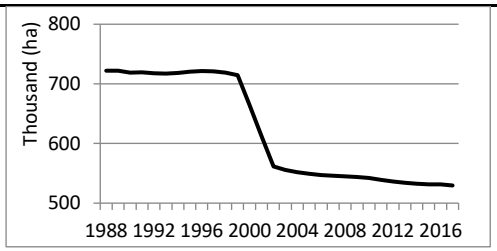
Siem Reap Province, Cambodia

Agriculture | **Development** | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

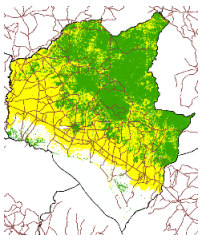
Outline of the Province

- **Provincial Area:** 1,054,449ha[i]
- **Forest Type:** Deciduous Forest, Evergreen Forest
- **Forest Cover Area:** 319,717ha(Forest Cover Rate 30.32%) (2016) [i]
- **Forest Category:** Permanent Forest Estate(PFE); No data
  Protected Area(PA); 227,022ha (7sites)
  Flooded forest and Mangrove out of PA ; No data
- **Targeted Forest:** No data
- **Tree Cover Area:** 529,613ha(Tree Cover Rate 41.1%)(2017)[ii]
- **Population:** 896,309 (Population Density 87person/km^2) (2008) [iii]
- One of the Provinces located in west-southern area of Cambodia and faces the Tonle Sap Lake. This is the biggest touristic place with located Angkor Vat Ruins.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- Regarding the factor of deforestation conversion of forest to farmland is the major factor and claiming is done to the ministry of agriculture.
- The army forces the land use conversion of the forest.
- Rich people employ local people to conduct logging and convert the land use from the protected forest to other land.
- Illegal logging is still carried out for the purpose of land use conversion or procurement of high value timber.
- Firewood and charcoal production is carried out in the protected forest. However, it is not the major cause of deforestation. Firewood is used in mills and charcoal is used in restaurants in town.
- Indigenous species such as rosewood are introduced for reforestation in the protected forest. These are high value timber species.

Issue

- Shortage of equipment and budget for forest management.
- Restrain and management of land use conversion of forest by army and rich people, etc.
- Control of illegal logging conducted at night
- Establishment of collaboration system with community for sustainable forest management.
- Expansion of protected forest
- Protection of wildlife animals when flood or draught occur

Counter measure

- Education to the local people (to understand forest function and to enforce the knowledge of forest related laws)
- Disclose of illegal act and conduct of replanting
- Expansion of protected forest
- Distribution of seedlings for promotion of community protected forest

Area decreasing the forests: changing to agricultural land (cassava)

Transporting illegal logged trees

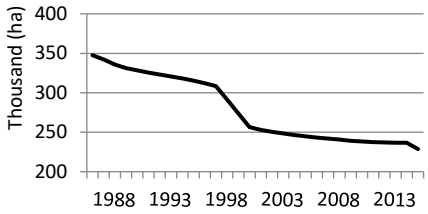
Oddar Meanchey Province, Cambodia

Agriculture | **Develop ment** | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

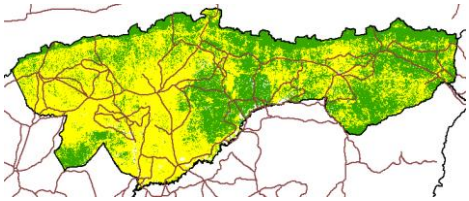
Outline of the Province

- **Provincial Area:** 663,165ha[i]
- **Forest Type:** Deciduous Forest, Evergreen Forest
- **Forest Cover Area:** 189,963 ha(Forest Cover rate 28.6%) (2016) i
- **Forest Category:** Permanent Forest Estate(PFE); No data
  Protected Area(PA); 191,403ha (3sites)
  Flooded forest and Mangrove out of PA ; No data
- **Targeted Forest:** No data
- **Tree Cover Area:** 228,662ha(Tree Cover Rage 43.9%) (2017) [ii]
- **Population:** 185,443 (Population Density 30person/km^2) (2008) iii
- Locates in north-western part of Cambodia, borders on Thailand with Northern parts.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- In the past civil war occurred in the area and Khmer Rouge lived there and they felled the forest to sell timber.
- The recent deforestation factor is settlement of army by Social Land Concession (SLC), domestic emigrant and poor people with their family in three protected forests who conduct logging to develop farmland or house construction.
- As Economic Land Concession(ELC) was issued a lot of deforestation accelerated. ELC is issued for the purpose of development of farmland, however in some ELC only logging and log extraction is carried out.
- It is still the area with much illegal logging (145 cases in 2018)
- Forest fire also occurs and it is a cause of deforestation
- As for firewood and charcoal, firewood is used in mills and charcoal is used in house or sold outside of the area.
- Fund support is received by Cambodia Wildlife Sanctuary & Safe Elephant Foundation and reforestation activity (4000 ha) is planed with company.

Issue

- Control of illegal logging and its restrain
- Coordination with SLC
- Countermeasure against forest fire

Counter measure

- Strengthening enforcement of law
- To secure breeding to understand forest conservation and to enforce common knowledge for the forest laws and ordinances to the army, community and local people.
- Boundary setting of protected area (stakes) and new establishment of protected area
- Promotion of forest conservation activities such as forest patrol that involves community or temples.

Confiscated illegal logged trees

Area decreasing the forests: changing to agricultural land (Cashew nuts Plantation)

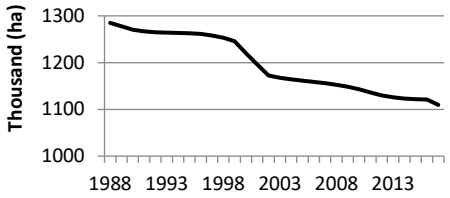
Preah Vihear Province, Cambodia

Agriculture | **Develop ment** | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

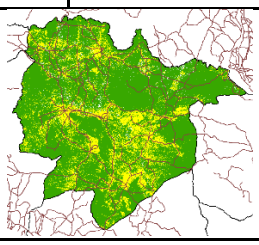
Outline of the Province

- **Provincial Area:** 1,403,087ha[i]
- **Forest Type:** Deciduous Forest, Evergreen Forest
- **Forest Cover Area:**1,094,472 ha(Forest Cover Rate 78%) (2016) [i]
- **Forest Category:** Permanent Forest Estate(PFE); No data
  Protected Area(PA); 774,566.82ha(9sites)
  Flooded forest and Mangrove out of PA ; No data
- **Targeted Forest:** No data
- **Tree Cover Area:** 1,109,456ha(Tree Cover Rate 79.2%) (2017) [ii]
- **Population:** 170,852 (Population Density 12person/km^2) [iii]
- Locates western side of Mekong River, Northern part of Cambodia. Northern part of the Province borders Thailand and Lao PDR.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- ELC of total area is 106,283 ha was issued to the 17 companies in the protected area. Forest has been converted to agriculture plantation for sugar cane, rubber, cashew nuts, black pepper, casaba, etc. by this ELC.
- In order to cope with the boundary problem, an army camp settled in the protected area and SLC was provided to the army family to live. SLC is also issued to the people without land.
- Local people conduct illegal logging to obtain income. Illegal logging has been carried out by the army camp, too. Furniture manufacturers are also carrying out illegal logging.
- When logging operation is carried out in accordance with ELC or SLC logging is done not only in the permission area of the concession but also its periphery area of the forest, so deforestation is accelerating beyond the plan.
- Rich people use poor local people to conduct logging illegally to obtain lands for others continuously.
- Charcoal is used by households and fuelwood is used in mills so Charcoal and fuelwood collection are also the causes of deforestation.

Issue

- Number of forest rangers to conduct patrol is insufficient.
- Expansion of deforestation is caused by vagueness of the boundary of protected area.
- Population increase or improvement of roads or infrastructure in the protected area induce deforestation and forest degradation.

Counter measure

- Enlightenment and dissemination to the local people (to secure understanding forest conservation and to enforce common knowledge for the forest laws and ordinances)
- Strengthening in control of illegal logging.
- To promote increase of community protected forest in the protected area. Through establishment of community protected forest local people are able to settle in the protected forest in their life area and it helps them to conduct protection activities such as patrol by themselves.
- Enforcement of collaboration system with various institutions such as WCS, FAO, UNEP, etc.
- Introduction of environment education in school.

Area decreasing natural forests: changing to natural rubber plantation

Intentional forest burning by local people

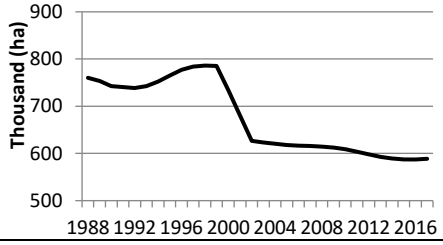
Kampong Thom Province, Cambodia

Agriculture | **Develop ment** | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

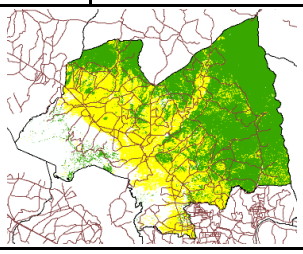
Outline of the Province

- **Provincial Area:** 1,244,763 ha
- **Forest Type:** Flooded Forest, Evergreen Forest
- **Forest Cover Area:**479,689ha (Forest Cover Rate 38.5%) (2016) [i]
- **Forest Category:** Permanent Forest Estate(PFE); No data
  Protected Area(PA); 313,094 ha(6 sites)
  Flooded forest and Mangrove out of PA ; No data
- **Targeted Forest:** No data
- **Tree Cover Area:** 588,357ha(Tree Cover Rate 45.9%) (2017) [ii]
- **Population:** 630,803 (Population Density 46person/km^2) (2008)[iii]
- Locates in central part of Cambodia, the second largest province in Cambodia. Western side of the Province faces Tonle Sap Lake.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- There are 10 ELCs Per Wildlife Sanctuary and SLC also exists, therefore development activities are going on in the concession area and deforestation and forest degradation occurs.
- Illegal logging is rampant by the local people in the protected area.
- Development of farmland occurs in the PA by the local people including domestic immigration.
- Game hunting, acquisition of honey, field firing for agriculture development, forest fire by artificial factor occurs.
- Firewood collection is done but it tends to decrease. As for fire wood it is collected for not only to use in the province but also to send and sell in the neighboring province, Kampong Cham where no forest exists to collect fire wood.
- By support of FAO (Forest Landscape Restoration Project) reforestation activity is implemented to increase forest area of 200 ha by the year 2020.

Issue

- Budget for forest sector is little and procurement of necessary manpower and equipment is difficult.
- Illegal logging workers are sometimes armed and they try to counterattack with chainsaw, so that forest patrol faces danger and ensuring safety of rangers is difficult.
- Due to shortage of budget reforestation can't be implemented.
- Draught and flood affect agriculture activities.

Counter measure

- Strengthening in enforcement of laws.
- Education to the local people (about law, forest resources, forest protection)
- Increase of frequency of forest patrol by ranger.
- Promotion of forest management system by local people's initiative by increasing of community protected forest and clarification of the boundary.
- Strengthening of forest protection activities at minimum administrative unit and cooperation with higher administration and policy to the activities.

Collected Fuel and charcoal wood

Intentional forest burning by local people

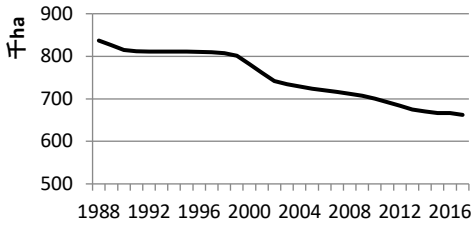
Kratié Province, Cambodia

Agriculture | Develop ment | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

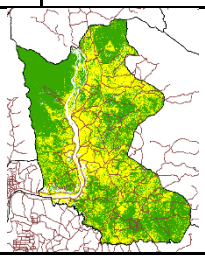
Outline of the Province

- **Provincial Area:** 1,197,305ha[i]
- **Forest Type:** Deciduous Forest, Evergreen Forest
- **Forest Cover Area:**735,068ha(Forest Cover Rate 61.39%) (2016) [i]
- **Forest Category:** Permanent Forest Estate(PFE); No data
  Protected Area(PA); 404,894ha(6sites)
  Flooded forest and Mangrove out of PA ; No data
- **Targeted Forest:** No data
- **Tree Cover Area:** 662,220ha(Tree Cover Rate 55.4%) (2017) [ii]
- **Population:**318,523 (Population Density 29person/km^2) (2008) [iii]
- Locates east-northern part of Cambodia, 140 km of Mekong River runs from north to south of the Province.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- Conversion of forest to agriculture by ELC is the major factor of deforestation and forest degradation in the province.
- Some immigrants who came from other province have economic power and in some cases conduct big scale land conversion by using big machine for agriculture development
- As the economic power is small for the people in the province the expansion of farmland is small.
- When logging operation was conducted for ELC, illegal logging was found at the area including the periphery of the concession area.
- Illegal logging is by local people. The purpose is selling timber and charcoal production.
- People use fuel wood for house use and charcoal is produced for selling to other provinces. Charcoal production is increasing in recent years so that fuel wood collection is one of the factors of deforestation.

Issue

- The prioritized subject is to secure health and safety for the rangers. At present necessary health measures (bring medicines) to them are not sufficient to work in the forest.
- Illegal logging is conducted mostly at night so that it can't be detected during the daytime patrol.
- Poor people live in the forest or periphery area do not have income source except logging activity.
- Equipment for patrol by rangers is not enough such as transport, GPS, camera, etc.
- Expansion of protected area and increase of forested area by reforestation as well as restoration at the degraded land.

Counter measure

- Education to the local people (understanding of forest resources and laws) and strengthening of enforcement of laws.
- Strengthening of patrol by ranger.
- Promotion of protection activities such as patrol in the community protected forest by local people.
- Conduct forest conservation activities or life improvement activities of the people by the cooperation with WWF and USAID, etc.

Area decreasing forests: changing to agricultural land (cassava)

Area increasing forest: Natural Rubber Plantation

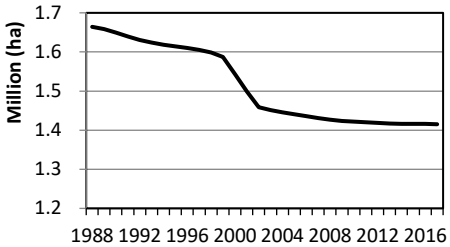
Savannakhet Province, Central Region, Lao PDR

Agriculture	**Development**	Fire wood Charcoal	Forest fire	**Illegal Logging**	Increase	Other

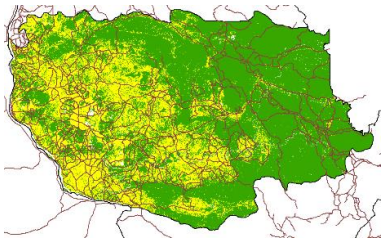
Outline of the Province

- **Provincial Area:** 2,170,000ha
- **Forest Type:** Dried Dipterocarpus Forest, Deciduous Mixed Forest
- **Forest Cover Area:** 1,240,000ha (Forest Cover Rate 57.1%) (2018)
- **Forest Category:** Protection Forest 661,758 ha Conservation Forest 309,048 ha Production Forest 202,485ha
- **Targeted Forest Cover Rate:** 65～75% (by 2020)
- **Tree Cover Area:** 1,415,131ha(Tree Cover Rate 66.1%) (2017) [iv]
- **Population:** 1,021,000[v] (Population Density 47.1person/km^2)
- Key area for transportation from Thailand to Viet Nam. East part of the Province borders on Viet Nam, and West part of the Province borders on Thailand across Mekong River.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- In the past forest decreased mainly because of farmland preparation for development of sugar mills or improvement of infrastructure.
- After division of the forest was settled in 2011 conversion of the forest needs to have a permit, so that conversion to farmland decreased.
- Slush and burn has decreased after banning logging in natural forest in 2014.
- Due to decrease of Slush and burn, forest fire also tends to decrease.
- Plan to conduct logging in 2,500 ha in Phou Vieng Protected Forest due to Dum construction started in 2017 (1,250 ha has already been logged).
- Illegal logging is conducted but the situation has been improving because of disclosure rate owing to awareness activities and improvement of reporting system.
- Reforestation of about 80,000 ha was implemented between 2007 and 2018 including natural rubber, Acacia, Eucalyptus, etc.

Issue

- Common knowledge and enforcement of the forest classification set up in 2011 are late.
- Manpower is short (there are about 200staffs) taking into account of the forest area in the province.

Counter measure

- Awareness activity to promote understanding of forest conservation and awareness activity about forest utilization ordinances.
- Setting up the forest management unit at village level.
- Visualization of forest boundary.
- Establishment of the area for natural regeneration to restore the degraded forest or devastated land in the protected forest and restriction of use of it.
- Selection of existing mother tree and seedling production.
- Patrol for protection of wildlife animals.

Changed forests to sugercane field

Converted the land from forest without permission

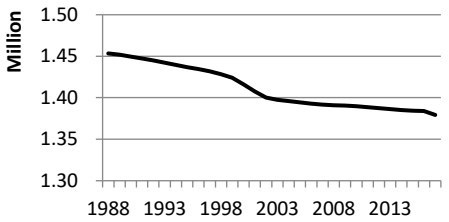
Khammouane Province, Central Region, Lao PDR

Agriculture | **Develop ment** | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

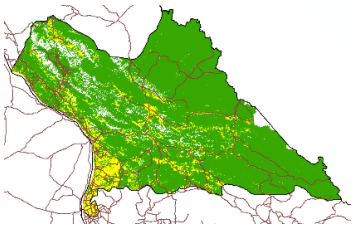
Outline of the Province

- **Provincial Area:** 1,600,000 ha
- **Forest Type:** Dried Dipterocarpaceae Forest, Pine- Broad Leaved Tree Mixed Forest, Evergreen Broad-Leaved Forest
- **Forest Cover Area:** 1,058,000ha(Forest Cover Rate 65%) (2018)
- **Forest Category:** Protection Forest (19sites), Conservation Forest (10sites), Production Forest (3sites), Regeneration area (21,000ha), Reforestation (23,800ha), Other Protection Forest and Village Forest managed by villages
- **Targeted Forest Cover Rate:** No data
- **Tree Cover Area:**1,379,280ha(Tree Cover Rate 83.5%) (2017) [iv]
- **Population:** 414,000[v] (Population Density 25.9person/km^2)
- East part of the Province borders on Viet Nam, and West part of the Province borders on Thailand across Mekong River.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- The biggest factor of the forest decrease is dam construction. A wide range of the forest sank in the dam lake while Hinboun dam - whose operation started since year 2000 - was being constructed and while Nam Theun dam 2 - whose operation started since year 2005 - was being constructed.
- Mine development of Copper, Iron, Potassium, etc. has been carried out in Khammouane province and this is the second biggest factor of forest decrease.
- Slush and burn is little. In the province it was found in the district close to the Viet Nam border, but it has been decreasing because of progress of regulation.
- Strict control started by government ordinance 2015-2016, and illegal logging has decreased greatly. Current illegal logging is done by local people who fell loges by few numbers at the border area where inspectors do not cover completely.
- In Khammoune province agriculture concession for sugar cane plantation is not provided. In case of the forest managed by the village decision making right is given by the village, so that conversion of the forest to plantation has occurred.
- In the year 2017 out of the plantation area of 20.3 thousands ha, natural rubber occupies 7,350 ha and Eucalyptus (partially Acacia) occupies 15,000 ha, and Eucalyptus is mainly by companies while Acacia is mainly by the farmers. These plantations started recently (3 to 4 years before).

Issue

- Classification of land is done but villages exist in areas classified as protected forest and agricultural activities are also conducted in some areas. It is necessary to rearrange land use classification to avoid such duplication in the future.

Counter measure

- In the past illegal logging in Khammuoune province was the problem. Due to strictly control which has been conducted since 2015, illegal logging has decreased, so the situation is improving.

Area decreasing forests (forests→sugercane plantation)

Area decreasing forests (forests→mango plantation)

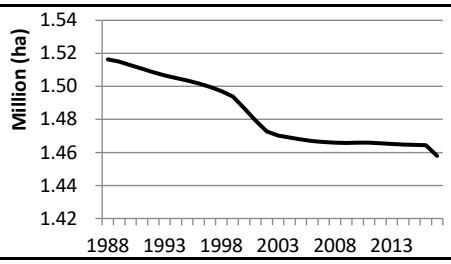
Bolikhamsai Province, Central Region, Lao PDR

Agriculture | **Develop ment** | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

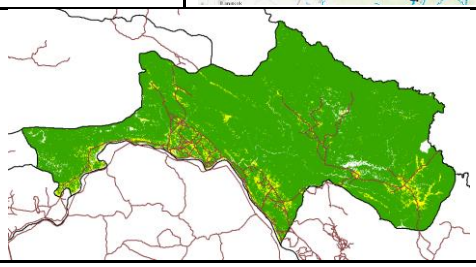
Outline of the Province

- **Provincial Area:**1,599,700 ha
- **Forest Type:** Evergreen Broad-Leaved Forest, Deciduous Mixed Forest
- **Forest Cover Area:** 1,179,000 ha(Forest Cover Rate 69.9%) (2015)
- **Forest Category:** Protection Forest 353,765ha, Conservation Forest 617,094ha, Production Forest 181,182ha, Reforestation26,700ha
- **Targeted Forest Cover Rate:** No data
- **Tree Cover Area:**1,457,922ha(Tree Cover Rate 92.3%) (2017) [iv]
- **Population:** 298,000[v] (Population Density 18.63 person /km^2)
- East part of the Province borders on Viet Nam, and West part of the Province borders on Thailand across Mekong River.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- Infrastructure improvement or dam construction, commercial logging, expansion of farmland by the farmers (Slush and burn and conversion to the rubber plantation), etc. are listed as the factors causing forest decrease. Slush and burn is carried out by the local people living in the remote mountain area.
- Commercial logging was rapidly carried out in the year 2000 to 2005, and it continued by the ban of natural forest and restriction of log transportation in 2015.
- Currently as illegal logging by commercial purpose decreases, the biggest factor causing forest decrease is Slush and burn. Regarding Slush and burn, it is difficult to control as it is conducted in remote areas and alternative measures of living are not built up.
- New slush and burn has decreased but it still continues in areas where the practice has been done before.
- Commercial plantation is done by companies or individuals. As for individuals, Teak is dominant.

Issue

- There is a theme to realize forest management in cooperation with the local people and to do this, it is important to make well known the protected area and educate and enlighten the local people and prepare regulations in the village. It is also important to promote the value of forest by use of NTFPs.
- Number of illegal logging groups has been reduced but they still exist.
- In accordance with ban of log export high processing is promoted by saw mill but there are many saw mills whose processing techniques are insufficient.

Counter measure

- For the purpose of measure of Slush and burn living stabilization by improvement of infrastructure or transition from Slush and burn to stabilized agriculture (Casaba, Pineapple, etc.), dissemination of big cattle such as cow or water buffalo, establishment of paddy field by introduction of irrigation system, extension of rubber plantation, dissemination of education regarding forest (especially in the mountain area) and enlightenment activities are implemented.
- there is a process to establish a system that dam construction companies disburse finance to the people who live surrounding the dam and manage the forest.

Area decreasing forests (slash-and-burn site)

Area decreasing forests (development site)

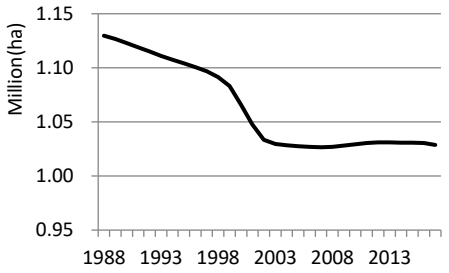
Vientiane Province, Central Region, Lao PDR

Agriculture | **Develop ment** | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

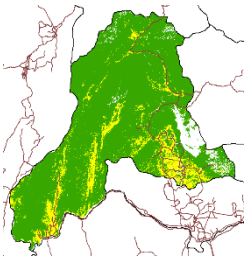
Outline of the Province

- **Provincial Area:**1,592,700ha[vi]
- **Forest Type:** Deciduous Mixed Forest, Evergreen Broad-Leaved Forest
- **Forest Cover Area:** 908,645ha(Forest Cover Rate 38.8%) (2015)
- **Forest Category:** Protection Forest 461,551ha, Protection Forest 235,785ha, Production Forest211,309ha
- **Targeted Forest Cover Rate:** 65% (by 2020)
- **Tree Cover Area:** 1,028,808ha(Tree Cover Rate 82.1%) (2017) [iv]
- **Population:** 444,000[v] (Population Density 27.88 person /km^2)
- Capital City Vientiane City was separated from Vientiane Province in 1989, the Capital City is not included in the Province.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- As for the reason of forest decrease in the province, development by companies such as mine development, water dam construction and plantation development is a major factor.
- Expansion of farmland (rice production) by encroachment due to farmer's movement also occurs.
- Illegal logging has been reduced compared to the past time due to enforcement of control such as banning of log export. Activities for education on illegal logging and setting punishment contribute to decreasing illegal logging.
- The planted area as of 2017 is 23.80 million ha. Of this plantation, natural rubber occupies for 7,350 ha, eucalyptus (partially acacia) occupies for 15,000 ha. Eucalyptus is mostly planted by enterprises, and natural rubber is mostly planted by farmers. These afforestation began in recent years (3-4 years ago). It is Feuang district where rubber plantation is increasing.

Issue

- Lack of budget or equipment for protected forest and unclear establishment of forest area in the province are the current themes.

Counter measure

- Forest decrease should be stopped by enforcement of laws and ordinance and through education, restoration of degraded forest, expansion of forest area by plantation activities.
- Understanding about forest fire has to be promoted and forest protection system by cooperation is established. Through this event number of forest fire has been considerably decreasing.

Area decreasing forests
(development for infrastructure)

Acting area of slash-and-burn
in Protection Forest

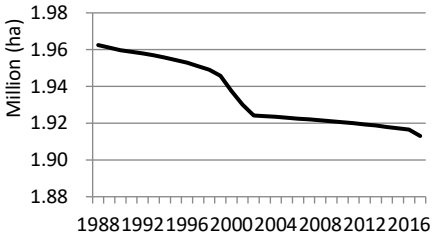
Luang Prabang Province, Northern Region, Lao PDR

Agriculture | **Development** | Fire wood Charcoal | Forest fire | **Illegal Logging** | Increase | Other

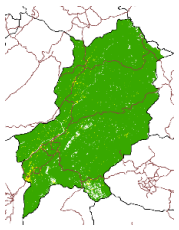
Outline of the Province

- **Provincial Area:** 2,000,000ha
- **Forest Type:** Deciduous Mixed Forest (altitude over 2000m, Cupressaceae Forest)
- **Forest Cover Area:** No data (Production Forest 95,589ha) (2018)
- **Forest Category:** Protection Forest 133,170 ha, Protection Forest 1,245,934 ha, Production Forest 147,060ha
- **Targeted Forest Cover Rate:** 70% (by 2020)
- **Tree Cover Area:** 1,913,047ha(Tree Cover Rate 95.8%) (2017) [iv]
- **Population:** 455,000[v] (Population Density 22.75 person /km^2)
- Northern part of the Province borders on Viet Nam. Prefectural Capital City Luang Prabang had been functioning as the National Capital up to 1975, now registered as World Heritage of UNESCO.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- Major factor of forest decrease is expansion of farmland and illegal logging. Especially expansion of farmland followed by extension of road network are the most major factors.
- Recently logging for development is increasing such as gravel collection for railway construction and illegal logging in the protected area.
- After immigration policy is proceeded to eradicate poppy culture or to reduce Slush and burn, forest has increased in areas where the inhabitants left. In contrast forest has decreased areas where people have gathered for infrastructure improvement or new farmland development.
- Plantation area is large in this province and Teak exists in 16,000 ha and rubber exist in 16,000 ha.
- Teak plantation proceeded because of the promotion of Teak Plantation by the government in 1980s.
- As for the rubber plantation it was conducted dominantly by companies. rubber plantation does not restore the forest as forest land was converted to Rubber plantation after Slush and burn so that forest is degraded, especially in Nane district and Nambak district.

Issue

- Budget for forest management such as plantation activity or establishment of forest boundary is limited and human resources are also insufficient.
- In case of cutting the plantation logging permit is required based on registration of plantation but only 26 % (2018) of the whole Teak plantation is registered in the province. Therefore, cutting is done mostly without logging permit and logs are sold in an unofficial route at cheap price.
- Surveillance and charge of the sawmill is done by the army and decisions about wood processing form is done by the ministry of commerce, so that it is difficult to conduct whole control.

Counter measure

- Teak plantation management committee has been established in a village and development of supporting system for application of registration of plantation or to obtain FSC certificate is in process.
- Conduct patrol and work for thorough common knowledge on regulations for conservation forest or protected forest to the village or company.
- There is a consideration to impose duty to conduct reforestation or natural regeneration, and to develop the compensation rule for illegal logging.

Standing out Teak Forest in the land use

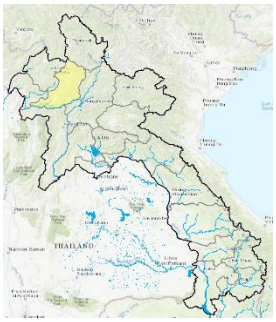
Natural rubber plantation

Oudomxay Province, Northern Region, Lao PDR

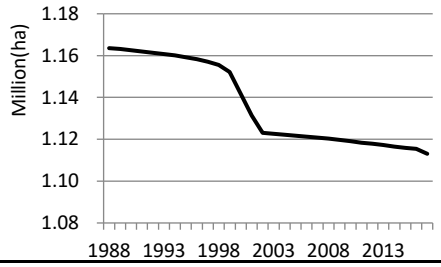
Agriculture | **Develop ment** | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

Outline of the Province

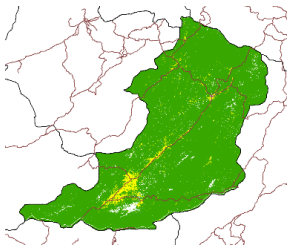
- **Provincial Area:** 1,170,000ha
- **Forest Type:** Deciduous Mixed Forest
- **Forest Cover Area:** No data
- **Forest Category:** Protection Forest 118,000ha, Protection Forest 442,000ha, Production Forest 20,000ha
- **Targeted Forest Cover Rate:** No data (target on forest regeneration, 2,000ha/year)
- **Tree Cover Area:**1,113,063ha(Tree Cover Rate 94.3%) (2017) [iv]
- **Population:** 414,000[v] (Population Density 25.9 person /km^2)
- 85% area of the Province is occupied mountainous area. Northern part borders on China, key area of the transportation with roads to China, Thailand and Viet Nam.



Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- Most of the people in the province are engaged in agriculture in mountain areas. Income source comes from mainly Slush and burn, and in addition collection of NTFPs. Because of this most of the people depend on the forest to support their lives.
- Most of the lumber, medicinal plants and vegetables produced in the province is exported to China, so that the impact of the China market is big. Recently there has been a boom in Cardamon and the plantation area is increasing rapidly.
- There is a rule that 3km of the upper stream is watershed forest and it is protected favorably, while outside the watershed area, forest has been mostly converted to farmland.
- Forest restoration activity has been done on 7,000 ha so far in the province. 1,4000 ha is reforestation and the rest is for restoration activity. As the northern forest in Lao PDR can recover in three to four years, the potential on forest restoration is high.

Issue

- In Oudomxay four Mekong branch streams are running and forest conservation is important taking into account water resource conservation. However, the budget for water resource management is given to the ministry of health or dam management, so that forest department has no budget provided. Therefore, forest activity for water resource management can't be favorably implemented.
- Flood and landslide disaster occurs increasingly, so that it is necessary to conduct reforestation as a long term action and pay compensation to the victims or introduction of alternative measure for income generation as a short term action.

Counter measure

- Establishment of forest boundary has been completed so far, and currently activity for thorough knowledge and enlightenment is in progress. Development of role and establishment of the system for forest management is underway at the unit of village.
- On the other hand it is difficult to secure conservation by regulations and it is more important to stabilize living for the local people. As one way of introducing alternative living measures, development of ecotourism is also addressed.

Main land use is slash and burn

Cardamom cultivation in understory the forest

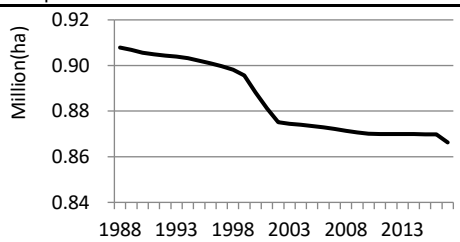
Attapeu Province, Southern Region, Lao PDR

Agriculture | **Development** | Fire wood Charcoal | Forest fire | **Illegal Logging** | Increase | Other

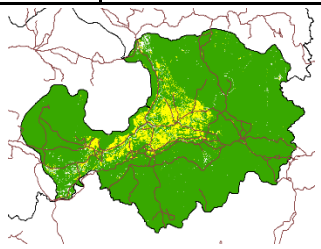
Outline of the Province

- **Provincial Area:** 1,030,200ha
- **Forest Type:** Deciduous Forest, Pine-Broad Leaved Mixed Forest, Dried Dipterocarpaceae Forest
- **Forest Cover Area:** 600,300ha(Forest Cover Rate 58.4%) (2015)
- **Forest Category:** Protection Forest 176,000ha, Protection Forest 215,000ha, Production Forest 135,600ha, other Village Forest and others 73,600ha
- **Targeted Forest Cover Rate:** 75% by 2020
- **Tree Cover Area:** 866,280ha(Tree Cover Rate 91.1%) (2017) [iv]
- **Population:** 150,000[v] (Population Density 14.53 person /km^2)
- Southern part borders on Cambodia and eastern part borders on Viet Nam. Western part of the Province is Bolaven Plateau famous for vegetables production in Lao PDR.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- Recently development has been in progress in Attapeu province and infrastructure development and dam construction or mine development is the major cause of deforestation.
- There are four dam constructions in the province including plan, and mine development on 1,800 ha near Vietnam border. And other mine development is underway. These are the big factors of deforestation.
- At the development site special permit for cutting of natural forest by development is issued, but surrounding areas of the development site in the natural forest, there is also over cutting, so that deforestation and forest degradation that exceeds the plan occur.
- Expansion of farmland for rubber, sugarcane, coffee, casaba, rice, etc. is also a deforestation factor.
- 2,900ha forest suffered from flood in 2018, and as a compensation for the victims about 2,140 ha of land is necessary in future. So there is a possibility that deforestation might occur because of this.
- In the province activities for conservation of existing forest, reforestation (target is 5,000 ha) and restoration of natural forest (for 145,000 ha) are implemented.

Issue

- There is a problem on the number of necessary personnel and their capacity for forest management such as to set boundary, and cooperation system with local people, and lack of budget.
- Contract with companies that conduct dam construction or mine development to provide compensation for tree plantation is made, however tree planting is not actually done.
- It is necessary to have an alternative living measure in order to realize forest conservation.

Counter Measure

- A factor for no progress on compensation tree planting by companies is that there is no appropriate site for tree planting around the development site. In order to settle this problem, the provincial office sent notice that companies should pay compensation money to the provincial office, then the provincial office will conduct tree planting in other areas and manage the forest. However, there is no company that has paid the compensation money at present.

Decreasing forests by development

Flood disaster stricken area

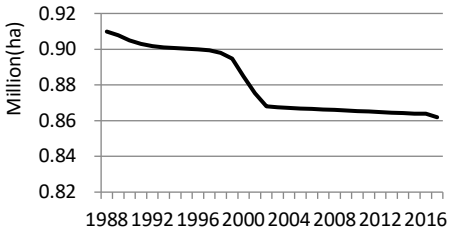
Salavan Province, Southern Region, Lao PDR

Agriculture | **Develop ment** | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

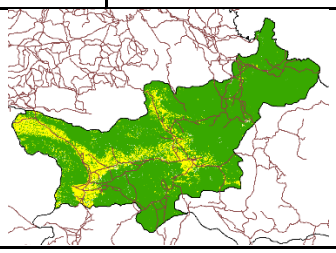
Outline of the Province

- **Provincial Area:** 1,200,000ha
- **Forest Type:** Deciduous Forest, Dried Dipterocarpaceae Forest
- **Forest Cover Area:** No data
- **Forest Category:** Protection Forest 250,000ha, Protection Forest 249,000ha, Production Forest 130,000ha
- **Targeted Forest Cover Rate:** 70% (by 2020)
- **Tree Cover Area:** 861,894ha(Tree Cover Rate 84.8%)[iv]
- **Population:** 419,000[v] (Population Density 34.92 person /km^2)
- Bolaven Plateau famous for vegetable production of Lao PDR is located in the Province. Eastern part borders on Viet Nam and western part borders Thailand.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- Deforestation occurring mainly in the production forest area and agriculture development such as casaba, corn, banana, etc. is the major factor.
- Currently there is no dam in the province but a plan of dam construction exists. Because of this, there is a possibility in future that deforestation will occur.
- Gravel collection permit in the production forest in the province is issued by the national government, so that it is difficult for the province to control it.
- Illegal logging has been supervised and it has been decreased, but at the area near border of the country illegal logging is still being carried out which is hard to supervise.
- As the vegetation in the province is Dipterocarp species. Forest fire is easy to happen.
- Reforestation by companies and individuals is increasing. Especially the companies pushing forward planting of Eucalyptus or Teak.
- The province also pushes forward planting of Teak, Acacia, Eucalyptus and natural rubber, etc.

Issue

- Forest area is wide and number of personnel to manage is short.
- Floods and draught by abnormal weather makes lives of the poor people who depend upon the forest difficult. Because of this it is impossible to limit the use of forest or prohibit it for sustainable forest management.
- There is no access road to supervise forest and therefore forest management is not perfectly done. Although satellite image detects the big scale of deforestation, it is difficult to visit the area to supervise the activity.

Count erme asure

- Introduction of Cardamom inside the forest is permitted which is profitable for the NTFPs and support living improvement.
- Recommending tree planting by companies and individuals.

After intentional burning to forest

Quarry in Production Forest

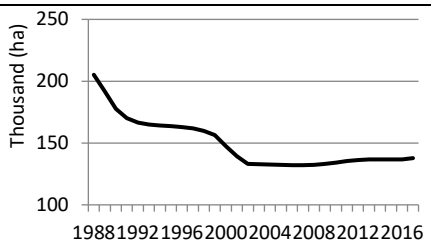
Khon Kaen Province, Northeastern Region, Thailand

Agriculture | Develop ment | Fire wood Charcoal | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

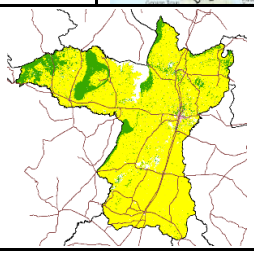
Outline of the Province

- **Provincial Area:** 10,660,000 ha[vii]
- **Forest Type:** Tropical Dry Deciduous Forest (Dipterocarpaceae)
- **Forest Cover Area:** 110,870ha(Forest Cover Rate 11.14%) (2017)
- **Forest Category:** Economic Forest No data, Conservation Forest 60,888ha, National Park 88,935ha
- **Targeted Forest Cover Rate:** 55% (by 2036)
- **Tree Cover Area:** 137,864 ha (Tree Cover Rate 13.0%)[viii]
- **Population:** 1,805,910 (Population Density 165.9 person /km^2) [ix]
- Khon Kaen Province is the second largest province of Northeastern Region of Thailand in the inland provinces. It is located in central of Khorat Plateau.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- Deforestation in recent years is caused by factors such as expansion of residence area or farmland and illegal logging.
- Particularly it is the first factor of forest conversion to farmland by farmers without land who encroach the protected forest and convert it.
- Scale of farmland was at first family based, but it has been expanding to the middle to big scale due to improvement of techniques and machine.
- Current farmland area of this Province is 5,743.42 ha and it occupies 60 %of the area of the province.
- Demand of timber for construction and export is high and illegal logging still occurs. Added value of Rosewood is especially high for furniture timber and it is decreased by illegal logging.
- Illegal logging is by local people and by foreigners with systematic method near the country border.
- Forest fire occurs by extension of the fire caused by field firing for the purpose of expansion of farmland, hunting of wildlife animal or collection of NTFPs.

Issue

- 4 M is short, i.e. Money, Management, Manpower and Material.
- Increase of temperature, change of dry season and forest fire occur due to climate change.

Counter measure

- There are 356 community forests (10.678 ha) in the province. Primal factor of deforestation is for the purpose of income so that introduction of CF and alternative means of living is important.
- In year 2019, the province promote planting one tree per person. There is a plan of tree planting carried out in a house garden and managed by family as planting done in remote areas is not successful in many cases because of lack of supervision.
- Regarding illegal logging, its disclosure is strengthening in collaboration with RFD, DNP and police.
- In order to control forest fire, enlightenment activity is carried out to inform local people not to burn sugar cane.
- Big scale dam construction is replaced by construction of several small scale dams – this technique has less impact on the environment.

Sugarcane field converted from forest

Intentional burning for maintenance of agricultural land

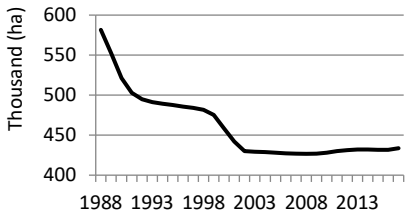
Chaiyaphum Province, Northeastern Region, Thailand

Agriculture | Develop ment | Fire wood Charcoal | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

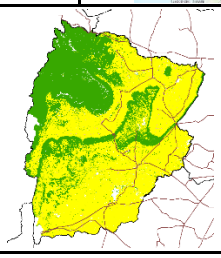
Outline of the Province

- **Provincial Area:** 1,269,841ha[vii]
- **Forest Type:** Tropical Dry Deciduous Forest (Dipterocarpaceae), Tropical Evergreen Monsoon Forest
- **Forest Cover Area:** 396,312ha(Forest Cover Rate 30.2%) (2017)
- **Forest Category:** No data
- **Targeted Forest Cover Rate:** 40% (Conservation Forest 25%, Economic Forest 15%) (by 2034)
- **Tree Cover Area:** 433,740ha(Tree Cover Rate 34.2%) (2017) [viii]
- **Population:**1,139,356 (Population Density 89 person/km^2) (2017) [ix]
- Inland province, western part of the Province is mountainous area, eastern part of the Province is part of Khorat Plateau.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- Deforestation advanced rapidly with the issue of forestry concession in 1990s. Contract involves reforestation and its supervision after logging, but many companies conduct only logging, so many concessions were cancelled in 1989.
- After cancellation of concession deforestation still continued, but its speed has dropped down.
- Factors of deforestation in recent years include the fact that young people work in the mills or the city but not engage in agriculture.
- Primal deforestation is caused by cultivation in the protected forest for sugarcane and casaba.
- Illegal logging is still carried out. In addition to the local people, foreigners are also involved in many cases and high value logs such as Eaglewood (Phialophora parasitica) is the target.
- Regarding forest fire, it is caused by collection of NTFPs, farmland preparation, and hunting, etc.
- After completion of new road, there is good access to the forest, so new residence areas or farmland tends to expand in the forest.

Issue

- There is a short of budget (support of community forest, seedlings production and maintenance after planting, etc.), machine (vehicle, GPS, etc.) and techniques (utilization of GPS).
- There are 410 community forests (28.426 ha) in the province and it is difficult to secure the budget to support all. It is necessary for each community forest to establish the system to work independently in the future.
- Dry seasons are becoming longer causing negative impact such as increase of forest fire or decrease of agriculture production.

Counter measure

- In order to increase forest coverage rate by 10 % more by 2034, reforestation of 120,000 ha is required, and there is a plan of reforestation project
- In order to prevent forest fire sharing related knowledge or training activity and delivery of equipment are carried out. Hot spot is extracted where ground surface temperature is detected by satellite image analysis, and budget allocation and ground trothing of the field are carried out

Area decreasing forests (forest→cassava)

Conversion from forest to agricultural land

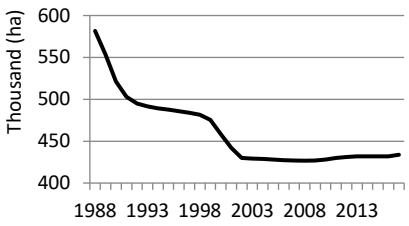
Mukdahan Province, Northeastern Region, Thailand

Agriculture | Develop ment | Fire wood Charcoal | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

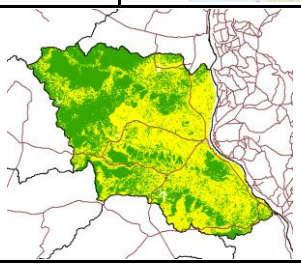
Outline of the Province

- **Provincial Area:** 412,605ha[vii]
- **Forest Type:** Tropical Dry Deciduous Forest (Dipterocarpaceae), Tropical Evergreen Monsoon Forest (Western part)
- **Forest Cover Area:**136735.8ha(Forest Cover Rate 33.1%) (2017) [vii]
- **Forest Category:** National Park, Conservation Forest (13sites), Economic Forest
- **Targeted Forest Cover Rate:** No data
- **Tree Cover Area:** 193,680ha(Tree Cover Rate 46.6%) (2017) [viii]
- **Population:**350,782 (Population Density 81person /km^2) (2017) [ix]
- Mekong River runs along east side of the Province, the opposite bank is Savannakhet Province in Lao PDR.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- Biggest factor of deforestation is agriculture development. In the past small-scale farmers exploited small scale farmland (around 1 ha), however in late years mechanization advanced because of agriculture investment and industrial farmland expansion (sugarcane or natural rubber) has expanded. Big scale farmland (more than 15 ha) advanced and deforestation has proceeded rapidly.
- Recently deforestation rate has been decreasing. The background is pointed out, i.e. 1) strengthening of law and ordinance, 2) support by various groups inside and outside of the country, 3) strengthening of forest patrol by local people with dissemination of community forest activities.
- Forest fire is also decreasing. It has close relation with activation of the community forest activities.
- In addition to execution of tree planting with 16 ha on national holiday reforestation activity is carried out in accordance with the budget of the year. Reforestation project was carried out in 2017 on 281.6 ha and in 2018 on 48 ha.

Issue

- Restraint of deforestation is the biggest subject, however enough budget to tackle the problem and vehicle, manpower and support, etc. are not sufficient.
- It is recognized that the province must tackle the activities such as improvement of forest conservation and prevention of forest fire.

Counter Measure

- Currently there are 262 community forests (14,796 ha) in the province. Community forest establish a committee in the village and regulate the rules to utilize the forest sustainably and a committee has an authority to issue the permission to use the forest and it plays an effective means to restraint deforestation factors such as conversion of forest to farmland.
- In order to prevent forest fire establishment of buffer zone is carried out as a concreate measure. As a little topography of steep slope exists in Mukdahan establishment of buffer zone becomes an effective means.

Area increasing forests (eucalyptus plantation)

Area increasing forests (natural rubber plantation)

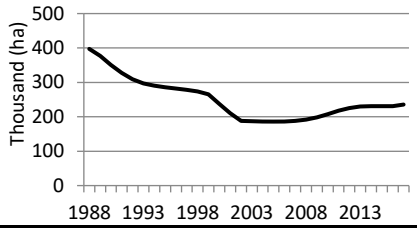
Udon Thani Province, Northeastern Region, Thailand

Agriculture | Develop ment | Fire wood Charcoal | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

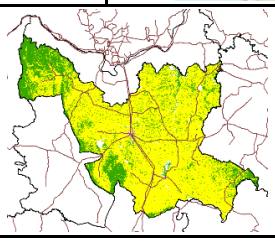
Outline of the Province

- **Provincial Area:** 1,107,150.7ha[vii]
- **Forest Type:** Tropical Dry Deciduous Forest (Dipterocarpaceae), Tropical Humid Deciduous Forest (Western part)
- **Forest Cover Area:**113,956.2ha(Forest Cover Rate 10.3%) (2017)
- **Forest Category:** No data
- **Targeted Forest Cover Rate:** 40% (Conservation Forest 25%, Economic Forest 15%)
- **Tree Cover Area:** 235,561ha(Tree Cover Rate 21.3%)[viii]
- **Population:** 1,583,092 人 (Population Density 135 person /km^2) [ix]
- Adjacent to Capital of Lao PDR, the Province is developed as key area of transportation and industry in Northeastern Region of Thailand.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- In 2002 jurisdiction of forest was divided into among three agencies: FDR, DNP and DMCR. Since then, unclear situation of the forest jurisdiction of each agency continued till around 2012, and during this period expansion of farmland (sugarcane, natural lubber, etc.) proceeded.
- Currently forest area is stable or it tends to increase a little. The reason why it happens is that execution of law is strengthened after the military government started. Increase of various kin of support to the stakeholders makes an effect, too.
- The biggest factor of deforestation is agriculture (sugarcane, natural lubber and casaba). There are two sugarcane mills in Udon Thani province, and sugarcane cultivation is expanding to supply the products to these mills.
- Illegal logging continues mainly by high value added species such as rosewood.
- As for forest fire, Udon Thani is one of the province of frequent occurrence of forest fire in North East region. The cause of forest fire is mainly human factor (agriculture, collection of NFTPs and field firing for hunting).

Issue

- Local people prefer to plant natural rubber or fast growing species, but these plantations are not considered to be forest in Thailand. The species considered as forest (Teak or Dipterocarp spp.) are slow growing and they can be sold only in Thai market, so there is low willingness for the local people to plant.
- There are activities about forest at each level such as region, cluster (plural provinces), province and district. It is necessary to integrate information obtained from each activity and formulate a network.
- Damage by flood or dry occurs by effect of climate change. Particularly, dry damage occurs a lot.
- It is necessary to improve the data related to forest and establishment of the system of decision making of policy based on the data.

Counter measure

- The province supports activities for community forest at 209 areas of 6,894 ha.

Area decreasing forest (changing to sugarcane field)

Area decreasing forest (changing to cassava field)

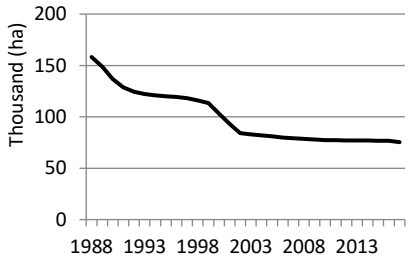
Cà Mau Province, Mekong Delta, Viet Nam

Agriculture | **Develop ment** | **Fire wood Charcoal** | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

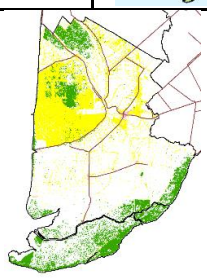
Outline of the Province

- **Provincial Area:**522,120ha[x]
- **Forest Type:** Mangrove Forest（Plantation and Natural. Natural Mangrove is few remaining）、Melaleuca（Plantation Forest）
- **Forest Cover Area:**94.200ha(Forest Cover Rate 10.8%（2016）) [x]
- **Forest Category:** Special Use Forest 18,143ha
  Protection Forest 23,248ha
  Production Forest 50,893ha(2014)
- **Targeted Forest:** To expand plantation area to 150,000ha by 2020
- **Tree Cover Area:**75,359ha (Tree Cover Rate 14.7%) (2017) [xi]
- **Population:**1,226.300[x]（Population Density 235 Person /km^2) (2017)
- This province located at the southernmost of the Mekong Delta and is surrounded by the sea from the east to the west.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- Before 1975, the forest area of Camau was over 300,000 ha. But because of aquaculture ponds which were developed for shrimp cultivation from 1970s to 1990s, forest cover decreased.
- After 1990s, reforestation programme started and deforestation for aquaculture development has been suppressed in recent years.
- Coastal erosion has become serious since 2007.
- There is approximately 254 km of coastline in Ca Mau, and 200 km of this is affected by erosion.
- In recent years, around 3,400 ha /year has disappeared due to costal erosion .
- The main cause of deforestation in recent years is coastal erosion. In addition, although it is a small amount, illegal logging for construction and firewood production is also taking place.

Issue

- Since mangrove alone cannot suppress coastal erosion, introduction of structures is considered.
- Fishermen who live in the forest area have few means of income so they are more vulnerable to the effect of climate change, pest, and economic trend.
- Although wood is produced at plantations, it is necessary to develop processing technology etc. to add high value because the wood price is low.

Counter measure

- Protection Forest is further divided into Very Important and Important to strengthen management
- Formulation and dissemination of rules for use production forest
- Education and conducting training for residents to improve the forest management methods
- Implementation of support and preferential treatment for residents who plant trees

Melaleuca Plantation owned by forest Company

Mangrove forest affected by costal erosion

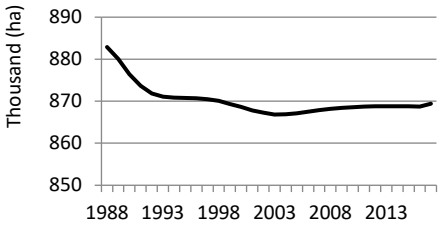
Lam Dong Province, Central Highland Region, Viet Nam

Agriculture | Develop ment | Fire wood Charcoal | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

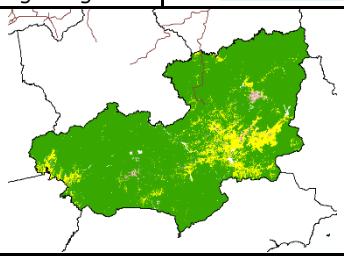
Outline of the Province

- **Provincila Area:** 978,330ha[x]
- **Forest Type:** Pine Forest, Pine Mixed Forest
- **Forest Cover Area:** 532.600ha (2016) [x] (Forest Cover Rate 53.6% (2017))
- **Forest Category:** No data
- **Targeted Forest Cover Rate:** Forest Cover Rate54% (2018)
- **Tree Cover Area:** 869,389ha(Tree Cover Rate 88.5%)[xi]
- **Population:** 1,298.900 (Population Density 133person/km^2) (2017)[x]
- Locates in mountain area in Central Highland Region. Provincial Capital Da Nang City was summer resort place during French rule.
- Only the Province doesn't border on Cambodia within Central High Region.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- There was no big economic activity from 1975 after the Viet Nam War until around 1986, and deforestation was little. For the purpose of economic activity, which started in 1986, exploitation of forest started since special economic ward was set, and deforestation greatly proceeded. After 2000 national policy for forest conservation was established and deforestation decreased.
- The biggest factor of deforestation in latest years is use of forest by companies, domestic immigration (immigration from north region or southern region) and minor ethnic group by forest conversion to farmland (coffee, thee, vegetable, etc.) and increase of demand of construction wood in the country. Especially company activities such as tourism industry, agriculture, livestock industry (caw and pig) and fish farming, etc. affect forests.
- Forest fire occurs in dry season from January to May, and the number of outbreak of forest fires is decreasing because of improvement of forest management.
- Deforestation by illegal logging is controlled by enforcement of various policies such as banning of natural forest in 2014 and activities for expansion of forest are carried out.

Issue

- Number of rangers to conduct forest patrol is short. Currently only one staff control 10,000 ha of forest although the policy shows that one staff should control 500 ha of forest.
- It is necessary to improve means of living to reduce dependence on forests or to control expansion of farmland
- Manpower is short for the leader to improve forest management or roll up other sector.

Counter measure

- PFES started from 2008 has success in securing the financial resources of forest sector. Income obtained by PFES is allocated to education and enlightening activities about forest conservation, improve living of local people and reforestation activity.
- Deforestation has been controlled by establishment of protected area and pushing forward plans for supporting agriculture based on scientific grounds.

Changing forests to agricultural land due to designation of New Economic Zone

Abundance agricultural investment from overseas

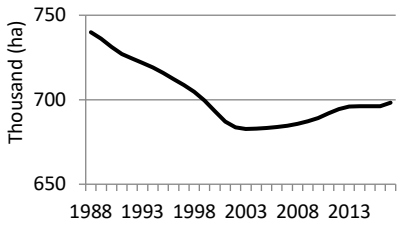
Kon Tum Province, Central Highland Region, Viet Nam

Agriculture | Develop ment | Fire wood Charcoal | **Forest fire** | **Illegal Logging** | **Increase** | **Other**

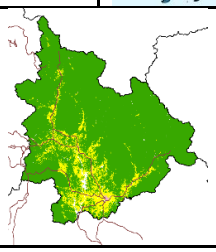
Outline of the Province

- **Provincial Area:** 967,420ha[x]
- **Forest Type:** Evergreen Broad-Leaved Forest,
- **Forest Cover Area:** 617.700ha(Forest Cover Rate 62.3% (2017))[x]
- **Forest Category:** No data
- **Targeted Forest Cover Rate:** 63.75% (by 2020)
- **Tree Cover Area:** 698,190ha(Tree Cover Rate 85.9%) (2017) [xi]
- **Population:** 520.000 (Population Density 54person/km^2) (2017)[x]
- Located in Central Highland Region, western part of the Province borders on southern area of Lao PDR and on east-northern area of Cambodia.

Dynamics of Provincial Tree cover



Provincial Tree Cover (2018)



Status of Deforestation

- In the past traditional Slush and Burn by minority groups was the most biggest factor as a driver of deforestation, currently they are settled down by improvement of techniques and doing more sustainable agriculture activity by circulating their farmland.
- Currently deforestation occurs by various factors, so that it is difficult to specify the biggest player.
- Although felling of natural forest has been banned by national policy, illegal logging is continuing due to shortage of rangers and other reasons.
- Currently occurrence of forest fire has decreased but soil erosion and mountain disaster is increasing.
- Reforestation on total 186,000 ha was carried out from 2014 up to now by government and private, The government has a plan to conduct further 14,000 ha reforestation by 2020.Main planting species are Pine, Litchi, Acacia, etc. (species are selected in accordance with elevation)
- Local people are able to receive money directly from forest management by PFES, and forest management activities are promoted..

Issue

- This province is one of the poorest province in Vietnam, and rangers and budget are limited.
- It is necessary to establish measures to improve livelihood while sustainably managing forest.
- Recently soil erosion has been increasing year by year. Mountain area is wide in Kon Tum province and it is necessary to promote reforestation on the steep slopes. In order to tackle this issue, there is a request to introduce soil conservation works and reforestation techniques on the steep slopes.
- Log of manmade forest is thin and it needs processing, therefore, it is necessary to improve wood processing techniques because currently lumber processing techniques are low.
- In accordance with the provincial plan, natural rubber price has been decreasing. It is necessary to consider the risk of reforestation by single species.

Counter measure

- Specification of important area of conservation and hot spot is underway , management is carried out particularly at the high priority area.
- As for communication with the local people including minority groups, the staff are trying to use their language in explanation and recording.
- Moving forward to establish the boundary between forest and farmland and establishing rules to impose punishment thoroughly to the logging operators without permit

Deforestation due to expansion of farmlans

Decreasing forests in steep slope

3.2.3 Deforestation and forest degradation in the LMB

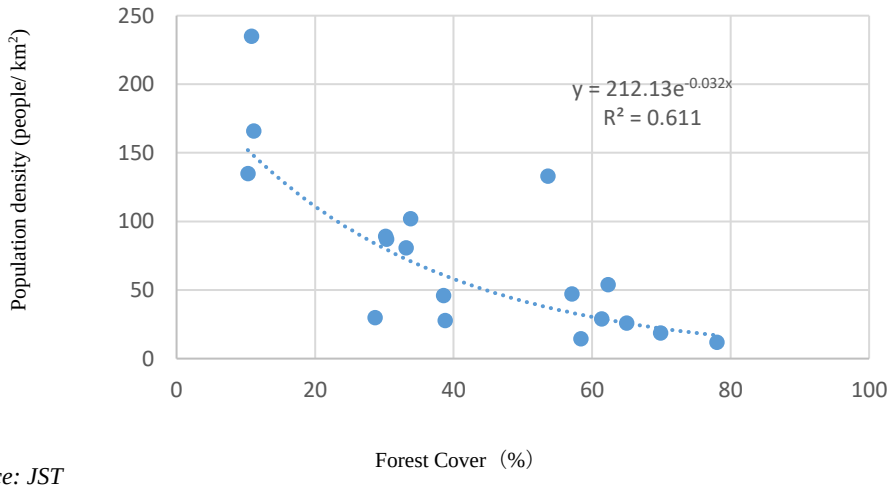
3.2.3.1 Deforestation and forest degradation trends in the LMB

Through this study, JST found three trends in the forest cover change in the LMB. Lao PDR, Cambodia, and Myanmar are all being deforested. The forest cover of Thailand is almost stable. While Vietnam is the only country in which the forest cover is increasing overall, the forest cover in the Central Highland area of Vietnam is still decreasing. Overall, therefore, the forest resources of the LMB are still decreasing in both area and quality.

3.2.3.2 Drivers of deforestation and forest degradation

The drivers of deforestation and forest degradation are often analyzed from direct and indirect factors. Direct factors are factors that directly cause deforestation, such as conversion to agricultural land, timber removal, etc. Indirect factors are the socioeconomic, political, and technical factors that lead to the direct factors. This chapter analyzes each of the direct drivers of deforestation and forest degradation, including the indirect factors.

Incidentally, one of the biggest indirect drivers of deforestation and forest degradation is population growth. With population growth, the demand for land for residences and agricultural use increases, along with the demand for wood materials such as timber and fuelwood, and the demand for NTFPs. Population growth therefore has widespread effects on the drivers of deforestation and forest degradation. Figure 3.26 shows the relationship between population density and forest cover in each of the provinces visited for interview surveys in this study. The results suggest that the population density is negatively correlated with the forest cover.



Source: JST

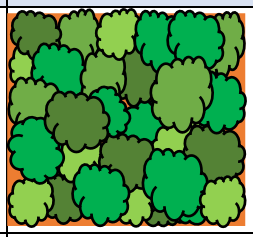
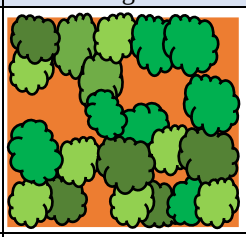
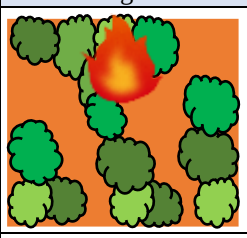
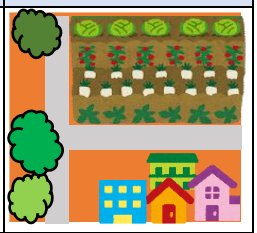
Figure 3.26 Relationship between population density and forest cover

According to the interviews, the populations of all of the provinces were increasing. For this reason, it should be recognized that population growth will continue to affect the drivers of deforestation and forest degradations described later in this chapter.

Next, in analyzing the drivers of deforestation and forest degradation, the conversion to agricultural land can be recognized as the largest driver when comparing only land areas converted from forest. Some drivers that do not manifest as changes of land area data, however, lead to deforestation eventually. Interview surveys have identified illegal logging, the excessive collection of firewood, and the unsustainable use of NTFPs as drivers of this type leading to the deforestation and forest degradation in the LMB. Previous research has shown that deforestation is less likely to be caused by a single driver, and that multiple deforestation drivers are involved before deforestation occurs.[46] Based on this information, the patterns of deforestation and forest degradation occurring in the LMB can be assumed to involve the several drivers shown in Table 3.32.

[46] What Drives Tropical Deforestation? Helmut J. Geist & Eric F. Lambin (2002) http://www.pik-potsdam.de/~luedeke/lucc4.pdf

Table 3.32 Progress of deforestation

Condition	Forest	Forest degradation[1]	Forest degradation[2]	Deforestation
Image				
Activity	—	-Wood extraction (company, high-value wood, etc.) -Road extension for development programme	-Wood extraction by local people for charcoal wood, and construction -Unsustainable use of NTFPs -Forest fires -Shifting cultivation	-Change of land use to agricultural use and/or use for residences

Source: JST

Table 3.33 summarizes the drivers of deforestation and forest degradation pointed out in the interviews in each province. The table demonstrates that multiple factors are driving deforestation and forest degradation in the respective provinces.

Table 3.33 Summary of the drivers of deforestation and forest degradation in each province

		Conversion to Agricultural land			Development activity					Fuel and charcoal wood		NTFPs	Forest Fire	Illegal logging			Costal erosion
		Policy	People	Land	Road	Residence	Dam	Mining	Military	Family	Export			Individual	*Organized	**Foreigner	
Lao PDR	Oudomxay		✔														
	Luang Prabang		✔		✔			✔						✔			
	Vientiane		✔				✔	✔					✔	✔	✔		
	Bolikhamsai		✔		✔		✔										
	Khammouane		✔				✔	✔						✔			
	Savannakhet						✔							✔	✔		
	Salavan		✔					✔					✔			✔	
	Attapeu		✔		✔		✔	✔							✔		
Thailand	Udon Thani		✔									✔	✔	✔			
	Mukdahan		✔										✔	✔			
	Khon Kaen		✔									✔	✔	✔		✔	
	Chaiyaphum		✔									✔	✔	✔		✔	
Cambodia	Oddar Meanchey	✔	✔			✔			✔	✔	✔		✔	✔	✔		
	Siem Reap	✔		✔					✔					✔			
	Preah Vihear	✔	✔	✔		✔			✔	✔				✔	✔		
	Kampong Thom	✔				✔					✔	✔	✔	✔			
	Kratié	✔	✔							✔	✔			✔			
	Kampong Speu		✔	✔						✔	✔			✔			
Vietnam	Kon Tum		✔										✔	✔			
	Lam Dong		✔										✔	✔			
	Cà Mau													✔			✔

*Organization: Illegal logging that is occurred by organized group
**Foreigner: Illegal logging that is occurred across the border
Source: JST

As shown in Table 3.33, the conversion of forest to agricultural land and illegal logging is recognized as a driver of deforestation and degradation throughout the LMB. Apart from the conversion to agricultural land and illegal logging, the following were identified as other drivers: dam and road development in Lao PDR, forest fires in Thailand, SLC and collection of fuelwood in Cambodia, and coastal erosion in the Vietnam Mekong Delta. The drivers of deforestation and forest degradation pointed out in the respective provinces are analyzed in detail below.

(1) Development other than agricultural development

Among the types of development other than agricultural development, this chapter mainly considers the development of roads, hydropower dams, and mining. These types of development require the conversion of forest to other land uses. They directly lead to deforestation and also cause the types of deforestation and forest degradation shown below.

- Increases in illegal logging activity in and around development areas. It often happens that the amount of timber extraction exceeds the planned timber extraction permitted in the development project agreements.
- The expansion of the road network for a development project improves accessibility to the forest, which increases forest encroachment by local people and logging groups.
- People who formerly lived in the development sites lose their land and become domestic immigrants. These immigrants convert forest into land for new farms and residences.

Each country has established permission criteria for development activities and rules for implementation. The interviews revealed, however, that in some cases the procedures and permits have not been observed. In some cases, for example, the reforestation activities included in the development contracts are never implemented. The skirting of the rules and disregard of the development contracts is too often tacitly accepted. Other factors contributing to the problem are a lack of capacity of the forest sector and insufficient activities to share awareness about forest conservation with other sectors.

1) Road and railway development

Road network development plans such as the East-West Economic Corridor and Southern Economic Corridor have been promoted in the LMB, and the road and railway network is expanding. This study could not obtain detailed data on the extension of the road and rail networks in each LMB country. As a reference for this chapter, therefore, Table 3.34 summarizes the road extensions, railway extensions, and changes in the Asian Highway extensions of the four countries in the LMB.

Table 3.34 Road and railway extensions and changes of the Asian Highway extensions in the four countries

Country	Road extensions	Rail extensions	Asian highway extensions	
			2004	2017
Cambodia	47,263 km (2013)	642 km (2014)	1,339 km	1,954 km
Lao PDR	39,586 km (2009)	No data	2,297 km	2,857 km
Thailand	180,053 km (2006)	4,127 km (2017)	5,112 km	5,523 km
Vietnam	195,468 km (2013)	2,600 km (2014)	2,678 km	3,117 km
Total	462,370 km	7,369 km	11,426 km	13,451 km

Sources: CIA World Factbook[47], Asian Highway Database[48]

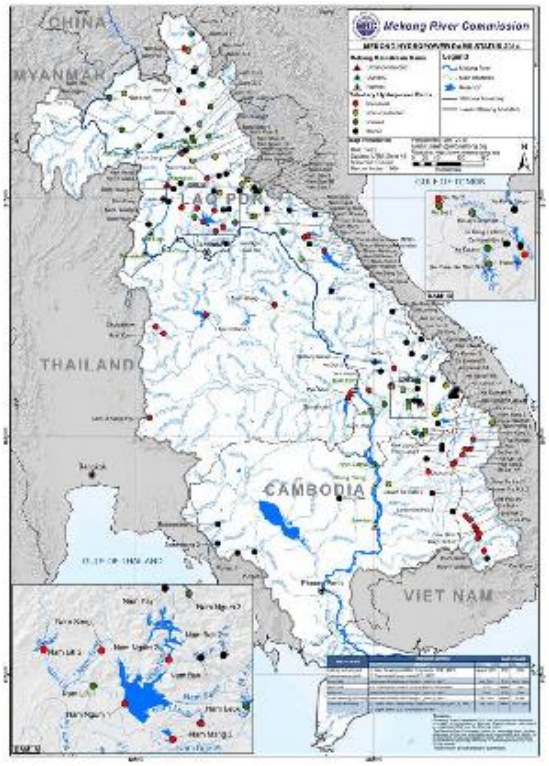
Table 3.34 shows that the Asian Highway has been extended by about 2,000 km in 13 years. The main roads connecting the capitals, the major industrial areas and agricultural product storage areas, the oceans and rivers, the major container terminals, and the major tourist facilities are selected as Asian Highway Routes. For this reason, it would be impossible to grasp the expansion of the entire LMB road network based only on the data on the Asian Highway Route. It is generally believed however, that the road network is expanding as a whole and accordingly contributing to the deforestation and forest degradation.

[47] CIA data https://www.cia.gov/library/publications/the-world-factbook/fields/385.html#CB

[48] Asian Highway Database https://www.unescap.org/resources/asian-highway-database

2) Hydropower dam

The MRC's council report[49] indicates that the first hydropower dam in the LMB was launched in Thailand in 1996, and that 38 hydropower dams with capacities of more than 15 MW were established by 2015. Another 11 mainstream hydropower dams are currently under construction or planned in the LMB. Figure 3.27 shows the existing and planned mainstream hydropower dams.



Source: MRC[49]

Figure 3.27 Hydropower dam project in the LMB

Next, Table 3.36 and Table 3.37 outline the hydropower dam projects of the mainstream and tributaries of the LMB. The two tables are color-coded in accordance with the criteria shown in Table 3.35 based on the results of the interviews conducted in the prefectures.

Table 3.35 Color coding criteria for hydropower dam projects

Classification	Color coding	Province
Province where hydropower dam development is pointed out as a factor of deforestation and forest degradation		Luang Prabang, Vientiane, Bolikhamsai, Attapeu
Province where hydropower dam development may become a factor of deforestation and forest degradation in the future		Salavan
Province where hydropower dam development is not pointed out as a factor of deforestation and forest degradation		Oudomxay, Kratié, Chaiyaphum, Khon Kaen, Kon Tum
No interviews conducted in the province	No color	Xayaburi, Champasak, Stung Treng, Ubon Ratchathani, Nakhon Ratchasima,

[49] THE COUNCIL STUDY, The Study on the Sustainable Management and Development of the Mekong River Basin, including Impacts of Mainstream Hydropower Projects; Thematic Report on the Positive and Negative Impacts of Hydropower Development on the Social, Environmental, and Economic Conditions of the Lower Mekong River Basin http://www.mrcmekong.org/assets/Publications/Council-Study/Council-study-Reports-Thematic/Impacts-of-Hydropower-Development-29-December-2017.pdf

Classification	Color coding	Province
		Xaisomboun, Sekong, Xieng Khouang, Dak Lak, Gia Lai, Dak Nong

Sources: MRC and JST

Table 3.36 Mainstream hydropower schemes

Project name	Province/Country	Situation		Installed Capacity (MW)
		Status	Schedule	
Pak Beng	Oudomxay / Lao PDR	Prior Consultation concluded	Expected in 2023	1,230
Luang Prabang	Luang Prabang / Lao PDR	Planned	Expected in 2030	1,410
Xayaburi	Xayaburi / Lao PDR	Under Construction	Expected to be finished in 2019	1,285
Pak Lay	Xayaburi / Lao PDR	Planned	Expected in 2030	1,320
Sanakham	Vientiane / Lao PDR	Planned	Expected in 2025	660
Pak Chom	Vientiane / Lao PDR	Planned	Expected in 2025	1,079
Ban Khoum	Champasak / Lao PDR	Planned	Expected in 2030	2,000
Pou Ngoy	Champasak / Lao PDR	Planned	Expected in 2025	651
Don Sahong	Champasak / Lao PDR	Licenced	Expected to be finished in 2019	260
Stung Treng	Stung Treng / Cambodia	Planned	―	980
Sambor3	Kratié / Cambodia	Planned	―	1,703

Sources: MRC[49] and JST

Table 3.37 Commissioned hydropower projects in LMB by the end of 2015

Project name	Commercial Operation Date	Country	Commercial Operation Date	Reservoir (km^2)	Installed Capacity (MW)
Chulabhorn	Chaiyaphum	Thailand	1972	31	40
Pak Mun	Ubon Ratchathani		1994	117	136
Srindhorn	Ubon Ratchathani		1971	288	36
Ubol Ratana	Khon Kaen		1966	410	25.2
Lam Ta Khong P.S.	Nakhon Ratchasima		2001	1,430	500
Nam Ngum 1	Vientiane	Lao PDR	1971	370	155
Se Xet 1	Salavan		1990	ROR	45
Theun-Hinboun	Bolikhamsai		1998/2002	105	500
Houay Ho	Attapeu		1999	37	152
Nam Leuk	Xaisomboun		2000	12.8	60
Nam Mang 3	Vientiane		2005	ROR	40
Se Xet 2	Salavan		2009	20	76
Nam Lik 1-2	Vientiane		2010	24.4	100
Nam Theun 2	Bolikhamsai		2010	450	1075
Nam Ngum 2	Vientiane		2012	122.2	615
Nam Ngum 5	Xieng Khouang		2012	15	120
Xekaman 3	Sekong		2013	5.25	250
Nam Ngiep 3A	Xieng Khouang		2014	ROR	44
Nam Ngiep 2	Xieng Khouang		2015	-	180
Nam Khan 2	Luang Prabang		2015	5167	130
Houay Lamphan Gnai	Sekong		2015	6.8	88
Nam Sun 3A	No data		2015	-	69
Nam Sun 3B	No data		2015	-	45
Selabam	Champasak		1970	6360	5.04
Nam Song	Vientiane		2012	ROR	6
Namsana	Vientiane		2014	96	14
Dray Hlinh 1	Dak Lak	Vietnam	1990		45
Yali	Gia Lai		2002	64.5	720
SeSan 3	Kon Tum		2006	-	260
Se San 3A	Kon Tum		2007	-	96
Dray Hlinh 2	Dak Nong		2007	-	16

Project name	Commercial Operation Date	Country	Commercial Operation Date	Reservoir (km^2)	Installed Capacity (MW)
Buon Tua Srah	Dak Lak/Dak Nong		2009	-	86
Buon Kuop	Dak Lak		2009	37	280
Plei Krong	Kon Tum		2009	80	100
Se San 4	Kon Tum/Gia Lai		2010	54	360
Sre Pok 3	Dak Lak/Dak Nong		2010	-	220
Sre Pok 4	Dak Lak/Dak Nong		2010	-	80
Se San 4A	Kon Tum/Gia Lai		2011	-	63
Sre Pok 4A	Dak Lak		2013	-	64
Upper Kontum	Kon Tum		2014	-	250
Hoa Phu	Dak Lak		2014	-	29

Sources: MRC[49], EDL-GEN[50]and JST

Deforestation and forest degradation due to hydropower dam development were pointed out as major problems in the interviews, especially in Lao PDR.

The specific impacts of hydropower dam development are direct deforestation associated with dam development, increased illegal logging around the development areas, non-performance of afforestation obligations written into the development contracts, and the occurrence of new deforestation by domestic immigrants who have been displaced from their land by development projects. As Table 3.36 shows, there are still many hydropower projects planned. The impact on deforestation and forest degradation in the future is therefore a serious concern.

3) Mining

There are abundant mineral resources such as gold, copper, iron ore, bauxite, lead, tin and zinc in the LMB[51]。 Interview responses from five provinces of Lao PDR indicated that deforestation and forest degradation were taking place for mineral resource development. According to the JETRO report[14], 649 Laotian companies with 909 business have been licensed as mining companies, of which 77 companies are actually mining copper, gold, silver, iron, brown coal, barium, lime, antimony, potassium, etc. JST was unable to obtain enough mining development information to reliably analyze the impact of mining development on deforestation and forest degradation in detail at this stage. It will clearly be necessary to collect and analyze more data on the current status of mining in LMB and the impacts of mining activities on the forests.

(2) Illegal logging

While there is no international definition of illegal logging, the practice is generally regarded as "the harvesting of wood in violation of the laws and regulations set by a country"[52]. Four major patterns of illegal logging can be observed in the LMB. Table 3.38 summarizes of the illegal logging patterns and the parties participating in illegal logging.

Table 3.38 Illegal logging patterns and participants involved

Patterns	Local people	Organizations	Foreigners
Logging activity in prohibited areas (national parks, protected areas, etc.)	○	○	○
Logging activity without permission obtained (including forged permits)	○	○	○
Logging beyond the allowed amount and/or allowed area	○	○	○
Logging activities that unfairly violate the rights of indigenous people, etc.		○	○

Source: JST

[50] EDL-Generation Public Company Website http://www.edlgen.com.la/project/nam-sana-hydro-power-plant/?lang=en
[51] Titch Solutions Industry Trend Analysis- Mekong Region: Immense Mining Potential But Greater Risks (2018) http://www.mining.com/wp-content/uploads/2018/10/Mekong_Region_Immense_Mining_Potential_But_Greater_Risks-Fitch-Solutions-04-October-2018-1.pdf
[52] Ministry of Agriculture Forestry and Fisheries (Japan) https://www.goho-wood.jp/nintei/doc/h27_kensyu2.pdf

Deforestation and forest degradation are not the only problems resulting from illegal logging. Illegal timber, which incurs little to no costs for management, is less expensive than legal timber produced under management based on laws and regulations. In a market where illegal timber and legal timber are mixed, the illegal timber therefore pushes down the price of legal timber from an appropriate level. Unreasonable reductions of the timber price will result in a lack of funds for the proper management of planted forests. Plantation forests are thus abandoned while the entry into natural forests is encouraged, accelerating deforestation and forest degradation.

Of the 21 provinces interviewed in this study, 19 provinces pointed out illegal logging as a factor of deforestation and forest degradation. It was thus shown that illegal logging is a driver of deforestation and forest degradation in the whole of the LMB. Table 3.39 summarizes the information on the provinces that have taken steps to deal with illegal logging.

Table 3.39 Summary of the status of illegal logging in each province

		Illegal logging			Status		Reason for the Decrease		
		Local people	Organizations	Foreigners	Decrease	No Comment	Policy	Awareness raising	Other
Lao PDR	Luang Prabang	✔				✔			
	Vientiane	✔	✔		✔		✔	✔	
	Khammouane	✔			✔		✔		
	Savannakhet	✔	✔		✔		✔	✔	✔
	Salavan			✔	✔		✔		
	Attapeu		✔			✔			
Thailand	Udon Thani	✔				✔			
	Mukdahan	✔			✔		✔	✔	✔
	Khon Kaen	✔		✔	✔				
	Chaiyaphum	✔		✔		✔			
Cambodia	Oddar Meanchey	✔	✔			✔			
	Siem Reap	✔				✔			
	Preah Vihear	✔	✔			✔			
	Kampong Thom	✔				✔			
	Kratié	✔				✔			
	Kampong Speu	✔				✔			
Vietnam	Kon Tum	✔				✔			
	Lam Dong	✔			✔		✔		✔
	Cà Mau	✔				✔			

Source: JST

As shown in Table 3.39, seven out of nineteen provinces commented that illegal logging was decreasing. In Lao PDR in particular, including the provinces that reported little to no illegal logging at present (provinces not included in Table 3.39), many comments indicated that the policies enforced have been effective in reducing illegal logging activity. Some respondents from Lao PDR, however, opined that illegal logging had decreased as a consequence of decreases in the quantities of high-value-timber targeted for illegal logging. In Cambodia, meanwhile, illegal logging has occurred in all provinces, and none of the provinces responded that illegal logging was on the decline.

Strengthened policy enforcement was not the only effective measure taken against illegal logging. The interview respondents pointed out that the public awareness activities for the local people, familiarization with laws and regulations, development of a patrol and reporting system by local residents, and poverty alleviation by introducing alternative livelihoods were also effective. All provinces, on the other hand, are short of funds, human resources, materials and equipment, and technology for carrying out these activities.

(3) Collection of fuelwood material

Out of the 21 provinces of the 4 countries visited for interview surveys, 5 provinces in Cambodia pointed out that the collection of fuelwood (charcoal and firewood) materials was related to deforestation and forest degradation. In Lao PDR, Thailand, and Vietnam indicated, where no

fuelwood materials are collected, the provinces nonetheless indicated that the activity had a small impact on deforestation and forest degradation. The factors underlying this difference are thought to be related to the electrification rates (ERs), gas usage rates, and population density of the respective countries. Table 3.40 shows only the electrification rates and population densities of the five LMB countries, as no data could be obtained on the gas usage rates. The Charcoal - firewood indexes shown in the table were calculated by JST from the rural ERs and population densities in order to compare the situations in the different countries.

Table 3.40 Electrification rates (2016) and population densities

	Electrification rate（ER）	ER (Urban)	ER (Rural)	Population Density	Charcoal - firewood index number
Cambodia	60%	97%	50%	90.67	45.34
Lao PDR	91%	99%	85%	29.71	4.45
Thailand	100%	100%	100%	135.13	0.00
Vietnam	98%	100%	98%	308.13	6.16
Myanmar	59%	79%	44%	81.72	45.76

Sources: IEA[53], WB[54], JST

$$Charcoal - firewood\ material\ index\ number = (1 - (ER(Rural) \div 100)) \times Population\ density$$

In Thailand and Vietnam, the population densities and rural electrification rates are both high, hence the charcoal - firewood indexes are low. In Lao PDR, the rural electrification rate and population density are both low, so the charcoal - firewood index is low. In Cambodia the electrification rate is low and the population density is high, leading to a high charcoal - firewood index. In Cambodia the accessibility to energy other than fuelwood is low and the density of the population requiring energy is high. These factors may explain why only Cambodia pointed out that the collection of fuelwood material had a strong impact on deforestation and forest degradation.

Firewood materials are collected in Cambodia not only for household consumption, but also for sale in urban areas and for use in factories. Table 3.41 shows the status of charcoal and firewood use in the Cambodian provinces interviewed.

Table 3.41 Status of charcoal and firewood use

Province	Impact on Deforestation and forest degradation	Fuelwood for the province	Fuelwood for outside of the province
Oddar Meanchey	Big	Charcoal: Household Firewood: Factory	Charcoal: Sales outside the province
Siem Reap	Small	Charcoal : Restaurant in the town Firewood: Factory	—
Preah Vihear	Big	Charcoal: Household firewood: Factory	—
Kampong Thom	Reduces	No data	Charcoal: Sales to Konpong Cham
Kratié	Increases	Charcoal: Household	Charcoal: Sales outside the province
Kampong Speu	Big	No data	Sales to the capital (Phnom Penh)

Source: JST

According to the UNDP Cambodia office, the annual demand for fuelwood in Cambodia was 6.10 million tons, of which 3.5 million tons went towards household use and 1 million tons went towards industrial use (especially clothing factories).

Cambodia is promoting measures to respond to the deforestation and forest degradation due to the collection of fuelwood materials, including the designation of protected areas and deployment of education for local residences. To meet the increasing demand for fuelwood in future, meanwhile,

[53] International Energy Agency Database https://www.iea.org/energyaccess/database/
[54] World Bank Website, Country Profile https://databank.worldbank.org/data/views/reports/reportwidget.aspx?Report_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n

Cambodia will need to plant charcoal and material in its production forests and establish a sustainable supply system for charcoal and firewood.

(4) Collection of the Non Timber Forest Products (NTFPs)

The use of NTFPs can help improve the livelihoods of local residents and encourage local residents to participate the forest conservation activities. For these reasons, the use of NTFPs is important for the realization of sustainable forest management activities by local residents. On the other hand, interview respondents from four provinces pointed out that some people burn forests to collect NTFPs, and thereby raise the risk of forest fires. While no provinces in Lao PDR mentioned the impact of NTFP use on forests, the Lao PDR national REDD + strategy [55] has pointed out that burning for hunting is linked to forest degradation. The situation in Lao PDR, therefore, is the same as that described in the aforementioned four provinces.

(5) Forest fire

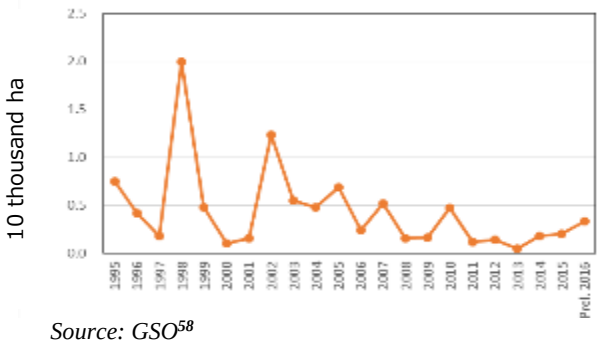
Among the 21 prefectures interviewed in this study, 10 provinces (2 in Cambodia, 2 in Lao PDR, 4 in Thailand, and 4 in Vietnam) identified forest fires as a driver of deforestation and forest degradation.

The causes of forest fires are related not only to climate, but also to the types of tree species and the presence or absence of fire-causing or preventive forest fire activities. While the risk cannot be judged solely from the temperature and amount of precipitation, lower precipitation generally correlates with a higher risk of forest fire.

Figure 3.28 and Figure 3.29 below plot the transition of forest fire areas in Thailand and Vietnam. Forest fires occur every year but spike in years when El Nino comes (1997-1998, 2002-2003, 2009-2010, 2012, 2015-2016).

Sources: DNP[56], RFD[57]

Figure 3.28 Transition of forest fire area in Thailand



Source: GSO[58]

Figure 3.29 Transition of forest fire area in Vietnam

In the interviews in Thailand, respondents pointed out that the effects of climate change will prolong the dry season and that forest fires will increase as a result of drought. These results underline the need to strengthen forest fire monitoring during periods and years of low rainfall.

[55] "Revised Draft of the National REDD+ Strategy" (DOF, Feb. 2018)
[56] DNP Forest Fire Control division website http://www.dnp.go.th/forestfire/Eng/description.htm
[57] RFD Website http://forestinfo.forest.go.th/Content.aspx?id=89
[58] GENERAL STATISTICS OFFICE of VIETNAM Website https://www.gso.gov.vn/default_en.aspx?tabid=778

Figure 3.28 and Figure 3.29 also show that the forest fire areas in Thailand and Vietnam are trending downward. According to the interviews, these two countries are working to strengthen their forest fire monitoring, enhance their equipment and materials, spread awareness and training to local residents, and establish fire extinguishing systems jointly with residents. These activities seem to have been helpful in reducing the forest fire areas. Meanwhile, forest fire data on Cambodia and Lao PDR could not be obtained in this study and will need to be obtained going forward.

(6) Conversion to agricultural land

The conversion of forest to agricultural land was pointed out as a driver of deforestation and forest degradation in 20 of the 21 province studied. Ca mau province in the Mekong Delta, Vietnam was the one province that did not cite conversion to agricultural land as a current driver of deforestation and forest degradation. The respondents from Ca mau mentioned, however, that deforestation had progressed due to conversion to agricultural land and aquaculture areas in earlier periods.

1) Patterns of agricultural conversion

Three major patterns of agricultural conversion were pointed out in the interviews: conversion through policy, conversion by poor people, and conversion by vicious companies and the rich.

(a) Conversion by policy

Conversion by policy is the process by which public entities such as countries, provinces, etc. grant the right to use or own land, and allow deforestation for development as a concession. The Economic Land Concession (ELC) conducted in Cambodia is applies to this pattern. Even if a concession is not granted directly, the conversion of forests to agricultural land is sometimes promoted as a result of political steps to increase the production of rice, sugar cane, etc. With the growing interest in forest conservation in recent years, however, various conditions have been imposed on large-scale concessions.

(b) Conversion by poor people

Residents and migrants convert forests to small-scale agricultural land in order to earn income. According to the interviews, farmers in Cambodia and Lao PDR are mainly small-scale farmers. In Thailand meanwhile, the scale of agricultural land conversion by farmers has expanded and economic development has led to the mechanization of farms. Mechanization is progressing through domestic and international investment and policy support in some parts of Vietnam, but there are still many small-scale farmers in that country.

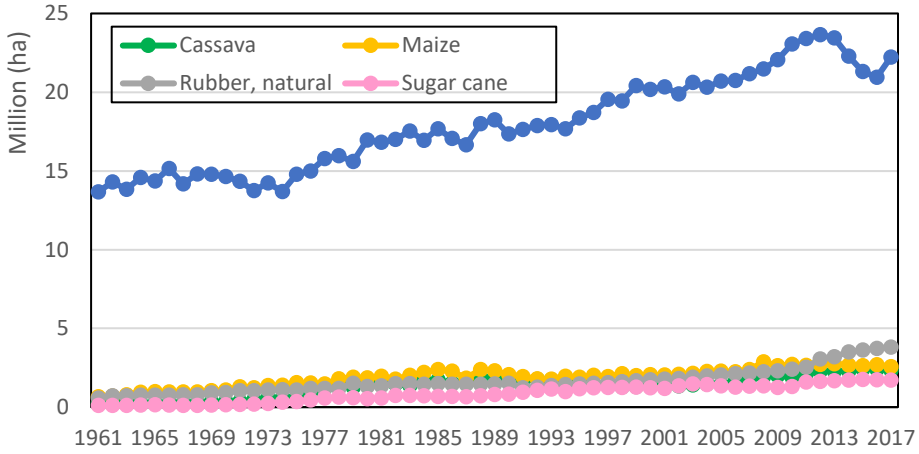
(c) Conversion by vicious companies and rich people

Interview respondents reported that malicious companies and/or rich people, etc. acquire new land by using poor people to convert natural forests to agricultural land.

Each country in the LMB has strengthened its regulations on the land use conversion of natural forests. While the regulations have made it difficult to acquire new land in natural forest, it is also difficult to force poor people to stop converting natural forest to agricultural land. Vicious agricultural conversion makes use of these poor people and make use of the fact that the land is not forest but used as farmland. In this way, several years after the natural forest was converted to agricultural land, they force the poor people to move away and then seize the land for themselves to establish farmland, factories, and resorts. This pattern of conversion was reported in the interviews in Cambodia, Thailand, and Central Highlands of Vietnam.

2) Crops introduced by agricultural conversion

Rice, natural rubber, cassava, and sugar cane are representative crops widely cultivated throughout the four countries visited for interviews in this study. Figure 3.30 below shows the transition of the agricultural area of representative crops in the four countries (Cambodia, Lao PDR, Vietnam, and Thailand).

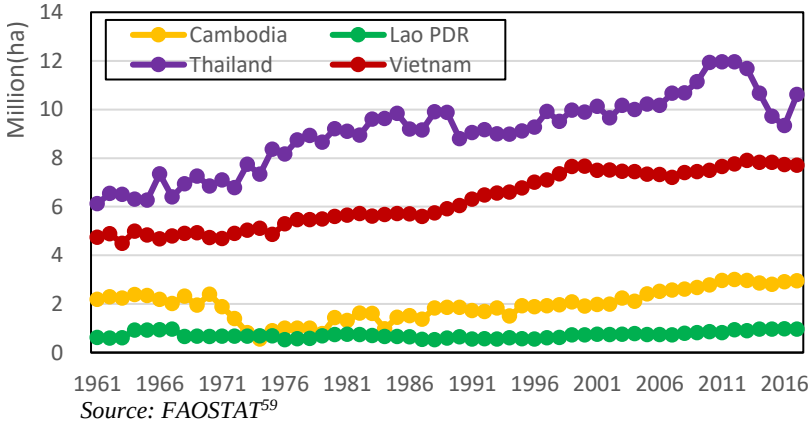


Source: FAOSTAT[59]

Figure 3.30 Transition of the agricultural area in the four LMB countries

Incidentally, data on the area of natural rubber in Lao PDR is omitted from Figure 3.30 The area data of natural rubber in this figure represents the total area of natural rubber in only the other three countries, Cambodia, Thailand, and Vietnam.

As shown in Figure 3.30, the production area of rice (paddy field) is overwhelmingly large in all four countries, albeit with slight declines in recent years. The transition of the paddy field area in the four countries is shown in Figure 3.31. The paddy field areas of Thailand and Vietnam are particularly large, but have been decreasing or stagnating in recent years. Thailand has implemented a policy to switch from rice to sugar cane, etc. in the northeast region, where there are many paddy fields. Vietnam, meanwhile, has been expanding the urban area in the Mekong delta region since 2000. These trends are the principal causes underlying the decrease and stagnation of paddy lands in the two countries. In contrast to the trends in Thailand and Vietnam, however, the paddy field area has creeped upwards in Cambodia and Lao PDR.



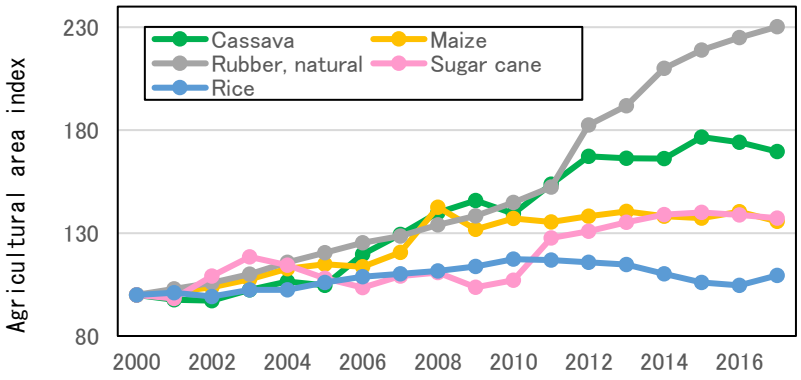
Source: FAOSTAT[59]

Figure 3.31 Changes in the paddy areas of the four LMB countries

In addition, the area of all the main crops other than rice is increasing. In order to analyze the dynamics of each crop area in recent years, the increase and decrease of each crop area is calculated using an agricultural area index set by assigning the cultivated land area for each crop in the year 2000 a baseline value of 100. The formula to calculate the agricultural area index is shown below.

$$Agricultural\ area\ index = \frac{Area\ of\ each\ crop\ of\ the\ corresponding\ year}{Area\ of\ each\ crop\ as\ of\ 2000} \times 100$$

[59] FAOSTAT Website http://www.fao.org/faostat/en/#data/QC

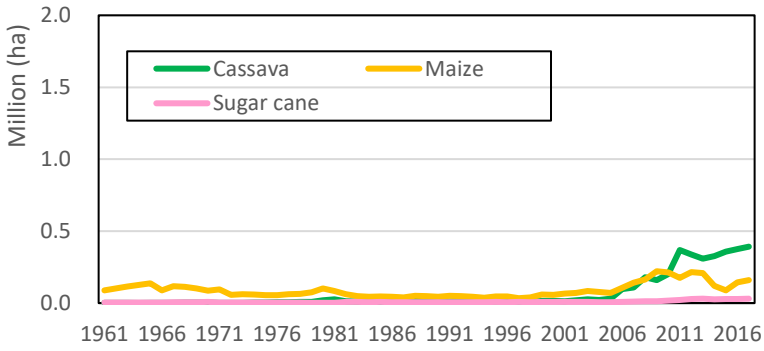


Source: FAOSTAT [59]

Figure 3.32 Change in agricultural land area with 2000 set as the base year

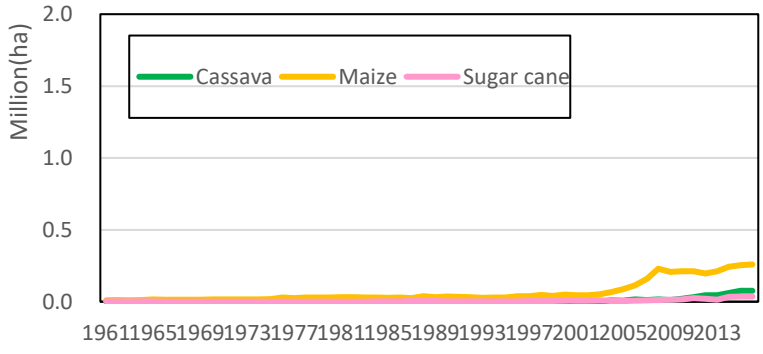
Figure 3.32 shows that the increase in the rice (paddy) area from 2000 to 2017 is small compared to the increases for the other crops over the same period. It should be kept in mind, however, that even a slight increase in the rice (paddy) area on the index corresponds to a large absolute area, given the large area in the baseline year of 2000.

The area of perennial crops such as cassava, corn, and sugarcane has expanded by about 1.4 to 1.7 times compared to 2000. These crops have been widely used not only as food in recent years, but also as a bioenergy source to replace petroleum energy. As a result, demand is likely to increase in the future. For this reason, it will be necessary to continue paying attention to the expansion of these agricultural crop areas as a driver of deforestation and forest degradation. Figure 3.33 to Figure 3.36 show the area changes of cassava, corn, and sugar cane in each of four countries (the area of coffee is included in the figure of Vietnam, where the expansion of coffee plantation was often cited as a deforestation driver).



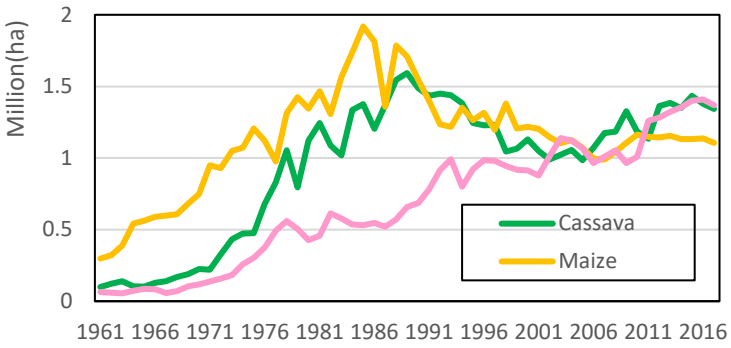
Source: FAOSTAT[59]

Figure 3.33 Change of main crop area in Cambodia



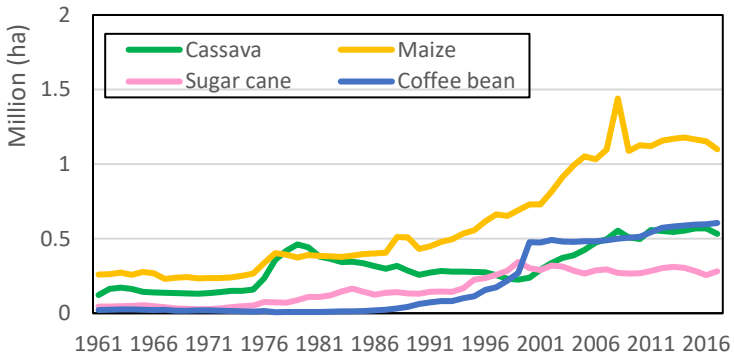
Source: FAOSTAT[59]

Figure 3.34 Change of main crop area in Lao PDR



Source: FAOSTAT[59]

Figure 3.35 Change of the main crop area in Thailand



Source: FAOSTAT[59]

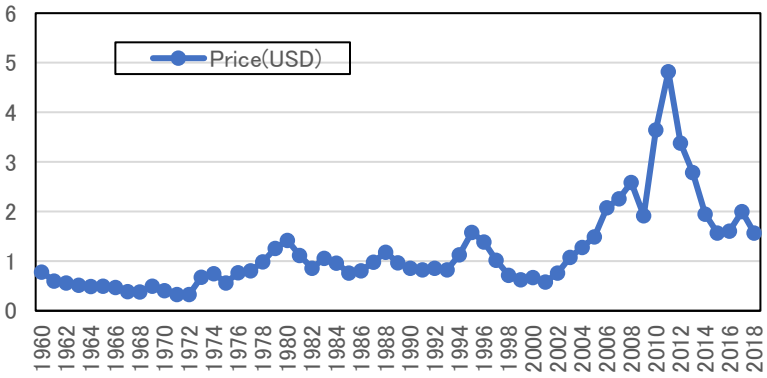
Figure 3.36 Change of the main crop area in Vietnam

Concerning natural rubber, Figure 3.30 and Figure 3.32 show significant increases in the area devoted to plantation. Based on the Land Cover data created in this study, JST visited 31 sites where increases in plantation forest were detected. Out of the sites visited, 24 sites were natural rubber plantations, as shown in Photos 3.1 and 3.2.

Photo 3.1 Lao PDR (Savannakhet)
Natural Rubber in an area with increased forest cover

Photo 3.2 Thailand (Chiang Rai)
Natural Rubber in an area with increased forest cover

Although the area of natural rubber has been increasing rapidly since 2010, the increase has been driven by the price inflation of natural rubber in the 2000s. The transition of natural rubber prices is shown in Figure 3.37.



Source: World Bank Commodity Market[60]

Figure 3.37 Transition of natural rubber price (USD/Kg)

As the first harvests of natural rubber come seven years after planting, the supply of rubber is expected to increase from now on. On the other hand, the price of rubber has already fallen from the peak period. If the price of rubber falls further due to the increase in the supply volume, it may be impossible for the farmers to obtain the originally expected earnings. If the rubber earnings are insufficient, the farmers will need to produce other crops to make up for the shortfall. At the time of the interviews they were not converting the existing rubber to farmland. They sought instead to maintain somewhat profitable rubber forests while securing new agricultural land separately. It should thus be noted that further declines in rubber prices could potentially cause further deforestation and forest degradation.

Besides the above crops, coffee (Central highlands of Vietnam P, Boraben Plateau in Southern Lao PDR, etc.), soybeans, bananas, shrimp (Mekong Delta in Vietnam), etc. were mentioned as drivers of deforestation in the interviews.

(7) River bank erosion and coastal erosion

1) River bank erosion

Regarding river bank erosion, it was pointed out that the bank on the Lao PDR side is being eroded by concrete revetment work being conducted on the Thai side of the Mekong River. This is an issue that needs coordination among nations.

2) Coastal erosion

Deforestation and forest degradation due to coastal erosion have been pointed out in the Mekong Delta region of Vietnam at the mouth of the Mekong Basin. According to local interviews, coastal erosion has been aggravated since 2007. Some 20 to 40 m of coastland is eroding each year, leading to the disappearance of 300 to 400 ha of costal forest such as mangroves. As countermeasures against coastal erosion, the Vietnamese are investigating the implementation of eco-friendly measures such as the use of mangroves and/or bamboo, etc., together with the introduction of conventional structures such as dikes and dams.

3.3 Potential issue

The results of the study shown in section 3.2 indicate that deforestation and forest degradation of the LMB is progressing. In this section, the effects of deforestation and forest degradation in the LMB conservation management will be considered.

3.3.1 Diverse functions of the forest

In general, forests are said to have diverse functions. Table 3.42 shows the functions of the forest

[60] https://www.worldbank.org/en/research/commodity-markets

summarized by the report of the Science Council of Japan.

Table 3.42 Diverse functions of the forest

Function	Summary
Conservation of Biodiversity	Gene conservation, species conservation (plants, animals, fungi) Ecosystem Conservation (River Ecosystem, Coastal Ecosystem)
Global environmental conservation	Global warming mitigation (carbon dioxide absorption, alternative energy of fossil fuel), Stabilization of climate system
Mountain disaster prevention/ soil preservation	Prevention of surface erosion and surface layer collapse, landslide disaster prevention, sediment runoff prevention, soil preservation, other natural disaster prevention functions (snowdrop prevention, wind protection, snow protection, tide protection etc.)
Water conservation	Flood mitigation, water resource storage, water purification
Comfortable environment creation	Climate mitigation, air purification (dust adsorption, pollutant absorption), comfortable living environment creation (noise prevention, amenity)
Health and recreation	Rehabilitation, recreation (rest, walk), recreation (sports, fishing)
Culture	Landscape, Learning, Education, Art, Religion, Festival, Traditional Culture, Maintaining Diversity in the Region
Substance production	Wood (building materials, fuel materials, raw materials for wood products and pulp), food, fertilizer, feed, chemicals and other industrial raw materials, ornamental plants, craft materials

Source: Science Council of Japan[61]

The report of the Scientific Council of Japan mentioned that as a feature of the diverse functions of the forest, it has extremely diverse functions, but individual functions have limitations. It points out also that the diverse functions of forests work as powerful functions by being exerted comprehensively. For example, even if the forest area has decreased, if dams are built, flood mitigation may be possible. But what is lost with forests is not only flood mitigation functions but also functions that cannot be compensated by dams alone, such as biodiversity conservation functions and global environment conservation functions. Deforestation and forest degradation of the LMB has led to the loss and degradation of such multi-functional functions of forests.

Such diverse functions of forests are very difficult to evaluate quantitatively. In addition, even those that can be quantitatively evaluated, there are many points to be noted. For example, the effect of forest function is widely different depending on the conditions. Therefore, it is said that quantitative evaluation should be conducted after understanding these uncertainties. Under these assumptions, the Scientific Council of Japan evaluated the monetary value of forest functions in Japan. Table 3.43 shows the monetary assessment of Japan's diverse functions of forests.

Table 3.43 Monetary value of forests function in Japan

Function	Valuation
Carbon dioxide absorption	11,453 million USD/Year
Fossil fuel substitution	2,090 million USD/Year
Surface erosion prevention	261,175 million USD/Year
Surface collapse prevention	78,030 million USD/Year
Flood mitigation	59,789 million USD/Year
Water resource storage	80,790 million USD/Year
Water purification	135,309 million USD/Year
Health and recreation	23,839 million USD/Year

Source: Science Council of Japan[61]

[61] Report on the Science Council of Japan, 'the evaluation of the various functions of agriculture and forests related to global environment and human life '(2001) http://www.scj.go.jp/ja/info/kohyo/pdf/shimon-18-1-1.pdf

These valuations are assessed differently depending on the function. In any of the evaluation methods, there is a limit of estimation that can be estimated to at least this extent within a certain range of assumptions, such as "compare existing forest with assumption that there is no forest". In addition, it is necessary to understand that the function being evaluated is a part of the entire diverse functions of the forest. On the other hand, according to these estimated values, it means that Japan's forests are creating a value of about 647 billion USD/ year, which translates to the value of 25,870 USD / ha / year.

The above case is the case of Japan, and its monetary value cannot be directly adapted to the function of the LMB forest. However, even in the LMB, it is necessary to recognize that deforestation and forest degradation will lead not only to loss and deterioration of diverse functions of forest but also to economic loss. In order to realize sustainable basin conservation and development, it is necessary to review the land use plans and basin development plans taking into account and properly understanding the diverse functions and economic value of forests enjoyed by the LMB, livelihoods of residents using forests and the measures against climate change and disasters.

3.4 Private Promotion and Business Partnership

3.4.1 Background and the Necessity of Private Promotion and Business Partnership

Generally, there have been strong demands for land-use conversion from forest to other for “production use” since the initial phase of the economic development from local resident including indigenous people, local private sectors, local government, global private sector, central government and others in Mekong River Basin.

It is virtually impossible to control all above stakeholders only by public sectors including foreign AID/Official Development Assistance (ODA).

Therefore, it is expected to have more efficient cooperation and better conditions by working in cooperation/partnership with private sector.

Also, the importance of the activities of private sector in the region become much stronger because the sector can contribute to the sustainable development by generating job opportunities, enhancing the capacity of human resources and technology development.

Tapping into in LMB markets by Japanese companies is more than desirable among MLB countries and Japan, because the entries are expected to boost production, raise incomes, and increase employment opportunities in MLB countries while it also contributes to safety and security of the food and stable supply of food to Japan.

Hence, in this Study, the followings interview surveys were conducted.

3.4.2 Objectives and the Methods of the Survey

3.4.2.1 Objectives

In this situation, the following surveys were conducted.

- Collecting information regarding the interests/plans of developing business in the Mekong River Basin mainly from Japanese-affiliated companies.
- Finding any business-related activities, mainly focused on Japanese companies including NGOs, which could contribute to diminish deforestation.
- Reviewing surrounding business environment and its issues and explore possible measures, policies, or any which promote the activities.

3.4.2.2 Methods

The surveys were conducted with the following manners.

(1) Target Area of the Business Activities

Area within Mekong River Basin in 5 countries.

Note: due to no Japanese-affiliated companies has been conducting business in Mekong River Basin in Myanmar, those who have interest or have being operating in 4 countries are targeted for having interviews of this Study.

(2) Target Organizations

Japanese-affiliated companies and NGOs including international NGOs which are working or having projects in the LMB regions, and few regional forestry related industries in those countries. (As for the same reason above, those who have been operating in 4 countries are targeted.)

(3) Types of Business Targeted

- "Deforestation Driver" related business
- "Non-Timber Forest Products: NTFPS" related business
- "Enhancing Added-Value" related business
- "Value Chain" related business
- "Alternative Energy" related business
- "Technology or Techniques" could contribute to mitigate deforestation
- "Eco-Tourism" related business
- "CSR, SDGs" related business
- Others

(4) Method of Collecting Information

The interview surveys were conducted with the following manners.

- Narrowing down the target organization by researching through the JICA library, internet and related documents including books.
- Sending request letter and having interviews. (Request letters with questionnaires for 68 organizations issued and sent)
- Interviews had been conducted from December 2017 to July 2019. (51 interviews were conducted.)
- While conducting above, forest conditions also have been checked through interviews with public sectors, NGOs and conducting field reconnaissance.

(5) List of Organizations Targeted

The following organizations in Table 3.44 are the targeted organization for this survey. Due to the requests from the interviewed organizations, exact names of the target organization are closed to public.

Table 3.44 Conditions of Interview Survey

Issue	Result	Target Organization	Ctry	Main Subject
DD	IVD	International NGO	KH, MM	Sustainable production and procurement of rubber
	IVD	Private company	KH	Systematic rubber plantation, processing and exporting rubber
	IVD	Private company	KH	Sustainable timber production management
	IVD	Central Government for Agricultural Sector	TH	PES for rice production in Northeast Thailand
	IVD	Central Government for Agricultural Sector	TH	Study for Palm production in Northeast Thailand
	IVD	International NGO	TH	Community Forestry in Northeast Thailand
	IVD	International NGO	TH	PES in Thailand
	IVD	International NGO	TH	Promoting organic agriculture and community forest
	IVD	International NGO	KH	Community forestry and funding for sustainable forest management in Cambodia
	IVD	International NGO	KH	Protecting natural forest, REDD+ and promoting sustainable procurement of fuel woods
	IVD	Central Government for Rubber Industry	KH	Rubber plantation, its management and sustainability of the production

Issue	Result	Target Organization	Ctry	Main Subject
	IVD	NGO in Japan	TH	Coordination with NGOs for capacity enhancement of local farmer
	IVD	Thai NGO	TH	Supply chain for organic foods and its sales
	IVD	Thai NGO foundation	TH	NGO network, roles and relationships in Thailand
	IVD	Producer group for organic agriculture	TH	Production and the supply chain for organic foods
	IVD	Committee on organic agriculture and community forest	TH	Background of establishing organic food market and regeneration of community forest
	IVD	Thai NGO	TH	NGO network and the conditions of Esan region
	IVD	Committee on community forest	TH	Re-establishing community forest and managing it
	IVD	Committee on community forest	TH	Re-establishing community forest and managing it
	IVD	Committee on community forest	TH	Re-establishing community forest and managing it
	IVD	Organic foods supermarket	TH	Organic supermarket and its background
	IVD	Private Company	JAID	Sustainable production of palm oil
	IVD	Private company	WW	Sustainable production & procurement of hard charcoal
	IVD	Private company	VN	Sustainable plantation and harvesting mangrove trees
	NA	International NGO	TH	Wetland & basin management in Northeast Thailand
	NR	Government corporation	TH	PES in Thailand
	NR	Private company	WW	Food production and sales from Palm oil
	NR	Private company	WW	Development, production and sales of detergent from Palm Oil
	NR	Private company	WW	Production of tires
	NR	Private company	WW	Sustainable production and procurement of rubber
	NR	Private company	WW	Policy on procurement of timbers and plantation in Vietnam
	NA	Garment Industry Association	KH	Garment Industry and the fuel procurement in Cambodia
NTFPs	IVD	Private company	VN	Production and Supply chain of Simon bitter Bamboo reducing slash & burn
	IVD	Private company	KH	Plantation in degraded land and NFFPs sales in Japan
	NA	Private company	LA	Sustainable cultivation and process of Konjac potato
AD	IVD	Private company	LA	Coffee value chain using IOT
	IVD	National Research and Development Agency	TH	Heightening adding value for teak
	IVD	Private company	VN	Procuring coffee beans in Vietnam and proportion of arabica beans
	IVD	Government corporation in VN	VN	Sustainable plantation and harvesting mangrove trees
	IVD	Japanese Consumers' Co-operative Union	VN	Supply chain of Shrimp
	IVD	Private company	KH	Pepper production and sales
	BK	Private Company	KH	Coffee in Cambodia and trade
	-	Private company	KH	Adding value for herbs, soap and other organic products
	IVD	Retail shop for organic cosmetics and foods	TH	Demands for organic goods and foods
	IVD	Faculty of University	LA	Coffee production and supply chain in Lao PDR
	NA	Private company	VN	Value chain of Vietnam coffee exporting to Japan
VC	IVD	Private Company	VN	Establishing vegetable value chain
	NR	Private Company	JA	Value chain for forestry sector
AE	IVD	Private Company	MG	Seles of hybrid cooking stove and production of eco-friendly fuel
	IVD	Incorporated association	JA	Dissemination of woody biomass energy
TC	IVD	Private Company	JA	Production, sales and construction of greening slope and the materials
	IVD	Private Company	JA, CH	Technology for container nursery and introduction it to China
	IVD	Private Company	VN	Business model formulation survey for slope ground anchor for disaster prevention
	IVD	Private Company	VN	Effective construction method for soft foundation in Mekong River mouth
	NR	Private Company	ID	Business model formulation survey for disaster prevention, environmental protection and regeneration
ET	IVD	Local NGO	KH	Ecotourism in inhabitants of indigenous people and protected area
	NA	Local NGO	KH	Ecotourism in inhabitants of indigenous people and protected area
	NA	International NGO	KH	Ecotourism in inhabitants of indigenous people and protected area
CSR	IVD	Private Company	KH・ ID	Forest protection as CSR

Issue	Result	Target Organization	Ctry	Main Subject
	IVD	Private Company	WW	Transition from CSR to SDGs for watershed protection and environmental education
	IVD	Government corporation	TH	Plantation as CSR
OT	IVD	Public Interest Incorporated Foundation	WW	Sustainable forest management and JICA project
	IVD	Private Company	LA	Plantation and export of agricultural products to Japan
	IVD	Independent administrative agency	WW	Business opportunities in LMB countries for Japanese companies
	IVD	International NGO	LMB	Various projects, policy suggestion and forest conditions in LMB
	IVD	International NGO	KH	JCM and REDD+ activities in Cambodia
	IVD	Public Interest Incorporated Foundation	WW	Various projects, policy suggestion and forest conditions in LMB
	IVD	International NGO	WW	CDP system and ESG investment
	IVD	Resident's mutual aid and banking system	TH	Establishing mutual banking system and its background
	NA	Faculty of University	DM	ESG investment

Abbreviations: Issues DD: Deforestation Drivers, NTFPS: Non-Timber Forest Products, AD: Added Values, VC: Value Chain, AE: Alternative Energy, TC: Techniques contribute to mitigate deforestation, ET: Ecotourism, CSR: Corporate Social Responsibility, OT: Others

Result BK: Information by Book, IVD: Interviewed, NA: Not Accepted, NR: No Response, - Info from book

Ctry: Country, CH: China, IDN: Indonesia, JA: Japan, KH: Cambodia, LA: Lao PDR, LMB: Lower Mekong Countries, MM: Myanmar, TH: Thailand, VN: Vietnam, WW: Worldwide

3.4.3 Result of the Survey

Within the 68 requested organizations, 57 responded and 51were interviewed while 1 (one) answered through e-mail. In addition, the study team collected related information through a book: 100 Japanese to whom you want to meet in Cambodia by Kiyioshiro Nishimiya, for another 1 (one) company. The results of the surveys for total 53 organizations are described as follows. Please note that the following is the summary of the information collected through the interviews for which quantitative evaluations had not been conducted. However, the study team regards that the comments reflect certain conditions of LMB countries with certain realities.

3.4.3.1 "Deforestation Driver" related business

31 request letters were sent to NGOs, Manufacturers and Supplier related to Oil Palm, Rubber Trees, Fuel Wood and Agricultural Activities were sent. 26 out of 32 requested responded and 23 were interviewed while survey was conducted through e-mail for another 1 (one) organization.

(1) Plantation

As mentioned in the previous section, in Cambodia, unsustainable harvesting and use of firewood remains a major cause of forest degradation and deforestation. As ELCs were expanded, farmers also encroached. Even after the ELC moratorium, they still have been entering the forest and collecting fuel wood illegally. As for natural rubber, which is prominent in countries in the lower Mekong region, it is very popular as a cash crop because rubber farming has multi chances for acquiring cash in a year while rice farming has only one or two time(s).

A company operating in ELC is trying to promote sustainable and transparent forestry. Before the operation, the forest was severely degraded and the land was exhausted due to the over-harvesting of firewood, NTFPs, and unsustainable slash-and-burn. It is virtually impossible to stop the collection of charcoal and NTFPs by residents inside and outside the ELC, and therefore, the company set usage fees and usage rules, provided guidance, established schools, and conducted training and patrolled in order to control the conditions. On the other hand, the period that can be used as ELC is 50 years, and it is necessary to be careful about the return on investment.

A governmental body which managing rubber production as well as export quoted that value-adding has been recognized as a remained issue because the export unit price of natural rubber in Cambodia has been low due to quality control problems, weak transport infrastructure, and the refining facilities and lack of waste treatment facilities. In addition, quality management by small-scale

farmers is not particularly good. On the other hand, although they recognize the necessity of the quality certification system which guarantees added value, they can not correspond for establishing so far. In addition, land acquisition by ELC has not been conducted since 2012 after the various issues were pointed out.

In Vietnam, forest cover is increasing due to its policies such as prohibition of logging of natural forests and afforestation, but deforestation and forest degradation are severe in central highland. In the Mekong Delta region, the decline of mangrove forests was also severe. War and the conversion of land use to farmland and aquaculture were major deforestation driver in the past, but now, coastal erosion, typhoons are major factors. In the past, natural forests were distributed along the coastline but are now lost due to erosion. The erosion becomes more serious in the last 10 years. In some areas, it is progressing at a speed of 30-40 m / year on the coastline from the east and 20-30 m / year on the west side. Also, the amount of sediment deposited in the estuary is decreasing.

In this situation, a forestry public corporation has been established with the investment of the People's Committee of Ca Mau provinces. The corporation has been conducting plantation as well as seedling of Melaleuca and Acacia independently in the area. Currently, the company is preparing for the acquisition of FSC certification. The company is considering acquiring certification in all forests to increase the unit price of the harvested timber by adding value with the certification while they have difficulty to prepare the budget for the acquisition. At current condition, timber production, logging and sales are the major business of the company while they are considering adding the values of harvested timber by processing pellets or other products.

(2) Sustainable Charcoal Production

Import amount of charcoal from Lao PDR to Japan has been increasing recently. In this situation, Japanese-affiliate companies and others are trying to develop a sustainable charcoal production that contributes to improving the livelihood of local resident as well as forest conditions. Sustainability will be kept by improving efficiency and productivities while planting trees. There have been certain difficulties for having certain sustainability regarding enough areas for plantation as well as its budget in current conditions.

(3) Regional Market Activities

In northeastern Thailand in the MLB region, the main cause of deforestation and forest degradation in recent years is the conversion of land use to cultivated land. Since the 1970s, cash crops have been encouraged by policy.

In recent years, especially around 2000, rubber production had been recommended and subsidized for small scale farmers. Also, in some parts of the northeast Thailand, oil palm production was also encouraged due to government policy seeking new area for oil palm rather than south Thailand. Most of those who responded and shifted were rice farmer. Some were seeking the subsidies for the conversion. In the northeast Thailand, harvesting time for rice, dominant crops for this region, is limited only in rainy season due to water availability while there are not many cash crops in this region. However, as the administrator replaces and changes the policy, the harvesting becomes very difficult because no subsidy can be expected for recommended crop anymore. In addition, prices of the cash crops often change, and the changes often give bad time for the farmer. Mostly, farmers decide to start planting the crop when the global price is high, but the price often becomes low when they harvest. As consequence of this, many of them abandoned the field. Moreover, the price of cash crops lies with the middlemen and large companies, and the unit price is generally low. The price cannot be controlled by the farmer. Therefore, they tend to expand or use many fertilizers and pesticides to yield more amount of the crops. Looking at farmers' livelihood, while focusing on single cash crops, the staple food: rice production decreased, and then, farmers started to buy everything from outside including staple food, other side dishes, and daily necessities. As a result, they shifted from self-sufficient life which was dominant in northeast Thailand several decades ago to a monetized economy. As the amount of money necessary for production increased, the need to borrow money increased while the production volume as well as the price were unstable in the long run. Mostly, they sank into debt traps.

In Northeast Thailand, NGOs by farmers were established to achieve sustainable farming operations

by sharing farming techniques rooted in local ecosystems. The cash crops recommended by the government can only generate income during the harvest season while the income was influenced by price fluctuations by global economy. With the encouragement of the Thai government since 1980, the conversion to cash crops has continued, but during the Asian currency crisis in 1997, many farmers no longer could live due to the decline in the price of cash crops. Farmers who rely only on cash crops started to buy everything for their livelihood, and their dependence on the external economy had increased. With the higher the degree of dependence, the more severe the changes in the economy will be, and then, the farmers become more vulnerable. Especially, farmers have no control for price of agricultural products and have little ability to withstand this change. In fact, although initial few years were good for many farmers who shifted to single cash crops, they fell into a situation where debts overlapped due to price fluctuations resulting in losing land. Many farmers were chasing a large amount of debt and struggling with their living.

In order to improve this situation, it is necessary to reduce spending by use of local resources to make their own food and daily necessities, and to improve households by selling surplus crops. Therefore, "Local Market" activity was carried out to create a market where producers directly deliver the crops to the people of the town in late 1990s with collaboration with Japanese NGO. This market creates a sales space for products produced by the villagers themselves for reducing consumption of goods coming from outside, for using local resources such as fishes, shellfish, mushrooms and others, and for circulating money in the region. In 2002, after the market activity stabilized in the village, the "Market connecting Village and Town" activity was started in 2002. This is one step ahead of the above-mentioned village circulation, expanding economic activities from a small economic range to an outer economic range. Here, organic farm products produced in the villages are sold to add value and to differentiate the market from the normal market. It also means delivering safe and secure food to the people in the town. It continues as of 2019.

3.4.3.2 "Non-Timber Forest Products: NTFPS" related business

3(three) request letters were sent to manufacturers and supplier related to Non-Timber Forest Products: NTFPs. 1(one) out of 3 requested responded and were interviewed.

A Japanese company dealing with a particular bamboo species had been interviewed. The target bamboo has a short regeneration cycle with minimum 3 years and therefore, it can be supplied with sustainable manner. In addition, this species grows only in particular parts of LMB region; southwest of China and northern Vietnam and neighboring areas on the Lao PDR. Although similar species exist in MLB region, properties such as strength and flexibility are insufficient. With those attributes, this species is sufficiently competitive. In addition, the above growing area in Vietnam is in ethnic minority areas where slash and burn cultivation is being implemented and continuous cropping disorders have occurred. Therefore, cultivating the bamboo contributes to improving the livelihood of the local residents and the reduction of slash-and-burn. More importantly, the company has its own sales channels in Japan, Europe and the United States, and this is essential for the business sustainability. On the other hand, since the range of self-growth is limited, the possibility of expansion of this business in other MLB regions is very small. It is also necessary to balance the bamboo cultivation area and forest areas for the sustainability of the forest.

3.4.3.3 "Enhancing Added-Value" related business

8(eight) request letters were sent to producers, manufacturers, suppliers and researcher related to "Enhancing Added-Value". 7(seven) out of 9(nine) requested responded and were interviewed. In addition, information for 1(one) company was collected through a book wrote for entrepreneurs and influencers in Cambodia.

(1) Coffee

Agroforestry in which coffee, other several plant species and trees are produced together, is known as one of the business models which could contribute to sustainable forest management. The value of the coffee beans has been heightened by this way, and thus, the sustainability of the production method must be publicized and the produced beans shipped to the market which accepts this value. In addition, this is taken as a measure to improve the livelihoods of local residents by promoting fair trade. On the other hand, coffee production itself has one aspect of deforestation, so implementing

agroforestry and fair trade does not directory lead to the prevention deforestation. It is important to suppress economic activities that expand production areas more than necessary by improving livelihoods. Therefore, when promoting this business model, it is necessary to check the condition of adjacent and surrounding forests and consider the balance of the entire region.

A fair-trade practicing company, established by Japanese co-ops, industry-direct organizations, and imports and sells coffee produced in the Bora Pen Plateau in southern Lao PDR. Although the area is not well known as a coffee production area, Tipica, a kind of Arabica bean that is said to be close to the original species and high-quality coffee, has been produced in this area. Therefore, there has been enough potential to find a market by producing it with an appropriate processing method. On the other hand, the linkage between the production area and the market was not clear or rather weak while the connection to the Thai / Vietnamese markets were strong through middleman such as brokers. Generally, shipping through brokers makes the crop price low.

The cash earned during the harvest season is often exhausted before the harvest season of the following year, and this leads the farmers to use high interest loans which makes their life hard. Therefore, since 2001, international NGOs and the Lao government organized a group of coffee producers who are eager to improve quality and supported the improvement of coffee quality in order to increase the income of producers. After then, although growers were able to produce high-quality coffee, it was difficult to find overseas markets without organic certification or fair-trade certification. Under such circumstances, the company established a relationship with a producer cooperative in Boraben Plateau and started procurement from the cooperative while supporting acquiring the certification in 2009. The company pays 70% of the bean fee to the producer in advance in consideration of the debt. With the aim of building long-term relationships, the company also supports the construction of warehouses and implementing processing equipment. A local union group has established a cooperative and the company supports it. Despite the efforts to make the cooperative independent, there are not many things mobilized at their own initiative, and thus the Japanese side has continued to put the efforts to manage it. Also, with support from Thai NGOs, attempts were made to establish producer support NGOs locally. However, due to concerns about the possibility of NGO's political activities, it is difficult for the NGO itself to be approved in Lao PDR.

Besides, coffee production itself could be a deforestation and degradation driver, and thus, it should be recognized that committing fair-trade does not necessarily contribute to sustainable forest management.

In Vietnam, forest cover is increasing due to its policies such as prohibition of logging of natural forests and afforestation, but deforestation and forest degradation is severe in central highland. In central highland, due to the rich soil in this region, the agricultural productivity is very high and thus, land-use conversion from forest to agricultural land such as rubber, coffee and pepper is prominent.

A Japanese company importing coffee beans from Vietnam deals with both Robusta and Arabica beans through local middlemen and importers / exporters. One of the reasons for purchasing from importers / exporters is for avoiding risks to be listed on violation list of official gazettes in Japan. The positive list system is a system that establishes standards for agricultural chemicals and prohibits distribution of contaminated goods if agricultural chemicals exceeding the standard are detected. The violated body will be listed and publicized in official gazettes. Another reason is that coffee production in Vietnam is not produced by state farms but by small-scale farmers which possess 1 ha on average and process the beans manually and produce small amount. Thus, collection of the beans from farmers by middleman is essential for the supply chain of the coffee. Due to the complexity of the supply chain, through the middleman, the quality improvement from the user side is very difficult. In addition, farmers tend to jump at a chance to make money by shifting to any cash crops such as coffee, corn and peppers which is prominent at the time. They judge the profits of crop cultivation based only on the price at that time, so they cannot make a judgment based on a long-term view. Even today, the conversion of natural forests to farmland (coffee and corn) is occurring in various places in Vietnam. In addition, there are many changes that can be seen in the areas where minorities live due to the low livelihood of them. The problem of minority is sensitive, and there are certain difficulties in managing the forests close to the

communities.

(2) Pepper

One of the Japanese-affiliate company in Cambodia is established pepper fields and is selling in Cambodia and exporting to Japan. Pepper itself fits the Cambodian climate as it has been cultivated in Cambodia for 700 years. Although it can be cultivated with relatively little efforts, the quality varies depending on the post-harvest management. Therefore, the company employ organic farming methods that do not use pesticides. The cultivated land is divided, and natural forests are left between the cultivated land so that even if any disease occurs, the other cultivated land is not affected. Basically, if it grows naturally, it will be resistant to pests in the first place, and there are fewer problems compared to introduced crops. On the other hand, Cambodian pepper farmers tend to pursue the quantity rather than pursuing quality. At the beginning of the business to export pepper to Japan, only the quantity and the unit price were evaluated by trading companies. In addition, no value of the Cambodian pepper was recognized in Japan at the time even with high quality of the products. Quite unexpectedly, the company was introduced through the BBC, and its value was recognized first in the West. After that, the company had a chance to conduct a poster session in a GIZ project, and the company got an opportunity to introduce Cambodian pepper. In this way, the added value of high-quality pepper was increasingly recognized in Europe. Since then, inquiries from Japan have gradually increased. After then, tourists were the major target of the business, but since there were limited possibility of expansion of the customers, sales in Phnom Penh started. In Phnom Penh, personnel of embassy, various donners and company are targeted, and it is highly likely that the business spread by word of mouth. In addition, considering branding, the president of the company conducts sales promotion activities at supermarkets in high-income areas in Japan. In this way, the creditworthiness in Japan has gradually been increasing and the transaction volume has been expanding.

(3) Organic shops and services

Organic products such as vegetables, cosmetics and the services have been used as a tool for improving livelihood by heightening the value of local products by producing without using synthetic chemicals and fertilizers. By improved livelihood, the pressure of deforestation and degradation becomes lower. In this interview survey, the conditions for establishing viable business were confirmed.

A Japanese-affiliated company sells products using natural herbs in Cambodia through directly managed stores, airport stores and the Web site. The main products were bath salts using Khmer herbs, which can be purchased at hotels, souvenir shops and travel agencies. However, for almost two years after opening, almost no products were sold, and the deficit continued. Since 2012, 1) succeeded in developing popular products such as soap and hand cream, 2) gained recognition by being featured in Japanese TV and manga books, 3) opened directly managed store in a market with many tourists, and then, the business gradually began to stabilize. In this way, local products are processed, and business is established by bridging local products with tourists. Currently, the company manufactures and sells herbal products such as soaps, bath salts, hand creams, aroma products and massage oils, and has set up a footbath experience course for customers visiting the workshop. In addition, the company arranges study tours and hold lectures in Japan.

(4) Extensive Aquaculture for Shrimp

While exploitative aquaculture became a major environmental issue by deforesting and degrading mangrove forest and polluting water, some Japanese organizations shift their suppliers to the one who is conducting or managing extensive aquaculture. The shrimp are farmed in the pond surrounded by mangrove forest where microorganisms such as plankton occur naturally, and it becomes shrimp feed. However, inquiries for eco-friendly products are not large, and therefore, the sales of “Extensive Aquaculture Shrimp” have been implemented on a trial basis. As seeing the market movement, it seems to be difficult to pass the ecological value on commodity price in Japan so far.

3.4.3.4 Value Chain related business

2(two) request letters were sent to a company and incorporated association related to Value Chain. 1(one) out of 2(two) requested organizations responded and were interviewed. The interview was conducted with companies which have tried to establish value chains. So far, the business is still in experimental phase.

3.4.3.5 "Alternative Energy" related business

2(two) request letters were sent to a company and incorporated association related to alternative energy. 2(two) out of 2(two) requested organizations responded and were interviewed.

Hybrid rocket cooking stove with high combustion efficiency was introduced in where excessive deforestation due to harvesting fuel wood is an urgent issue. The validity of "eco fuel" derived from unused sawdust and chuff was verified with the simplified machinery available in the area. The cost for procuring materials from Japan is the bottle neck for the viability of this business model. Hence, the efforts to utilize local materials to assemble the stove had been conducted. However, the quality of available material in the area cannot sustain the efficiency of the stove.

In addition to above, attempts to promote the use of bio-fuel had been conducted. It turned out that a large-scale plant and a large amount of raw materials (woody biomass) are required to achieve efficient energy generation in the Lower Mekong region. Besides this, establishing sustainable fuel procurement system such as large-scale plantation of the fuel woods is required for this. Also, except for generating power, utilization of the generated heat energy shall be considered for more efficient utilization of the local resource.

There once was an inquiry from Thailand to sell wood chips to Japan as a raw material for biomass power generation. However, as using wood chips in Japan, it is required to ensure traceability of the chips. In current conditions, it is not realistic to respond to the inquiry above in Japan. Once system for support sustainable system is established in MLB country, the utilization of the fuel wood will be reconsidered.

3.4.3.6 "Technology and Technique which contribute to mitigate Deforestation and Degradation" related business

5(five) request letters were sent to private companies related to technology and technique which contribute to mitigate deforestation and degradation. 4(four) out of 5(five) requested organizations responded and were interviewed.

In Japan, disaster prevention technologies such as forest restoration technology and slope stabilization technology are accumulated. While these technologies are in demand in developing countries, it is difficult to introduce Japanese materials and equipment considering the cost. For this reason, it is necessary to arrange local procurement of materials and equipment as well as establish production system for local materials. On the other hand, similar technologies like these have started to be introduced into the Mekong basin at lower cost from China and South Korea. Japanese technologies are superior in terms of sustainability and effectiveness compared to cheap similar methods and technologies, but these advantages do not appear in a short period of time, so they cannot withstand competition with these inexpensive technologies in current situation. Thus, efforts are being made to incorporate Japanese technology into the technical guidelines of the target countries. In addition, it is important to improve and maintain the level of local engineers who construct with the technology.

Container seedling technology makes it possible to produce seedlings that are lightweight and have a high survival rate. Although it is in the stage of popularization in Japan and has high technical effectiveness, the development of this technology requires a large initial investment, research on seedling methods according to the soil and species in the region, and appropriate management. Therefore, a large initial investment is required for applying this to LMB countries.

3.4.3.7 "Eco-Tourism" related business

3(three) request letters were sent to NGOs who are conducting eco-tour in Cambodia. 1(one) out of 3 requested organizations responded and were interviewed. Although responses were obtained from all three organizations, two organizations were unable to make adjustments.

"Mondul Kiri Eco Tour" is run by a local NGO and is in fifth year of operation. The main purpose of this

eco-tour is to protect elephants that had been overworked by local residents (minority ethnic groups), to prevent deforestation by local resident and to improve livelihood of local residents. It is an attempt to create and generate benefit for the elephants as well as the resident by establishing Eco-tour targeting foreign tourists. Regarding continuity of tours, local NGOs and tours run by locals (Cambodians) are essential because NGOs led by foreigners have difficulty in continuation of the tour as well as in support due to its personnel transfer. In the tour, local residents are hired at rest houses as well as accommodations to return the profits to them. Also, elephant care takers who watch elephant 24 hours are also hired. The other tours in the region organized by an international NGO project seems not to be going well. As the study team try to participate for offered tour, it turned out that the tour guide is not representatives of the local resident but were "flow" guides who did not show responsible behavior. This event prompted a question whether the tour gives the benefit to the resident.

3.4.3.8 "CSR, SDGs" related business

3(three) request letters were sent to a government company of Thailand and Japanese companies related to CSR activities. 3(three) out of 3(three) requested organizations responded and were interviewed.

The Thai public corporation (electric power company) implements afforestation activities in cooperation with the Ministry of Natural Resources and Environment. As an electric power company, it is unavoidable to place an environmentally burden, and therefore, the company has been trying to improve the public image by conducting CSR activities.

There are many CSR activities have been conducted by Japanese companies who consider that they are responsible for burdening the environment through their corporate activities. Continuity with long-term vision, appropriate local as well as international partners and in-house consensus are the keys to have successful CSR activities. Generally speaking, forest conservation has not much appeal while tree plantation has strong appeal to the public and thus, it is hard to get in-house consensus for conducting forest conservation activities as CSR. Some company threw an idea that awarding system from the public sector or authority such as JICA helps promote acquiring in-house consensus by having social recognition.

In addition to the fact that the ESG investment has become widely recognized, Japanese government established Task Force on Climate-related Financial Disclosures；TCFD recently. By seeing the given movements, the idea that recognition of the risk as well as necessity of taking the measure toward climate change are essential to the long-term stability and growth of their business is pervading among private sector. For example, a beverage company has been conducting activities to conserve water source forests as mainstream corporate activities which is essential to their corporate activities rather than as a social responsibility for the burden placed on the environment.

3.4.3.9 Others

In addition to the above, request letters were sent to companies, NGOs, and administrative corporation that are considered to have related information or contribute to mitigate deforestation and forest degradation. 8(eight) out of 9(nine) requested organizations responded and were interviewed.

In order to promote forest related business that can contribute to forest conservation in developing countries, an administrative corporation selected products which have potential for commercialization from undeveloped and low-use resources derived from forests in developing countries. After the conduction, a database was developed, and the database is open to the public through the Web site.

Until now, many Japanese-affiliated companies or enterprises have been conducting forest related activities such as plantation as CSR while the activity itself is not directory related to their business, and thus, most of the activities are not conducted in long-term nor with sustainable manner. For this reason, many CSR activities have limitations, and therefore, how to make such activities connected to the core business becomes very important.

On the other hand, developing countries do not have sufficient economic incentives for sustainable forest management, and thus, forest degradation and deforestation due to conversion of farmland are still going on. In order to mitigate them, it is necessary to increase the economic value of forest resources by finding useful resources derived from forests that had been ignored in each region, by cultivating demand, by

securing access to markets, by developing new products, by improving processing methods and etc. For this purpose, it is essential to input technology and invest funds through business activities by private sector.

A local Japanese-affiliate company produces, exports agricultural and forestry products (black sesame, azuki beans), imports agricultural and forestry equipment, and conducts agricultural consultation in Lao PDR. While working on the cultivation of edible black sesame in northern Bokeo, the company has been working to regenerate the forest. With the lands devastated by the Chinese concession in mind, they are considering developing similar activities throughout Lao PDR in the future. They have been conducting the business in Lao PDR since 2005 while they have some difficulties for continuing some components of business due to changes in the national policy which made original business plan invalid. For example, they tried to export plants which become healthy foods but withdrew due to licensing issues. Looking at forestry in Lao PDR, proper forest management is badly necessary to increase commercial value while current forest management has lack of plantation and nurturing skills and methods. Besides, during the rainy season, roads are divided by landslides which occur every year especially in the mountainous sites where illegal loggings have been occurring.

In the southern part of Thailand where is outside the target area of this study, there is an NGO that has built a local mutual banking and assistance system. Although the region was rich in nature, the capitalist economy permeated the region, leading to decline of agriculture, increasing debt problems of small farmers, abandoning farming by the next generation, increasing large scale regional economic development such as large-scale shrimp farming, modifying local food system (including food price increases), and generating health damage (cancer, diabetes, hypertension, etc.) due to the use of agrochemical chemical fertilizers.

Especially, due to the appreciated price of the food, progression of transition from subsistence crop to single cash crop occurred prominently. By then, food self-sufficiency in southern Thailand is now around 6% while that of whole Thailand is more than 100%. In rural areas, there were many cases where people lost their land because they were unable to repay the loan. In order to recover from this situation, the NGO established mutual savings bank in the region 30 years ago. By holding this system for 30 years, they consider that they have been contributing to the local society by supplying local welfare, life insurance system, local business support, system to protect land and housing, social activities, food security, prevention of natural disasters and response to elderly and youth problems in the area. In addition, the NGO established a cafeteria called “Binode Kitchen”, which plays the role of connecting food producers and consumers, the region and the government, and functions as a learning center for learning local policies. At present, 1) regional bank (community bank) system and regional development fund: community fund, 2) welfare and life insurance system for local resident (members only) have been established and operated. Those cover temporary reimbursement as for emergency relief as of losing title by crash, medical expenses, hospital expenses, transportation expenses, funeral expenses, training, study tours and others for members. It also can be used for various supports such as development funds, local business and business start-up, and support for sustainable agriculture. The regional bank (community bank) has about 6,000 members in total.

3.5 Impact of Deforestation on Mekong River

In this project, forest cover maps were prepared by using satellite image data from 2018 to 1987. It was possible to grasp the trend of the change of forest cover area for about 30 years.

In the Council Study published by the MRC in April 2018, the effects of changes in forest area on flow conditions were examined by hydrological and hydraulic analysis assuming forest areas in 2020 and 2040. MRC considers the effects of forest area on flow conditions to be acceptable (Chapter 2, Section 2.5.8.2 (2), 2). The Council Study considered conditions other than forest area and did not focus solely on changes in forest area. Therefore, in this project, simulation was carried out on the state of forest cover in 2040, which was assumed from the secular change of the forest cover map, and the effect of the change of forest area on the flow condition was evaluated.

3.5.1 Deforestation scenario

In this study, the two forest cover scenarios as below were prepared for evaluation of impact of deforestation in LMB.

[Scenario 1, deforestation case]

Based on the historical forest cover maps, future deforestation in 2040 is predicted at Step-1. Most of forest areas are expected to decrease.

[Scenario 2, recovery case]

Forest cover area which will recover up to past maximum forest areas from 1987 to 2018 was prepared as ideal case

Scenario 1 is prediction case on 2040. Based on the historical forest cover maps from 1987 to 2018 (32 years), forest cover areas was estimated. Figure 3.38 shows the regression line based on historical forest cover area. By using this line, forest cover area on 2040 was estimated. It is found that forest cover area decreases at most of sub-basins. This prediction of forest cover area is different from the forest cover area which was estimated by MRC in Council Study.

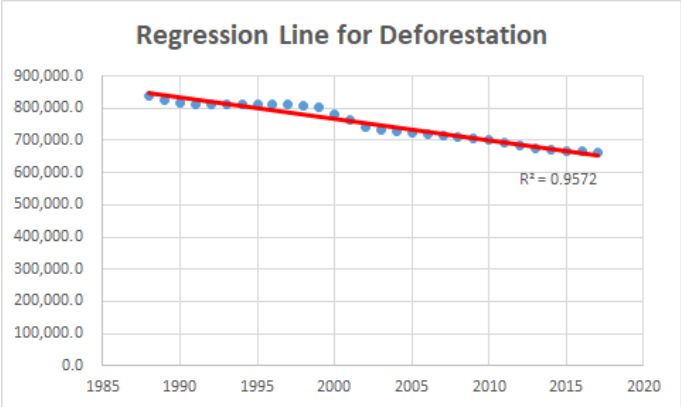


Figure 3.38 Regression Line for Deforestation

Scenario 2 was prepared for evaluation of positive impacts of recovery of forest cover area. The maximum forest cover area from 1987 to 2018 was given to each sub-basin as ideal case.

3.5.2 Preparation of Land Use file for SWTA Model

As summarized in Section 2.1 of Chapter 2, the DSF (Decision Support Framework) of the MRC Toolbox shall be utilized in this work. As a result of consultation with MRC, considering the workload of MRC staff, 2 deforestation scenarios were examined using SWAT (Soil & Water Assessment Tool) and IQQM models. Land use files reflecting changes in forest area (input file of the SWAT model) will be prepared by the survey team.

Land use change can be considered in the SWAT model. The current MRC SWAT model establishes a baseline (2007) based on time series data from 1985 to 2007 (Rainfall, temperature, relative humidity, solar radiation, and wind speed) and land use information from 2003. The baseline information is older than approximately 10 years and consultation with the MRC regarding the possibility of updating has been conducted. However, since the response was that changes to the baseline required the approval of the NMC in each country and it would take several years to update the model, the existing model will be utilized in this work.

In the SWAT model, land use can take into account geology, topography gradients, etc. Table 3.45 shows the land use codes defined in the SWAT model. There are 42 land-use categories. For example, if there are 15 land-use categories in a watershed, a Hydrologic Response Unit (HRU) is set according to the ratio of each land-use area.

Table 3.45 Land Use Code of SWAT Model

No	Code	Land Cover Type	No	Code	Land Cover Type
1	AGRI	Agricultural land-intensive	21	MISC	LMB Miscellaneous land
2	BAMMB	Bamboo	22	MULB	LMB Mulberry Tree
3	BRNL	Barren Land	23	PDDY	LMB Paddy Field
4	CLDS	Clouds	24	PRNL	LMB Perennial Land
5	CMCS	Crop mosaic, cropping area < 30	25	SWID	LMB Widen culture
6	CMCL	Crop mosaic, cropping area > 30	26	UDFR	LMB Undistinguished forest
7	DECD	Deciduous	27	MXMS	Mixed mosaic
8	DCMS	Deciduous mosaic	28	MEDM	Mixed (evg & dec) med-low cover den
9	EVMS	Evergreen mosaic	29	MEDH	Mixed (evg & decid), high cover den
10	EHCD	Evergreen, high cover density	30	ORCD	Orchard

No	Code	Land Cover Type	No	Code	Land Cover Type
11	EMLD	Evergreen, medium low cover den	31	OTH1	Other
12	GRAS	Grassland	32	PAST	Pasture
13	INUN	Inundated	33	PLAN	plantations
14	INMS	Inundated Mosaic	34	REGR	Regrowth
15	AQUA	LMB Aquaculture Land	35	REGI	Regrowth, inundated
16	DTFR	LMB Disturbed Forest Land	36	ROCK	Rocks
17	FCRP	LMB Field Crop	37	URBN	Urban or built-over area
18	FRSL	LMB Forest land	38	WATR	Water
19	FRMC	LMB Forest/misc. Land	39	WETD	Wetland
20	Holt	LMB Horticulture	40	WSDR	Wood-and shrubland, dry
			41	WSEV	Wood and shrubland, evergreen
			42	WSIN	Wood and shrubland, inundated

Source: MRC

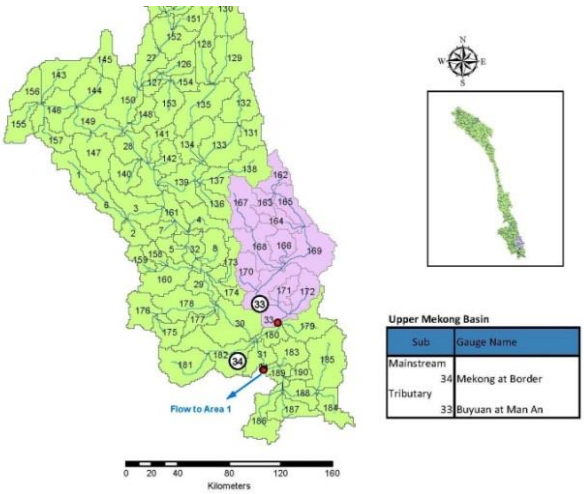
As described in Chapter 2, Section 2.1.2, the MRC divides the Mekong Subregion (including China) into 870 subregions. The number of sub-watersheds and the set number of HRU are shown in Table 3.46. On the next page, Figure 3.39 and Figure 3.41 show Sub-basin of SWAT model at each area

Table 3.46 Sub-basin and HRU of the Mekong River Basin

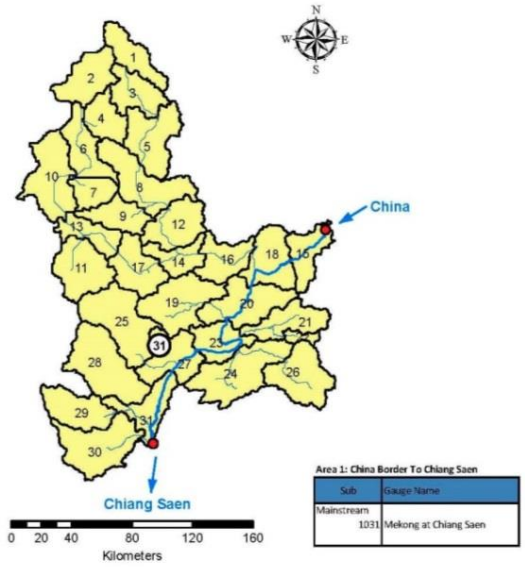
Area	Number of Sub Base	Number of HRUs	
		Total in Area	Average
Area0 (Upper Mekong)	190	886	5
Area1 (China – Chiang Saen)	31	566	18
Area2 (Chiang Saen – Luang Prabang)	70	1,027	15
Area3 (Luang Prabang-Vientiane)	38	739	19
Area4 (Vientiane - Mukdahan)	121	2,012	17
Area5 (Mukdahan-Pakse)	66	1,313	20
Area6 (Pakse-Kratie)	140	2,568	18
Area 7 (Chi-Yaso)	62	1,245	20
Area 8 (Mun-Rasi)	58	1,143	20
Area9 (Great Lake)	94	1,098	12
Total	870	12,597	-

Source: Developed by the research team from technical documentation provided by MRC

Area 0: Upper Mekong in China



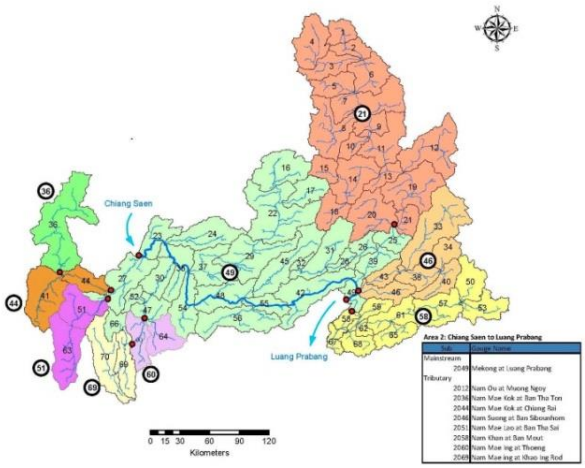
Area 1: Chinese Border to Chiang Saen



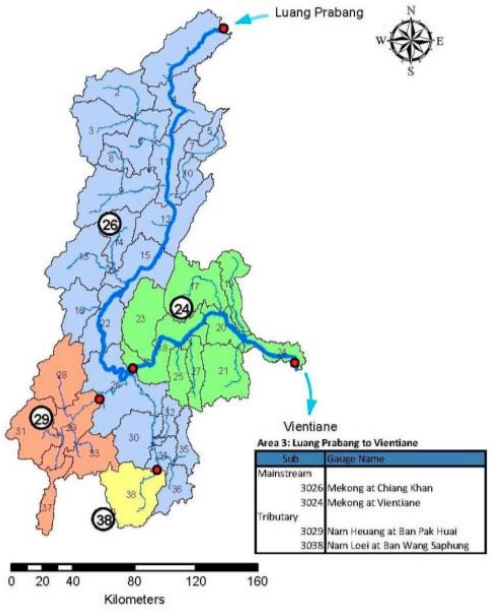
Source: MRC

Figure 3.39 Sub-Basin of SWAT Model (1/3)

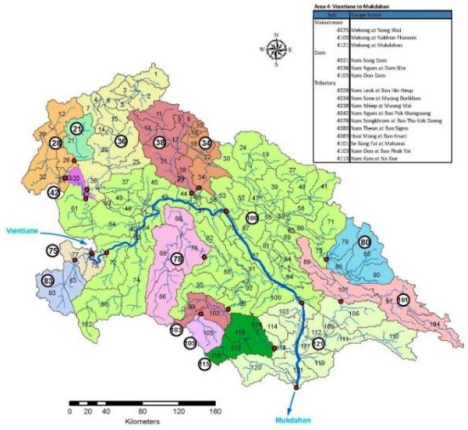
Area 2: Chiang Saen to Luang Prabang



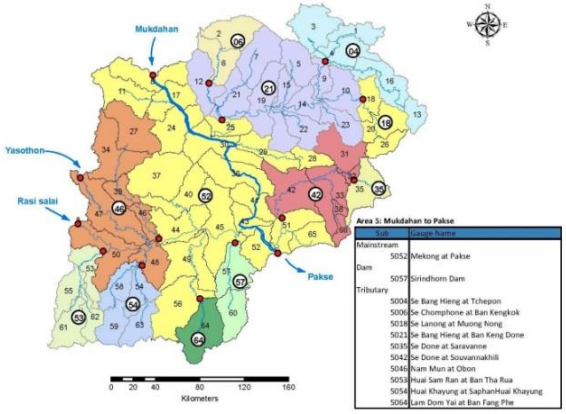
Area 3: Luang Prabang to Vientiane



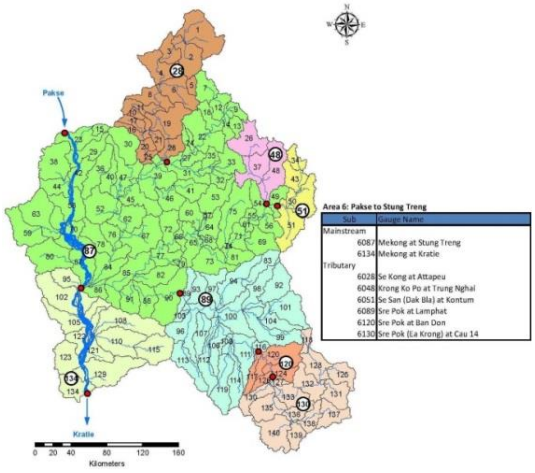
Area 4: Vientiane to Mukdahan



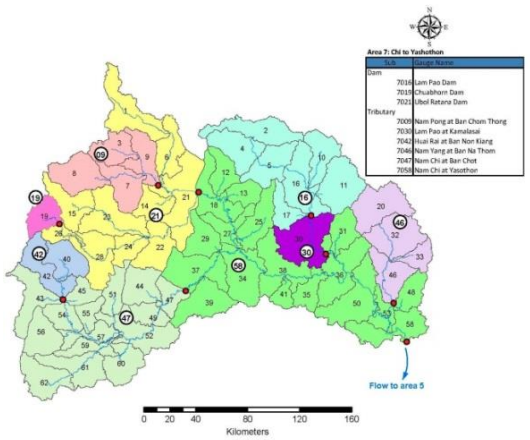
Area 5: Mukdahan to Pakse



Area 6: Pakse to Kratie



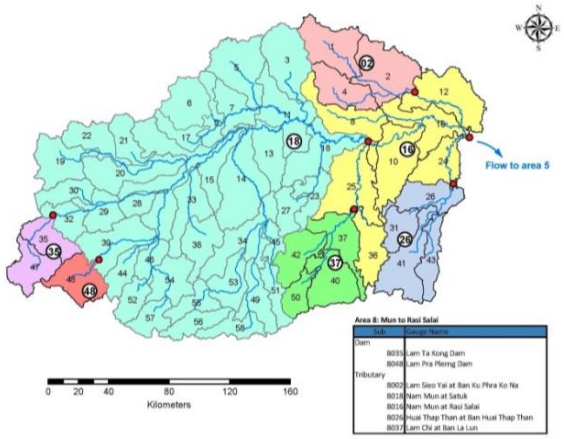
Area 7: Chi up to Yasothon



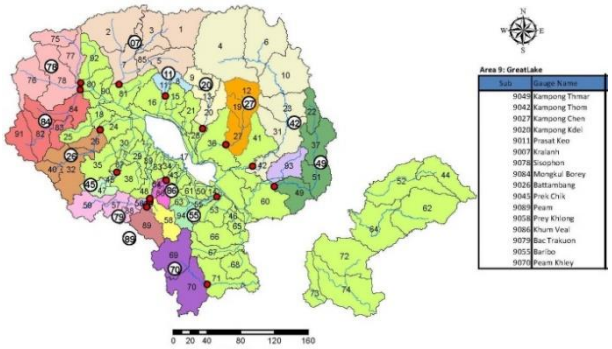
Source: MRC

Figure 3.40 Sub-Basin of SWAT Model (2/3)

Area 8: Mun up to Rasi Salai



Area 9: Great Lake/Cambodia



Source: MRC

Figure 3.41 Sub-Basin of SWAT Model (3/3)

In MRC, the GIS team creates the land use maps, and the analysis model team creates the input data. As for land use in 2040 and 2020, which were established in the Council Study of the MRC, the spatial distribution of each land use could not be assumed. Therefore, the MRC estimated the land use by multiplying the change rate by the data in the baseline year of 2007, based on the values (For example, the urban area expands by ○○%.) provided by the NMCs of each country.

In this project, the rate of change in forest cover in 2040 (Assumptions) was calculated from the rate of forest cover in 2007 by using the interannual change in the land cover map, and the HRU was changed using the rate of change.

The method for calculating the rate of change from the forest cover area is shown in Figure 3.42. The rate of change in forest cover from 2040 to 2007 is calculated using the 2040 forest area estimated from the secular change in forest cover from 2018 to 1987 and the trend of the change, and the HRU corresponding to the forest in the SWAT model is changed.

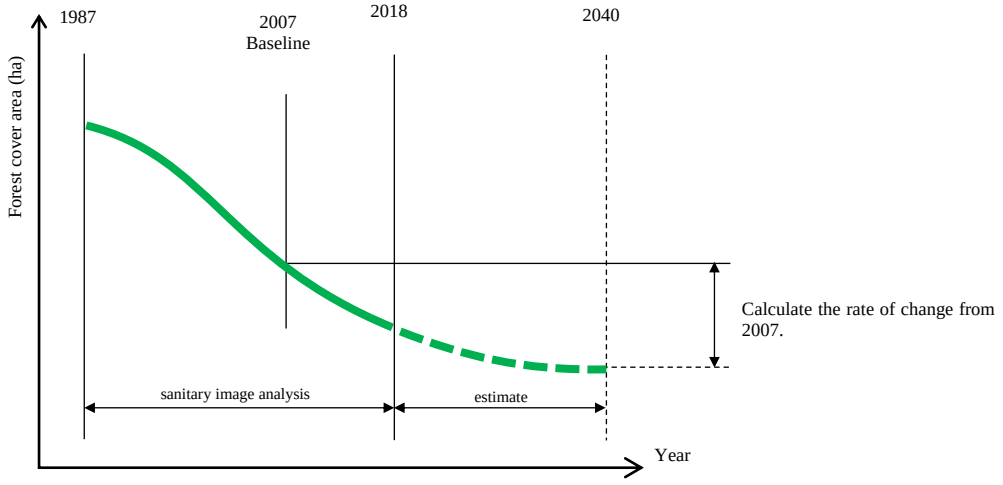


Figure 3.42 Estimation of Forest Cover Area in 2040

Since there is a clear correlation between the decrease in forest area and the increase in agricultural land area, when the HRU corresponding to forests is reduced, the HRU corresponding to agricultural land is increased.

Specifically, Land Use Codes 17 (FCRP, LMB Field crop), 18 (FRSL, LMB Forest land) and 19 (FRMC, LMB Forest/misc. land) as the HRU for forest area, and land use codes 1 (AGRI, Agricultural land – intensive), 5 (CMCS, Crop mosaic, cropping area < 30), 6 (CMCL, Crop mosaic, cropping area > 30), and 23 (PDD, LMB Paddy field) as the HRU for agricultural land, the HRU values are adjusted.

Figure 3.43 shows the rate of change in forest area in scenarios 1.Except for some sub-basin, decrease in forest cover area in LMB on 2040 is expected.

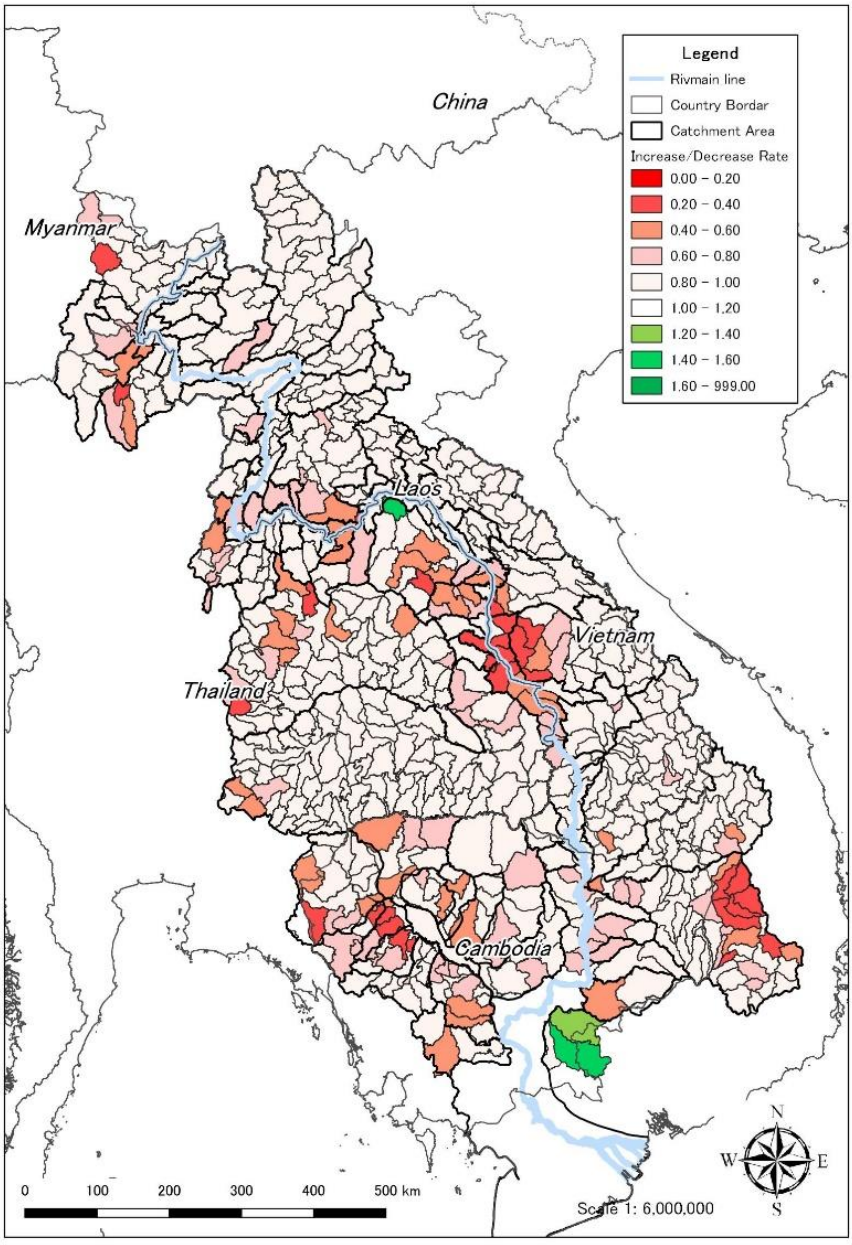


Figure 3.43 Change of Forest Cover Area in Scenario 1

Figure 3.44 shows the rate of change in forest area in scenarios 2. At Scenario 2, the forest cover area could be recovered up to past maximum forest cover area. Forest cover areas in Thailand increases dramatically, which suggests that past deforestation of Thailand especially 1980's was serious.

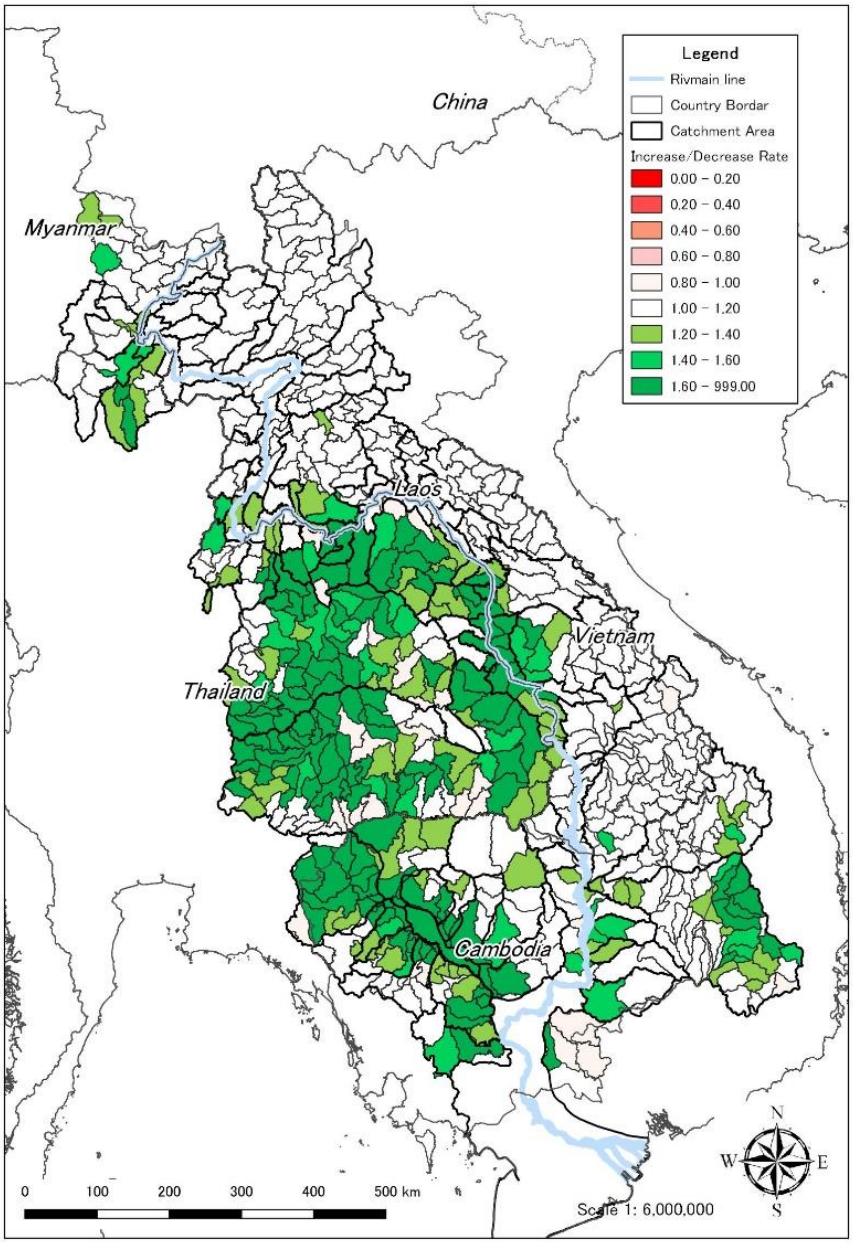


Figure 3.44 Change of Forest Cover Area in Scenario 2

3.5.3 Hydrological Analysis

3.5.3.1 SWAT Model

Firstly, in order to evaluate the impacts of changes of forest cover area on runoff from river basin, sensitive analysis on runoff was carried out with SWAT Model. Base model for this analysis is the base line model of 2007 which was used for the Council Study by MRC. Figure 3.45 shows the Sub-Model of SWAT that whole river basin of Mekong River including China is divided to ten (10) areas considering the topographic features, etc. Figure 3.46 shows the annual runoff volume from sub-model.

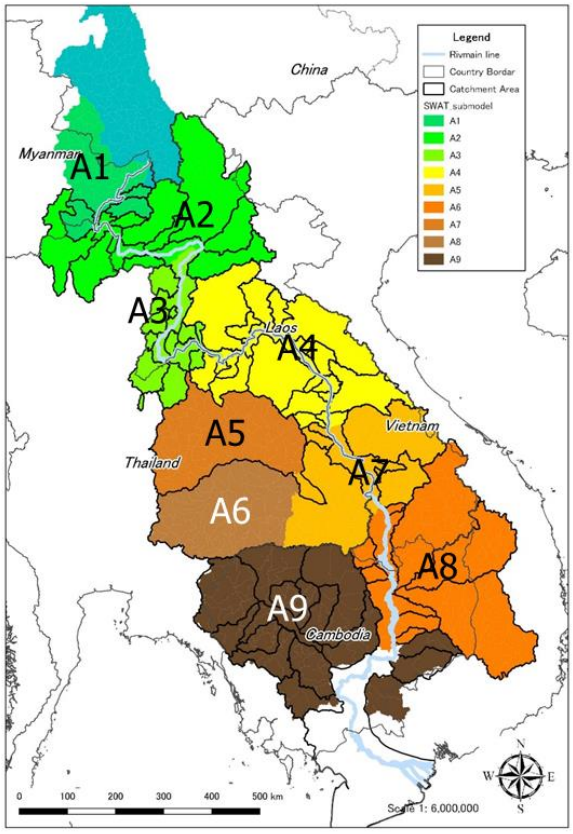


Figure 3.45 Sub-Model of SWAT model

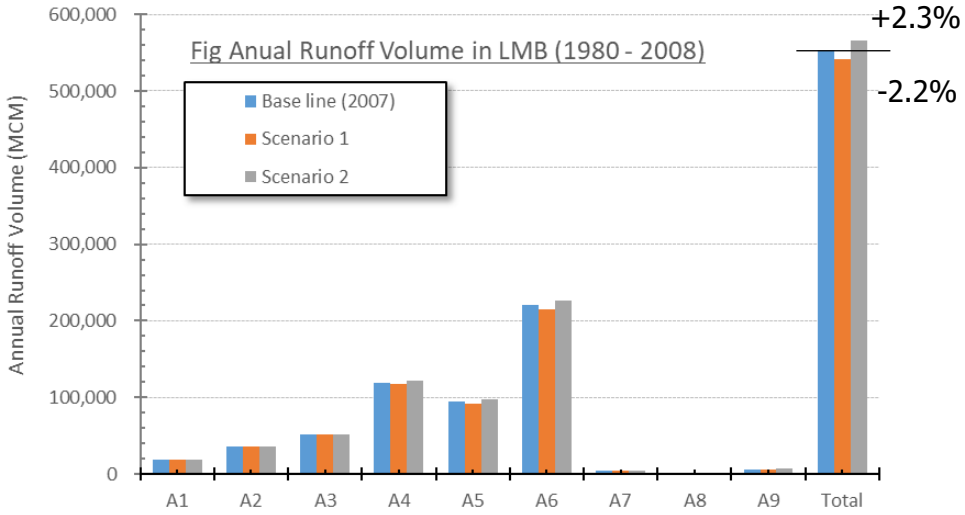


Figure 3.46 Annual Runoff Volume in LMB

According to the Figure 3.46, it is found that runoff from Scenario 1 (deforestation) is smaller than that of Scenario 2 (recovery). by 4.5%.

3.5.3.2 IQQM Model

Secondly, runoff at mainstream of Mekong River considering water use such as hydropower dams, irrigations, drinking/industrial water use, etc. was calculated by using IQQM model. Figure 3.47 shows the key hydrological stations of Mekong River. Kratie in Cambodia is downstream end of IQQM model.

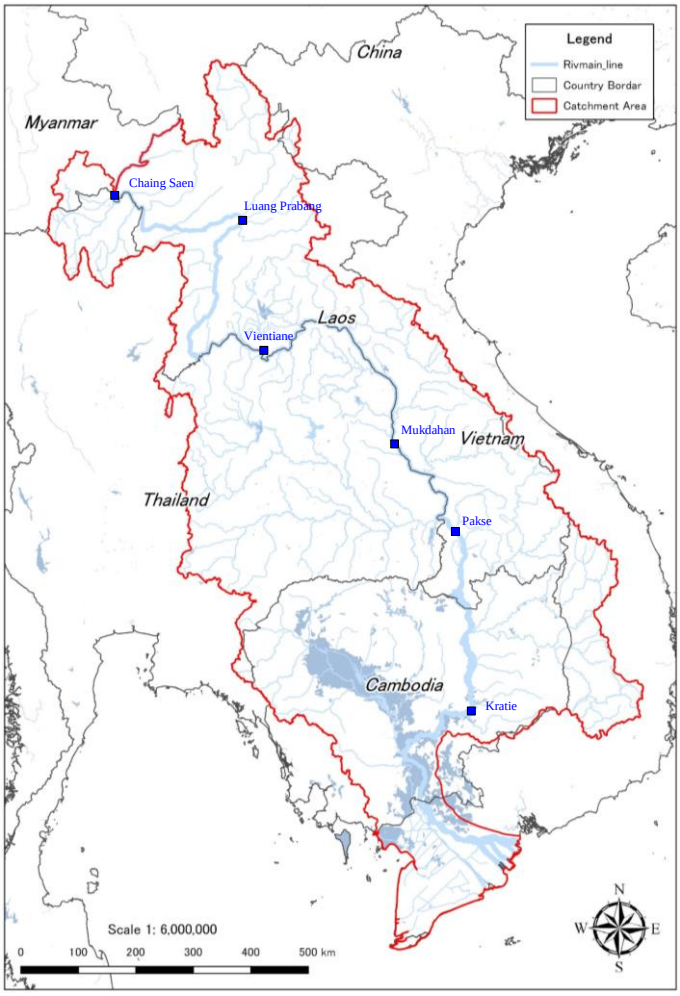


Figure 3.47 Calculation Points with IQQM model

Figure 3.48 shows the estimated annual runoff at major hydrological stations of mainstream of Mekong River. Same as the result with SWAT model, runoff from Scenario 1 (deforestation) is smaller than that of Scenario 2 (recovery). This is an interesting result. it is said that usually, an evapotranspiration from forests increases in proportion to increase of forest cover areas, which result in the decrease in runoff from river basins.

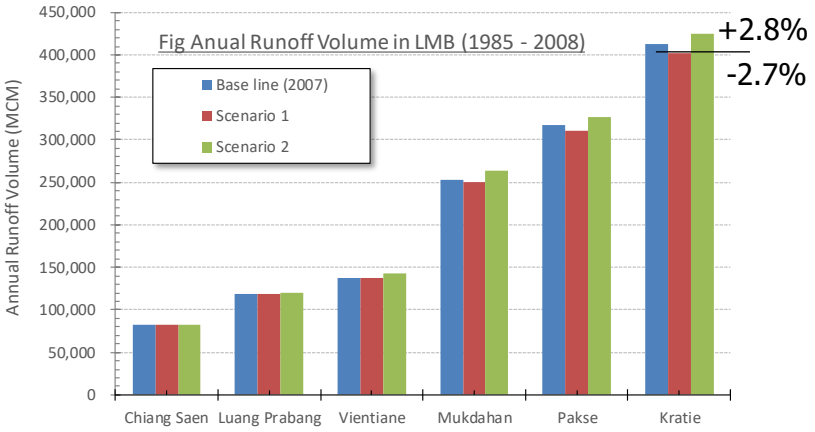
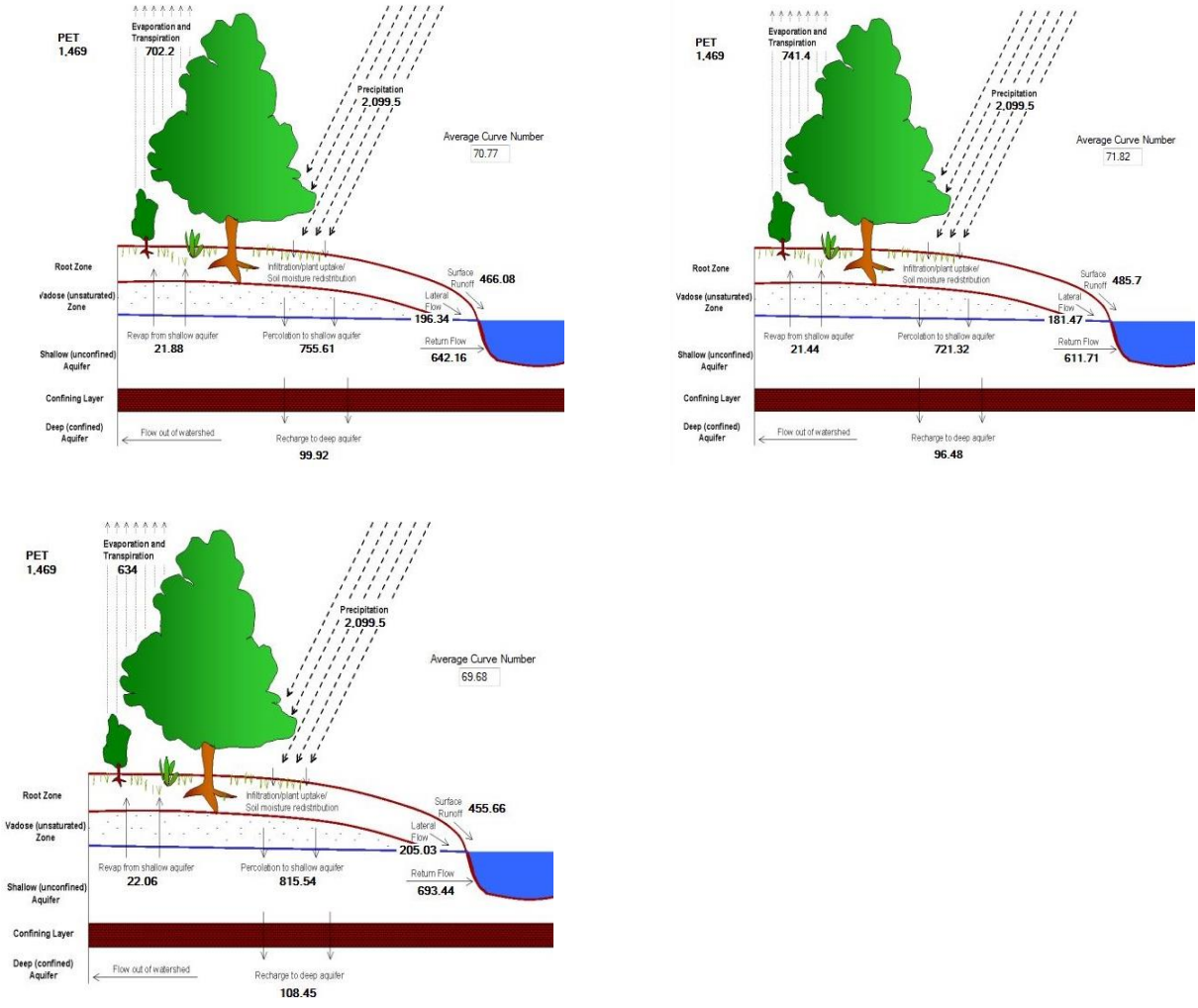


Figure 3.48 Annual Runoff Volume at Major Stations in Mainstream of Mekong

3.5.3.3 Findings

As mentioned above, it is found that the deforestation might decrease in runoff volume from river basin. For more understanding this phenomena, water balance of A4 was examined carefully as example.



Source: MRC

Figure 3.49 Annual Distribution of Water Resources in A4 (1980 to 2007)

Table 3.47 Annual Distribution of Water Resources in A4 (1980 to 2007)

Scenario	Hydrological Distribution of Water Resources (mm) *Annual average from 1980 to 2007						
	1.Precipitation	2. Evaporation & Evapotranspiration	3. Surface Runoff	4. Lateral Flow	5. Percolation to shallow aquifer	6. Return Flow	7. Runoff (sum of item 3 to 6)
Base line	2,099.5	702.2	466.08	196.34	755.61	642.16	1,304.58
1 Deforestation		↑741.4	↑485.70	↓181.47	↓721.32	↓611.71	↓1,278.88
2 Recovery		↓634.0	↓455.66	↑205.03	↑815.54	↑693.44	↑1,354.13

Figure 3.49 and Table 3.47 show the Annual Distribution of Water Resources in A4.

(1) Scenario 1

Evapotranspiration increases under deforestation scenario. Under the scenario 1, It is assumed that land use after deforestation is be converted to farmland (fields and irrigation land). In general, there is more evapotranspiration from forests than farmland. However, Table 3.47 shows the different result as usual, which is interesting result.

In younger trees, the root depth is shallow, and when the soil moisture is low due to drought, the roots may not absorb moisture and the evapotranspiration may decrease. It could be said that expansion of forest area does not always induces an increase of evapotranspiration. However, since the age and root depth are not taken into account in the land use setting of the SWAT model, the hydrological analysis results of the MRC Tool box will need further examination.

Surface water increases. The reason for this is thought to be a decrease in the amount of underground penetration due to a decrease in forest area. As a result, underground runoff (intermediate runoff, underground infiltration, condensate) is reduced, so total runoff is reduced.

(2) Scenario 2

In scenario 2 assuming forest recovery, evaporation and evapotranspiration decrease. As mentioned above, it is generally considered that evapotranspiration increases as forests increase.

Surface water is reduced. This is thought to be due to the promotion of rainwater infiltration by the forest and may contribute to mitigating flooding. In addition, groundwater is recharged and the base flow is increased, so that an increase in river water in the dry season can be expected due to forest recovery.

3.5.3.4 Recommendations

Through the sensitivity analysis for evaluation of impacts of deforestation, it was found that Lower Mekong Basin is very complex. As mentioned above, it was found that the amount of surface runoff which causes flooding and sediment disasters could be decreased due to forest recovery. In addition, the amount of seepage is increased, which induces recharge groundwater more, and the amount of runoff into the Mekong River could be increased, especially dry season. This suggests that forest contributes to flood mitigation and increase of base flow of Mekong River.

The point where evaporation and evapotranspiration decreases due to the recovery of forest area should be examined. Although it is assumed that the forest area decreased by deforestation is converted to farmland (fields and irrigation areas), the amount of evapotranspiration from forests is usually greater than that of farmland.

Table 3.48 shows the evapotranspiration data at each sub-basin based on the original output results of the SWAT model provided by MRC. From the table, for A3, A5, A6, A7, and A9, the amount of evaporation in scenario 1 is larger than in scenario 2. While, for the remaining Sub-basins, the amount of evapotranspiration in Scenario 2 is larger than Scenario1.

Table 3.48 Annual Evapotranspiration by SWAT Model (1985 to 2008)

Sub-basin	Evapotranspiration (mm)		
	Baseline 2007	Scenario1 (Deforestation)	Scenario2 (Recovery)
A1	709	750	978
A2	774	903	941
A3	802	1,253	702
A4	746	771	833
A5	839	1,505	1,354
A6	864	1,235	1,051
A7	945	1,421	1,412
A8	1,118	1,136	1,285
A9	1,233	1,417	1,184

Source：MRC

Value of evapotranspiration at Sub-basin A4 in Table 3.48 is significantly different from the value of evapotranspiration shown in Table 3.47. The values in Table 3.47 are considered to be estimated by calculating the runoff from each basin and then subtracting the runoff from the rainfall. There are cases where this method is used as a method for calculating the water resources balance in watersheds where meteorological and hydrological data are scarce.

In this study, due to the confidentiality policy of MRC, JST was unable to examine all the input and output data of MRC Tool box. If MRC will utilize the MRC tool box as a tool for water resource management continuously, the update the model data (currently the base model is 2007) is indispensable and it is necessary to review the calculation methods for evapotranspiration in farmlands and forest cover areas.

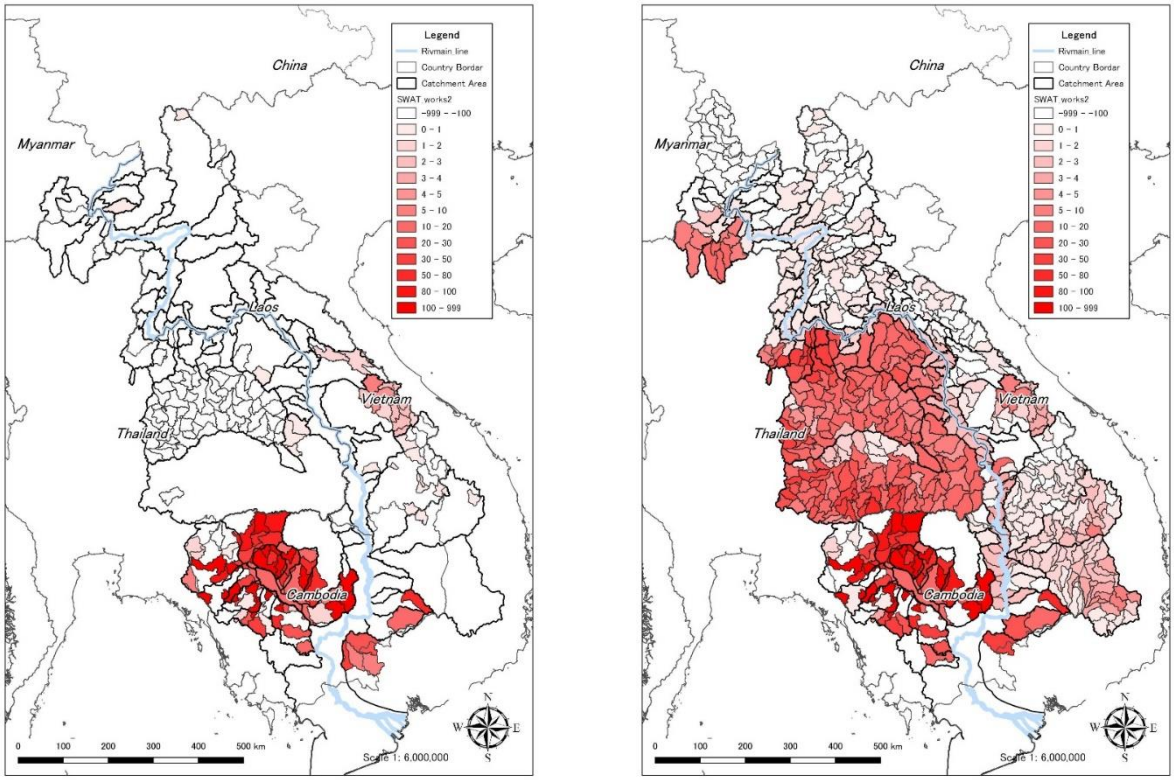
3.5.4 Extraction of Hot Spot-2

In order to identify the hot spot 2 which is defined as “vulnerable areas against flooding and drought by deforestation”, runoff volume and maximum peak discharge from 1980 to 2007 was examined. Figure 3.50 and Figure 3.51 show the changes of annual runoff volume and peak discharge against base line of 2007, respectively.

Roughly, at the areas where there is forest cover, the runoff volume and peak discharge increase.
However, runoff volume and peak discharge increase at some areas, regardless increase/decrease in deforestation.
This suggests that the long-term runoff mechanism in large river basin such as LMB is so complicated that it is difficult to identify the vulnerable area against flooding and drought by deforestations.

Scenario 1 (deforestation) Scenario 2 (recovery)

(1) Increase in Annual Runoff Volume



(2) Decrease in Annual Runoff Volume

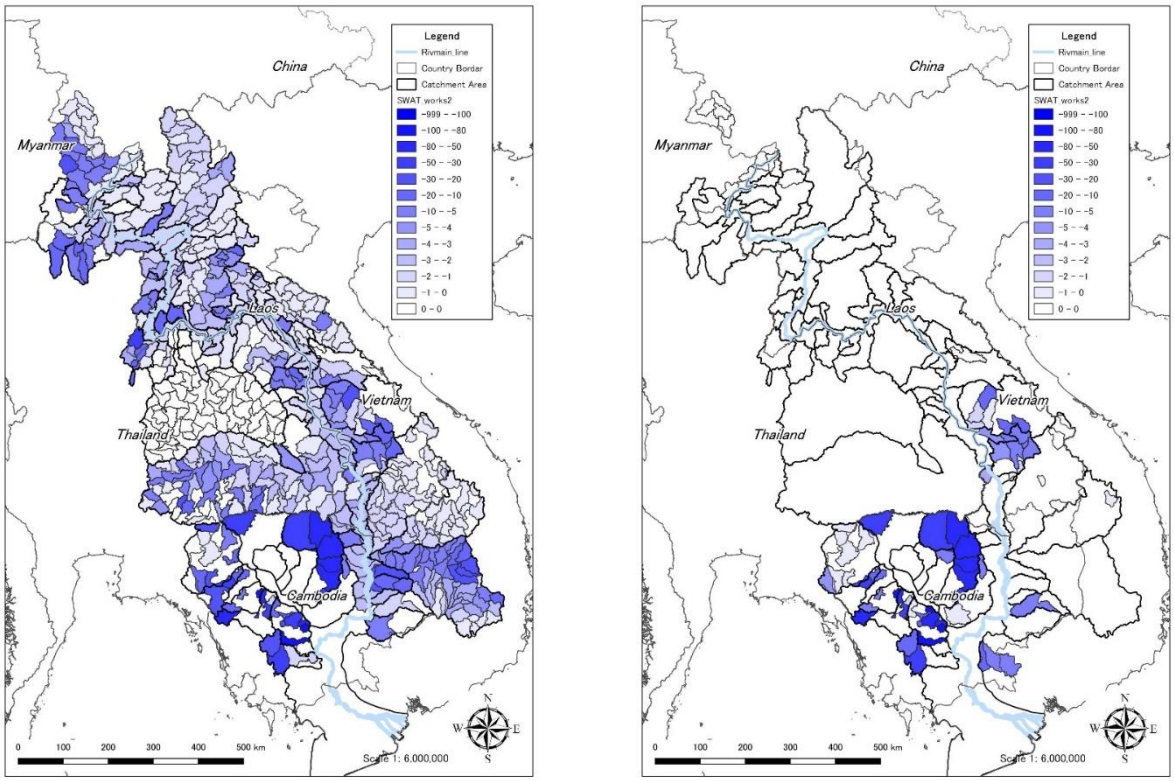
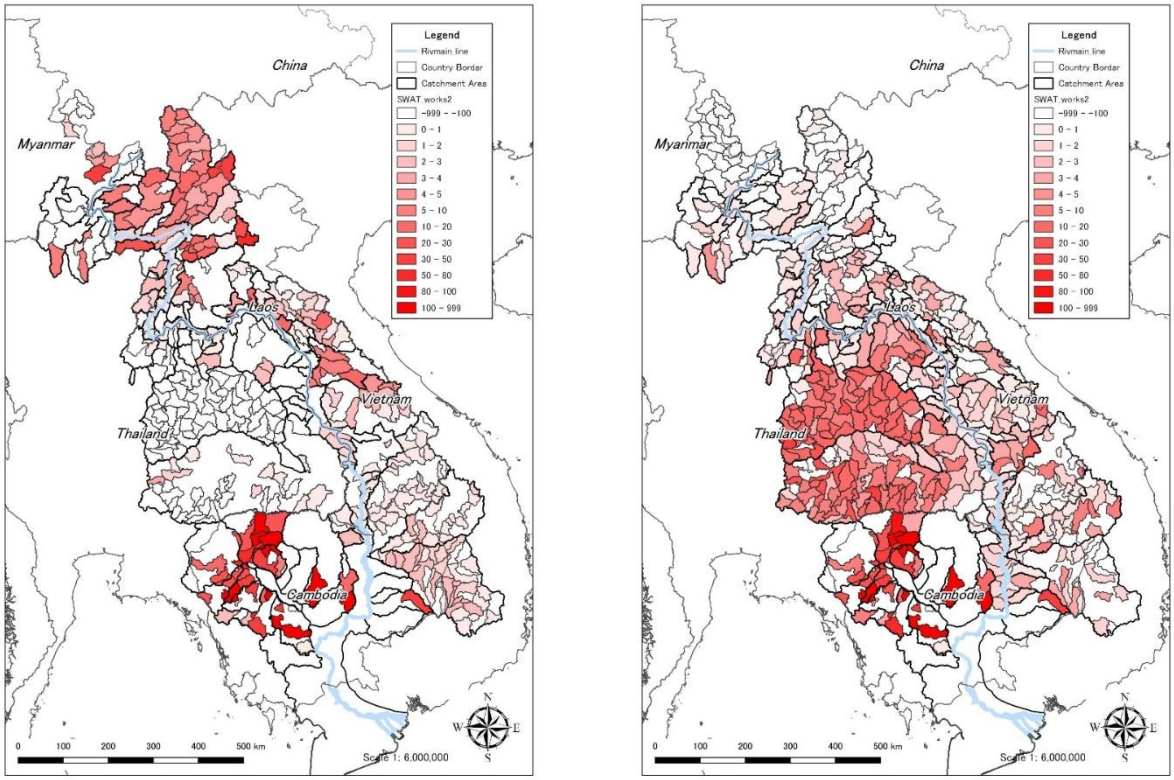


Figure 3.50 Change in Annual Runoff Volume against Baseline of 2007

Scenario 1 (deforestation) Scenario 2 (recovery)

(1) Increase in Peak Discharge Runoff



(2) Decrease in Peak Discharge

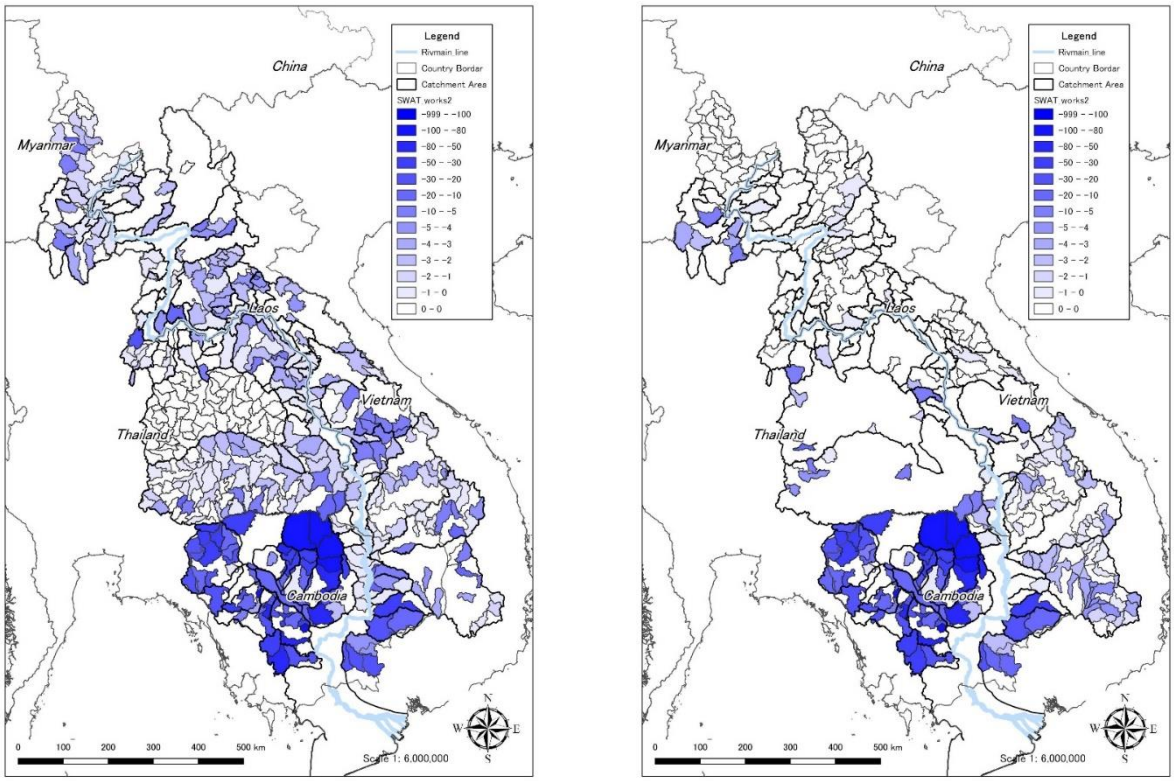


Figure 3.51 Change in Peak Discharge against Baseline of 2007

[i] CAMBODIA FOREST COVER 2016 (MoE 2018)
https://redd.unfccc.int/uploads/54_3_cambodia_forest_cover_resource__2016_english.pdf
[ii] Data from JST
[iii] General Population Census of Cambodia 2008 Provisional Population Totals (National Institute of Statistics, Ministry of Planning, 2008) http://www.stat.go.jp/english/info/meetings/cambodia/pdf/pre_rep1.pdf
[iv] Data from JST
[v] Statistics Year Book 2017 https://www.lsb.gov.la/wp-content/uploads/2018/10/Yearbook-2017-2.pdf
[vi] https://en.wikipedia.org/wiki/Vientiane_Province
[vii] Executive Summary Forest Area Data Preparation Project Year 2016 – 2017(RFD)
http://forestinfo.forest.go.th/Content/file/executive%20summary%2060.pdf
[viii] Data from JST
[ix] Statistical Yearbook Thailand 2018
http://service.nso.go.th/nso/nsopublish/pubs/e-book/SYB-2561/files/assets/basic-html/index.html#1

[x] GENERAL STATISTICS OFFICE of VIET NAM https://www.gso.gov.vn/default_en.aspx?tabid=774
[xi] Data from JST

CHAPTER 4 TECHNICAL SUPPORT COMMISIONS

4.1 Purpose of Commissions

JICA formulated the technical support commission in this project and invited the two (2) support members as shown in Table 4.1. The commission gave helpful recommendations and suggestions for smooth implementation of the project.

Table 4.1 Member of Technical Support Commission

Member	Organization	Description
Toshio KOIKE	Director of ICHARM (International Centre for Water Hazard and Risk Management)	Supports of establishment of climate change scenarios and evaluations of impacts of climate changes, etc.
Taikan OKI	Professor of the University of Tokyo Univ.	Supports for development of basin models and evaluations of impacts of climate changes, etc.

4.2 1st Technical Support Commission in Japan

1st Technical Support Commission was held as follows.

Table 4.2 Summary of 1st Technical Support Commission

Item	Description
Date	23rd April 2018
Place	JICA Headquarter
Participants	Dr. Toshio Koike, Dr. Taikan Oki, JICA, JICA Study Team
Agenda	1. River basin model and utilization of forest change 2. Evaluation method of hot spot 3. Policy recommendation
Contents of discussion	➢ Long term forest cover change (more than 10 years) should be considered in order to evaluate correlation properly between forest cover and river basin condition. ➢ Impact of sediment should be considered in river basin model. ➢ Simulation calculated dam Impact is so complicated so that it should be evaluated separately. ➢ Verification method of RRI model after installing should be considered. ➢ Suggestion related to observation monitoring of sediment, water quality and water amount is important for future activity. ➢ Viewpoint forest change impacts to livelihood such as fishery and agriculture is included to the suggestion.

4.3 2nd Technical Support Commission in Japan

2nd Technical Support Commission was held as follows.

Table 4.3 Summary of 2nd Technical Support Commission

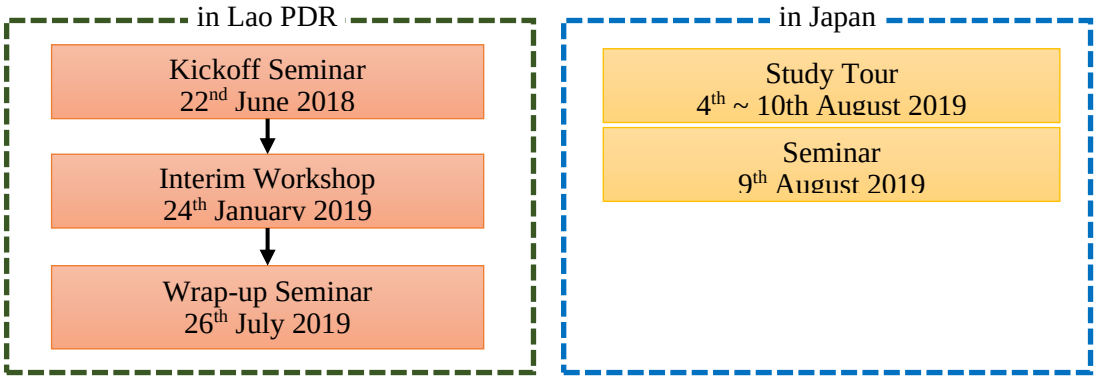
Item	Description	
Date	22nd March 2019	11th April 2019
Place	Science Council of Japan	United Nations University
Participants	Dr. Toshio Koike, JICA, JICA Study Team	Dr. Taikan Oki, JICA, JICA Study Team
Agenda	1. Report of the progress 2. Discussion	

Item	Description
Contents of discussion	➢ For the future suggestion, energy policy on the Mekong river basin, data approval system of Swat model and biodiversity / forest management by NGO may be important challenges. ➢ ADPC data must be open. ➢ Precipitation data is needed for evaluation of hydrology in addition to forest cover rate and water outflow. ➢ Impact occurred by forest reduction should be classified in deferent land usage.

CHAPTER 5 SEMINARS

5.1 Purpose of Seminars

In order to share, discuss and report the survey progress and outputs with relevant agencies and stakeholders etc., seminars in Lao PDR and Study Tour / Seminar in Japan were held as following diagram.



5.2 Figure 5.1 **Schematic Diagram of Seminars/Commissions held by JICA StudyOutline of Seminars**

In this section, the contents of the seminars are summarized.

5.2.1 Kickoff Seminar

Kickoff seminar was held as follows.

Table 5.1 Summary Kickoff Seminar

Item	Description
Date	22nd June 2018
Place	Conference room at MRCS Office, Vientiane, Lao PDR
Participants	42 participants from MRC Secretariat, NMC from 4 countries, Relevant ministries and agencies from 4 countries, JICA and JICA Study Team
Objectives of the Seminar	➢ Present, discuss and finalize the Inception Report of the Project ➢ Present and discuss the major key finding from the informal meetings with NMCs and relevant national line agencies
Agenda	・ Opening - Welcome Address by Chief Executive Officer, MRC - Opening Remarks by JICA - Memorandum of Understanding (MoU) between MRC and JICA Signing - Opening Guidance by JICA Study Team ・ Session I: Inception Report on the Study - Presentation on Inception Report on the Study by JICA Study Team - Discussions on Inception Report on the Study facilitated by MRCS ・ Session II: Major Key Findings from Informal Meetings - Presentation on the major key findings from the informal meetings with NMCs and relevant national line agencies by JICA Study Team - Discussions on the major key findings from the informal meetings with NMCs and relevant national line agencies facilitated by MRCS ・ Wrap-up - Wrap-up and Next Steps by MRCS - Fill-up the Questionnaire - Closing Remarks by MRCS

The major result of the discussion is as follows,

Table 5.2 Major Result of Kickoff Seminar

Item	Result
Inception Report on the Study	➢ Contents of the Project and Inception Report were explained with participants and agreed. ➢ Transboundary issue should be considered for the model and forest cover map ➢ Data/information sharing should be according to MRC's rule.
Major Key Findings of "Climate Change / Hydrology"	➢ Three MRC's CCAI climate change scenarios will be used and combined with deforestation data to evaluate the impacts on hydrology and hydraulics of the river basin ➢ Future deforestation/forest cover data for SWAT model will be prepared by JST to evaluate the negative/positive impacts on LMB. ➢ In particularly vulnerable areas, detailed hydrological and hydraulic analysis will be conducted by using RRI Model. ➢ Target year for the scenario shall be 2040.
Major Key Findings of "Forest Cover Map"	➢ MRC's land cover data and 4 MCs' forest cover data shall be collected and combined to make whole cover map. ➢ In addition to using MRC's land cover data, using ADPC land cover data is considered as an option for preparing the forest cover map of the whole Mekong basin. ➢ Forest policy and its achievement should be considered.
Major Key Findings of "Formulation of Future Projects"	➢ Future projects related to good practices for protecting forest resources will be identified and proposed based on the results of this initial study. ➢ Quantitative evaluation of forest function is necessary.

Photo 5.1 Kickoff Seminar

After this seminar, Inception Report was finalized with the reflection of opinions and comments remarked

in this seminar.

5.2.2 Interim Workshop

Interim workshop was held as follows.

Table 5.3 Summary Interim Workshop

Item	Description
Date	24th January 2019
Place	Conference room at MRCS Office, Vientiane, Lao PDR
Participants	46 participants from MRC Secretariat, NMC from 4 countries, Myanmar, Relevant ministries and agencies from 4 countries, JICA and JICA Study Team
Objectives of the Seminar	➢ Report the progress of project activities especially the results from interview with relevant line agencies during August to November 2018 ➢ Discuss the preparation of forest cover maps and hot spot (deforestation areas) and drivers for deforestation ➢ Discuss further study on hydrological/hydraulic analysis and policy recommendations with relevant agencies.
Agenda	・ Opening - Opening Remarks by MRC and JICA - Opening Guidance by JICA Study Team ・ Session I: Interim Report on the Study - Presentation on Interim Report on the Study by JICA Study Team - Discussions on Interim Report on the Study facilitated by MRCS ・ Session II: Discussion for Further Studies - Presentation on the major key findings such as relation of deforestation drivers and actual land cover changes, Deforestation scenarios, Methodology of estimation of hotspot 2 and Next steps - Discussions on the major key findings ・ Wrap-up - Wrap-up and Next Steps by MRCS and JICA Study Team - Fill-up the Questionnaire - Closing Remarks by MRCS

The major result of the discussion is as follows,

Table 5.4 Major Result of Interim Workshop

Item	Result
Land Cover Maps (LCM) based on ADPC	➢ Reason that 21 categories are to be 4 categories is to grasp the trend of forest reduction as Land Cover Map ➢ Deference between Maps owned by MRC and maps of study output should be clear ➢ Study output should be adjusted with Council Study etc.
Trigger of deforestation (=drivers)	➢ Hot spot 1 defines the place where forest reduces actually and is needed to grasp the trend of forest reduction ➢ Hot spot 2 defines the place impacted by forest reduction and climate change indirectly
Methodology of finding "Hot Spot 2"	➢ Available precipitation data is until 2008 but more data is needed. ➢ It takes more than 2 months to analyze hydraulic

Photo 5.2 Interim Workshop

After this seminar, Interim Report was revised as a Draft Final Report with the reflection of opinions and comments remarked in this workshop.

5.2.3 Wrap-up Seminar

Wrap-up seminar was held as follows:

Table 5.5 Summary of Wrap-up Seminar

Date	26th July 2019
Place	Vientiane, Lao PDR
Participants	31 Participants from MRC office, representatives of 4 NMCs, Myanmar, relevant national line agencies, relevant authorities in Japan and other stakeholders
Contents	・ Sharing the results of basin environment change by climate change and the results of analysis on forest cover maps. ・ Sharing of possible projects and programs promoting forest conservation and management to be included in the proposed best practices/recommendation. ・ Exchanging opinions related to the project formulation and follow up for the implementation.

The major result of the discussion is as follows,

Table 5.6 Major Result of Wrap-up Seminar

Item	Result
Forest cover	➢ The word of "Tree cover" is used for forest cover because plantation and agroforestry are counted as forest. ➢ Classifying of natural forest and plantation is not conducted because of differences in forest definition in each country. However, classification is needed for deep analysis in the future. ➢
Hydraulic analysis	➢ Impact and relation between deforestation and rainfall should be analyzed. ➢ Sediment data couldn't be collected so that impact of sediment couldn't be input to the river basin model. Analysis of relation between forest cover and sediment flow is important so that sediment data should be collected in the future.
Forest reduction	➢ Agroforestry may have opportunity for mitigation of deforestation .
Future activities	➢ Water quality in Mekong river is getting worse by chemical fertilizer and industry waste water from city. Monitoring and identifying of source should be implemented. Establishment of monitoring points shall be requested. ➢ Capacity building for the river basin management will be requested.

Photo 5.3 Wrap-up Seminar

5.2.4 Study Tour in Japan

Study tour in Japan will be held in order to study and strengthen the relationship for basin management and conservation. Summary is as follows,

Table 5.7 Summary of Study tour in Japan

Date	4th ~ 10th August 2019
Purpose	・ To learn Japanese engineering technologies, knowledge and experiences regarding river basin management, water source and forest conservation in Japan ・ To draw a line with these lessons to develop the implementation system and decision making for the Mekong River Basin management in the future ・ To establish a relationship between persons concerned in Japan and the invitees.
Participants	1. Mr. Nam So, Mekong River Commission (MRC) 2. Mr. Prayooth Yaowakhan, MRC 3. Mr. Chou Beang Ly, Cambodia National Mekong Committee (CNMC) 4. Mr. Phetsamone Khanophet, Lao National Mekong Committee (LNMC) 5. Mr. Panut Manoonvoravong, Thai National Mekong Committee (TNMC) 6. Mr. Tien Hong Truong, Viet Nam National Mekong Committee (VNMC) 7. Mr. Soe Myint Oo, Myanmar Forest Department, Ministry of Natural Resources and Environmental Conservation (MONREC)

Program		Activity	
		AM	PM
4th Aug.	Sun	Arrive in Tokyo, Japan. Move to the Accommodation.	
5th Aug	Mon	Kick-off Meeting ・Ice-breaking session ・Sharing of objectives and issues Venue: the accommodation	Lecture (Water and Disaster Management Bureau, MLIT) ・ Policy in Management of River Basins and Water Resources Venue: Tokyo
6th Aug	Tue	Lecture (Forestry and Forest Products Research Institute: FFPRI) ・ Sediment disaster, monitoring Venue: Tsukuba City (Ibaraki Pref.)	Lecture (ICHARM) ・ River Basin Analytical Model Venue: Tsukuba City (Ibaraki Pref.)
7th Aug	Wed	Site Visit (Minakami City) ・ Observation at “Forests for Natural Water” Venue: Minakami City (Gunma Pref.)	
8th Aug	Thu	Site Visit (Okutama Town) ・ Observation at “Ogouchi Dam” Venue: Okutama town (Tokyo)	
9th Aug	Fri	Open Seminar ・ Presentation of Performance obtained through the Project ・ Open Forum/ I Discussion Audience: 100 attendees from related agencies, private sectors etc. Venue: Tokyo	Wrap-up Discussion ・ Discussion on the Lessons thru the Study Tour Venue: Accommodation or AM’s Seminar Room
10th Aug	Sat	Move to Airport & Leave for Each Destination	

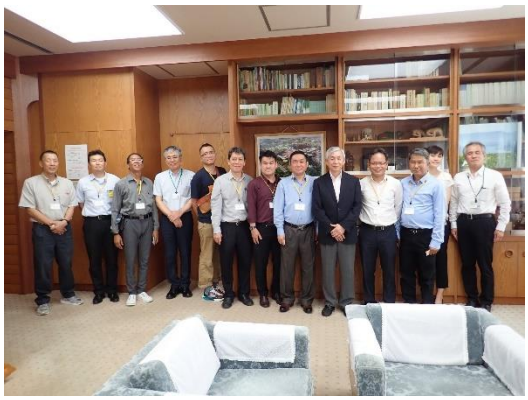
ICHARM: International Centre for Water Hazard and Risk Management, under the auspices of UNESCO

MLIT: Ministry of Land, Infrastructure, Transport and Tourism

Trough the study tour, following opinions were commented and purpose of tour was achieved.

- ✓ Experiences and knowledges of flood disaster and alert system in Japan are useful and information sharing with residents is so important.
- ✓ Experience to touch the forest function at the site was precious. Importance of forest management on the river basin management was felt.
- ✓ Concept of not only conservation of forest but also education for environment in eco-park has opportunity to be adopted in Mekong countries.
- ✓ Conservation and maintenance of water resource at the upper stream is needed in Mekong countries.

Lecture at MLIT



Visiting at FFPRI

Lecture at ICHARM

Site visit at Minakami town

Site visit at Ogouchi dam

After Open Seminar

Photo 5.4 Study tour in Japan

5.2.5 Seminar in Japan

Seminar in Japan was held in order to share the result of the Study and promote the participation of the private sector and partnership in Japan. Summary is as follows,

Table 5.8 Summary of Seminar in Japan

<table>
<tr><td colspan="3">Basin Management and Forest Conservation ～Challenge to Climate Change through Partnerships～</td></tr>
<tr><td>Date</td><td>9:00~12:30, 9th August 2019 (part of study tour in Japan)</td><td rowspan="4"> 
</td></tr>
<tr><td>Place</td><td>JICA Conference Room</td></tr>
<tr><td>Participants</td><td>Approx. 80 people from relevant Industry, Government, Academia and Embassies.</td></tr>
<tr><td>Purpose</td><td>・ To open the outputs of the Project and create interest in river basin management and environmental conservation on Mekong river basin
・ To make opportunities to utilize the knowledge of the project through the connection with public and private organization
・ To promote the recognition of MRC's role and position under the Mekong and Japan relations hip through the participants of study tour.</td></tr>
<tr><td>Program</td><td colspan="2">• Opening Remarks by JICA
• Key Note Speech "Impacts of the Changes in Climate-Water-Forest-Sediment Environment on the Mekong River Basin"
The International Centre for Water Hazard and Risk Management: ICHARM
Director Toshio Koike
• Key Note Speech "Outline of the MRC, Its Strategy, Challenges, Relationship Status with Donors, and Expectations for further Cooperation with Japan"
Mekong River Commission: MRC: Dr. So Nam
• Project Output Report
JICA Study Team: Mr. Takayuki Hatano
• Report form Mekong Countries
Cambodia National Mekong Committee: Mr. Chou Beang Ly
Lao National Mekong Committee: Mr. Phetsamone Khanophet
Thai National Mekong Committee: Mr. Panut Manoonvoravong
Viet Nam National Mekong Committee: Mr. Tien Hong Truong
Myanmar, Ministry of Natural Resources and Environmental Conservation (MONREC): Mr. Soe Myint Oo
• Private Sector Report 1
"Suntory Group's "Sustainable Water Philosophy" and Our Activities"
Corporate Sustainability Division, Suntory Holdings: Mr. Kenji Naiki
• Private Sector Report 2
"Aeon activities for sustainable society through forest activities"
Aeon Environmental Foundation: Ms. Yuriko Yamamoto
• Q&A
• Closing Remarks by JICA</td></tr>
</table>

ICHARM: Dr. Koike

MRC: Dr. So Nam

Suntory Holdings: Mr. Naiki

Aeon Environmental Foundation: Ms. Yamamoto

Photo 5.5 Open Seminar

CHAPTER 6 APPROACH AGAINST ISSUES

In this chapter, based on the results and findings in Chapters 2 to 5, the issues of forest conservation and watershed management are examined, and the solutions for each issue are described.

6.1 Forest management

6.1.1 Issues on forest conservation

6.1.1.1 Issues on deforestation and forest degradation

The respondents were interviewed on three widespread issues related to the drivers of deforestation and forest degradation in the LMB: (a) indirect factors contributing to the drivers, (b) factors that have become barriers to solving the drivers, and (c) problems that are newly generated by the drivers. The issues related to the drivers are summarized in Table 6.1**.**

Table 6.1 Issues related to the drivers of deforestation and forest degradation

1. Development other than agricultural development
1-1 (c) Illegal logging brings with it increased development activity (Lao PDR, Cambodia)
1-2 (c) Reforestation obligations stipulated in development contracts are not implemented（Lao PDR）
1-3 (c) Dam failures accompany deforestation and the forests that remain after dam failure damage will be converted into new settlements and agricultural land for the victims（Lao PDR）
1-4 (a) Coordination between sectors is insufficient (Lao PDR)
1-5 (a) Differences in recognition of forest value between sectors (Lao PDR)1-6 (c) Domestic migration of residents of development areas (Vietnam)
2. Illegal logging
2-1 (a) Lack of human resources such as rangers (Cambodia, Lao PDR, Thailand, Vietnam)
2-2 (a) Lack of equipment for patrol (Cambodia, Lao PDR, Thailand)
2-3 (a) Forest boundaries are ambiguous (Cambodia, Lao PDR, Thailand, Vietnam)
2-4 (b) Illegal logging takes place at night（Cambodia）
2-5 (b) Illegal logging groups are armed and prepared to attack (Cambodia)
2-6 (a) Lack of alternative livelihoods for the poor (Cambodia, Lao PDR, Thailand, Vietnam)
2-7 (b) Illegal logging across borders (Lao PDR, Thailand)
2-8 (b) Poor access to illegal logging sites (Lao PDR)
2-9 (b) The subdivisions with jurisdiction have difficulty in managing total wood extraction, and loopholes exist in the laws (Lao PDR)
2-10 (b) Illegal logging by foreigners (Thailand)
2-11 (a) Increased demand for domestic timber (Cambodia, Lao PDR, Thailand, Vietnam)
2-12 (a) The plantation trees are small in diameter and cannot be used as substitutes for the larger-diameter trees of natural forests (Vietnam)

3. Collection of fuelwood
3-1 (a) Population growth in natural forests (Cambodia)
3-2 (a) Collection of firewood material in natural forests (Cambodia)
3-3 (a) Increased charcoal demand in the urban areas (Cambodia)
3-4 (b) Funding shortfalls limit the implementation of plantation activities (Cambodia)
3-5 (a) Increased Energy demand due to population growth (Lao PDR, Cambodia)
4. Collection of NTFPs
4-1 (a) Burning for hunting wild animals (Cambodia, Thailand)
4-2 (a) Burning for the collection of honey (Cambodia)
4-3 (a) Burning to promote the growth of mushrooms (Thailand)
4-4 (b) Incorrect recognition of local residents for collecting NTFPs (Thailand)
5. Forest fire
5-1 (c) Worsening air pollution caused by forest fires (Thailand)
5-2 (a) Increased forest fires due to the prolonged dry season (Thailand)
5-3 (b) Financial support is needed due to difficulties in getting the local people to participate in forest fire prevention and extinction as volunteers (Thailand)
6. Conversion to agricultural land
6-1 (a) The economic poverty of local farmers is worsened by natural disasters such as increased floods, droughts, and locusts (Cambodia, Lao PDR, Vietnam)
6-2 (a) Agriculture development policy (Cambodia, Thailand)
6-3 (a) Lack of alternative livelihoods and lack of means of livelihood improvement (Cambodia, Lao PDR, Thailand, Vietnam)
6-4 (b) Existence of villages in protected areas (Cambodia, Lao PDR, Thailand)
6-5 (a) Lack of patrol and awareness-raising activities due to budget shortages (Cambodia, Lao PDR, Thailand, Vietnam)
6-6 (a) Traditional shifting cultivation in remote areas such as mountain areas (Lao PDR)
6-7 (a) Expansion of agricultural land by domestic migration (Lao PDR, Vietnam)
6-8 (a) Expansion of agricultural land accompanying the expanded development of the road network (Lao PDR, Thailand)
6-9 (a) Mechanization of agriculture (Thailand)
6-10 (a) Expansion of agricultural land by the development of factories (Lao PDR, Thailand)
6-11 (a) The falling prices of simple plantation products are impoverishing the farmers (Vietnam)
6-12 (a) Agricultural production brings in more income than forestry production (Vietnam)
6-13 (a) Increased drought (Cambodia, Lao PDR, Thailand, Vietnam)
7. River bank erosion and coastal erosion
7-1 (a) Insufficient supply of sediment downstream from the sediment deposits in the dams upstream (Vietnam)
7-2 (a) Changes in the periods and intensities of typhoons (Vietnam)
7-3 (a) Collapse of unbuilt riverbanks caused by bank protection work performed on only one side. (Lao PDR)

Source: JST

Many of these issues are common to multiple drivers (e.g., lack of funding, lack of coordination among sectors, etc.). In addition, issues arising from one driver cause other drivers to occur (e.g., the occurrence of domestic migration due to dam development causes the conversion of forest to agricultural land). Thus, the issues and drivers of deforestation and forest degradation are closely related.

6.1.1.2 Other forest-related issues in the LMB

Section 6.1.1 summarizes the issues related to the drivers of deforestation and forest degradation. The forest-related issues that the interview respondents pointed out other than the issues related to the drivers of deforestation and forest degradation are arranged in Table 6.2.

Table 6.2 Forest-related issues in the LMB other than the drivers of deforestation and forest degradation

8. Issues arising from deforestation and forest degradation
8-1 Increased occurrence of mountain disasters (Lao PDR) 8-2 Progress of soil erosion (Lao PDR, Vietnam, Thailand) 8-3 Increased occurrence of floods (Lao PDR) 8-4 Implementation of compensation for people affected by mountain disasters and floods (Lao PDR) 8-5 Decreased wildlife (Lao PDR)
9. Issues in tackling deforestation and forest degradation
9-1 Technical difficulties of reforestation on steep slopes (Vietnam) 9-2 Lack of forest data for policymaking (Thailand)
10. Issues in forestry
10-1 Land ownership conflicts with local residents (Cambodia) 10-2 Small share of the GDP held by the forestry sector (Cambodia) 10-3 Inadequate understanding of other sectors prolongs the periods required to gain profits from the forestry sector (Cambodia) 10-4 Lack of management after planting (Cambodia, Lao PDR, Thailand) 10-5 Response to increasing demand for domestic timber (Cambodia, Lao PDR, Thailand, Vietnam) 10-6 Price competition with illegally harvested timber (Lao PDR) 10-7 Lack of data for developing a forestry strategy (Cambodia, Thailand) 10-8 High transportation costs (Cambodia, Lao PDR) 10-9 Immature wood processing technology (Lao PDR, Thailand, Vietnam) 10-10 Establishment of the Value Chain for Domestic Wood Products (Thailand) 10-11 Improved productivity and quality of plantation forests (Thailand, Vietnam) 10-12 The higher income brought in by agriculture versus forestry (Vietnam) 10-13 Deflated wood price due to the oversupply resulting from improved productivity (Vietnam)

Source: JST

Issues caused by the progress of deforestation and forest degradation, issues in tackling deforestation and forest degradation, and issues in forestry promotion for realizing sustainable forest management were all pointed out as issues other than the issues related to the drivers of deforestation and forest degradation.

In addition, many of the issues listed in Table 6.1 and Table 6.2 are similar and overlapping. These issues are organized into 10 issue groupings in Table 6.3.

Table 6.3 Issue Groupings

Number	Issue grouping	Related issues
1	Policy improvement, law enforcement, and capacity development for forest sector staff	1-1, 1-2, 2-3, 2-4, 2-5, 2-7, 2-10, 10-1, 10-6, 10-10
2	Lack of funds	2-1, 2-2, 2-3, 3-4, 5-3, 6-5, 10-4
3	Capacity improvement, resilience	1-6, 2-6, 3-1, 3-2, 4-1, 4-2, 4-3, 4-4, 6-3, 6-4, 6-5, 6-6, 6-7,

Number	Issue grouping	Related issues
	enhancement, and life stability of the local people	6-11, 6-12, 8-4, 10-1, 10-2, 10-6, 10-12
4	Enhanced forest monitoring and data accumulation	1-2, 2-4, 2-5, 2-7, 2-8, 2-10, 3-1, 5-2, 9-2, 10-7
5	Increased demand for forest resources (construction wood, fuelwood, NTFPs, etc.)	2-11, 2-12, 3-1, 3-2, 3-3, 3-4, 3-5, 4-1, 4-2, 4-3, 4-4, 10-2, 10-5
6	Immature technology for forest regeneration and forestry (forestation and processing)	6-12, 9-1, 10-4, 10-8, 10-9, 10-11, 10-12
7	Lack of sectoral arrangement	1-3, 1-4, 2-3, 2-9, 6-2, 6-8, 6-9, 6-10, 6-11, 10-1, 10-3
8	Lack of cooperation between nations	2-10, 6-11, 10-8, 10-13
9	Increased occurrence of disasters (natural disasters and pollution)	5-1, 5-2, 6-1, 6-13, 7-1, 7-2, 7-3, 8-1, 8-2, 8-3, 8-4, 9-1
10	Decline of biodiversity	4-1, 4-4, 8-5

Source: JST

The issue grouping shows that one group of issues cuts across multiple problems and drivers of deforestation and forest degradation.

6.1.2 Forest-related projects that have been implemented in the LMB in cooperation with Japan

Table 6.4 summarizes activities related to the forest conservation and/or management activities that have been implemented in the LMB in cooperation with Japan since 2000. Various activities have been implemented in Cambodia, Lao PDR, and Vietnam. Thailand, now a high- and middle-income country, has been less active. Thailand has evolved from being a country that receives assistance for the solution of development-type issues to a country that receives assistance for the solution of middle-income issues.

Table 6.4 Forest-related projects that have been implemented in the LMB in cooperation with Japan

No.	Project Name	Scheme	Implementation period	Main activities
Cambodia				
1	Adviser to Support Development and Implementation of Cambodia REDD+ Strategy	Technical Cooperation (Individual Expert)	2016-2018	-Support for Readiness Phase and Implementation Phase of REDD+
2	Project for Facilitating the Implementation of REDD+ Strategy and Policy (CAM-REDD)	Technical Cooperation Project	2011-2017	-Support development of National REDD+ Strategy and capacity building of stakeholders -Design the methodology on Measurement, Reporting and Verification (MRV) of the GHG gas emission due to deforestation.
3	Adviser on Forestry Policy and Administration	Technical Cooperation (Individual Expert)	2010-2014	-Promote implementation and formation of major policy on, sustainable forest management and contribution to climate change measures, through the National Forest Program, etc.
4	The Project on Capacity Building for the Forestry Sector Phase 2	Technical Cooperation Project	2005-2010	-Promote of sustainable village resources utilization for the sake of stable living of local residents (capacity development of stakeholders and dissemination)
5	Adviser on Forest Resource Management	Technical Cooperation Project	2003-2005	- Support on Forest Policy and capacity development - Support on development of local forest plan and promotion of afforestation in local area
6	The Capacity Building for the Forestry Sector in the Kingdom of Cambodia	Technical Cooperation Project	2001-2004	- Capacity development on sustainable forest management for mainly staff of Forestry administration of Cambodia
Lao PDR				
1	The Programme for Forest Information Management	Grant Aid	2010	- Construct Forest Resource Information Center - Provide Remote Sensing equipment - Technical support on forest survey training, etc.
2	Participatory Land and Forest Management Project for Reducing Deforestation	Technical Cooperation Project	2010-2015	- Design and implement deforestation control system - Monitor Forest Coverage/ Carbon Stock and Socio-Economic situation - Formulate the project of REDD+ demonstration
3	Forest Strategy 2020 Implementation Promotion Project	Technical Cooperation Project	2006-2010	- Strengthen the capacity on management, monitoring and evaluation of staff of Department of Forestry and Forest Strategy Bureau - Support National Forest Program
4	Forestry Sector Capacity Development Project	Technical Cooperation Project	2010-2014	- Enhance the capacity on policy formulation and system design for staff of Department of Forestry - Enhance the capacity on implementation and management of policies such as forest related strategies / plans
5	Capacity Development Project for Establishing National Forest Information System for Sustainable Forest Management and REDD＋”	Technical Cooperation Project	2013-2016	- Prepare the information on forest carbon dynamics in national level and REDD+ - Design prototype of National Forest monitoring system Database - Design next national forest inventory

No.	Project Name	Scheme	Implementation period	Main activities
6	Sustainable Forest Management and REDD+ Support Project	Technical Cooperation Project	2014-2020	- Strengthen capacity about policy making and implementation of sustainable forest management - Development of National Forest Monitoring System - Strengthen capacity on REDD+ implementation and management (national and local level)
7	Forest Management and Community Support Project	Technical Cooperation Project	2004-2009	- Disseminate sustainable land and forest utilization activities in and around the project site
8	Forest. Conservation and Afforestation Project Phase2	Technical Cooperation Project	1998-2003	- Prepare forest management plan at village level - Introduce alternative livelihood activities - Improve operation skill and knowledge of local administration and staffs
Thailand				
1	Reforestation and extension techniques for forester (Phase2)	Technical Cooperation (Training in Third country)	2010-2013	Training in third country - Acquisition of knowledge about sustainable forest management by local people
2	Training for Developing Ecotourism by Utilizing Local Resources in Asian Countries.	Technical Cooperation (Country focused training)	2009-2010	- Acquisition of useful knowledge and skills for implementing ecotourism utilizing natural resources in own countries
Viet Nam				
1	Sustainable Natural Resource Management Project	Technical Cooperation Project	2015-2020	- Promote policy formulation and implementation about natural resource management - Promote sustainable forest management by implementing REDD+ action plan in provincial level - Establish comprehensive management system of important ecosystem area
2	Advisor to Forestry Program	Technical Cooperation Expert with ODA Loan	2013-2015	- Enhance capacity concerning policy formation and measure formulation of forest and natural environment fields - Promote Aid Coordination among donors in the forest and natural environment fields
3	Protection Forests Restoration & Sustainable Management Project	ODA Loan	2012－2020	- Afforest watershed conservation forests in 11 provinces in the central coastal area - Strengthen capacity on forest management of local government and local communities - Support for livelihood improvement of local residents
4	Dien Bien REDD+ Pilot Project	Incidental Technical Cooperation Project with ODA Loan	2012-2013	- Prepare implementation plan for REDD+ of the pilot area - Develop provincial MRV system - Develop options of provincial Benefit Distribution System (BDS)
6	Project for Development of the National Biodiversity Database System	Incidental Technical Cooperation Project with ODA Loan	2011-2015	- Establish the basic design of National Biodiversity Database System (NBDS) and develop the capacity of related staff - Recommendation on cooperation mechanism with other sectors of NBDS - Develop Provincial Biodiversity Database as BDS of Namdin Province

No.	Project Name	Scheme	Implementation period	Main activities
7	Project for Sustainable Forest Management in the Northwest Watershed Area	Technical Cooperation Project	2010-2015	- Confirmation of effectiveness on livelihood improvement of the local residents implementing participatory forest management through the implementation of the provincial level REDD+ action plan - Enhance the technical and institutional capacity on implementation of provincial level REDD+ action plan
8	Project for Strengthening Community-based Management Capacity of Bidoup-Nui Ba National Park	Technical Cooperation Project	2010-2014	- Establish implementation structure of Community Based Eco-Tourism (CBET) and Ecologically Friendly Livelihood Options (EFLO), and implement model project - Make consensus building on natural resource management rule of park with local residents
9	The Afforestation Planning and Implementation Capacity Strengthening Project	Incidental Technical Cooperation Project with ODA Loan	2010-2013	Strengthen capacity for planning of afforestation plans through trainings of afforestation projects with major stakeholders concerned forestry in 23 provinces.
10	The Project for Afforestation on the Coastal Sandy Area in Southern Central Viet Nam（Phase 2）	Grant Aid	2009-2015	Afforest in coastal conservation forests in central coastal provinces where difficult to plant
11	The study on potential forests and land related to 'Climate Change and forests' in the socialist republic of Viet Nam	Technical Cooperation (Development Survey)	2009-2012	Improve information about land having potential of the carbon storage promotion project by A/R CDM, REDD+ etc.
12	Advisor for Rural Development in Ca Mau Province	Technical Cooperation (Individual Expert)	2009-2011	- Strength the capacity of the governmental organization for regional development in Kamau Province - Establish and disseminate the technology of agricultural and forestry combined management
14	Support Forest Development policy implementation	Technical Cooperation (Individual Expert)	2007-2010	- Improvement of awareness and understanding of counterparts in formulation and implementation of forest related policies - Strengthen coordination of policies among donors
15	The Study on capacity development for AR-CDM Promotion	Technical Cooperation (Development Survey)	2007-2009	- Develop the capacity for A/R CDM promotion of governmental organizations - Prepare the guidebook for A/R CDM promotion and PDD draft
16	In-Country Training Course for capacity building on Nature Conservation, Environment Education and Ecotourism for Protected Areas	Technical Cooperation Project	2006-2009	- Develop the capacity related Environmental Education and Ecotourism - Draft and plan on Environmental Education and Ecotourism
17	Project on the Villagers Support for Sustainable Forest Management in Central Highland	Technical Cooperation Project	2005-2008	- Improve people's knowledge and technology on Agroforestry and Agro-Silvo-Pastoral (agriculture-forestry-pasture(livestock)) - Develop the capacity on livelihood improvement support project of administrative staff
18	Forest Fires Rehabilitation Project Ca Mau Viet Nam	Technical Cooperation Project	2004-2007	- Improve technical adjustment in reforestation project of target site - Develop the knowledge and skills on market research, and utilization and processing of Melaleuca wood, of concerned restoration project - Strengthen fire prevention system of the area

No.	Project Name	Scheme	Implementation period	Main activities
19	Project for Rehabilitation of Natural Forest in Degraded Watershed Area in the North of Vietnam	Technical Cooperation Project	2003-2008	- Develop technical research for natural forest restoration and farmland conservation in the basin - Disseminate information and demonstration of examples of afforestation technology and farmland conservation technology for natural forest restoration in the basin
20	afforestation technology development project in acid sulphate soil in the Mekong Delta	Technical Cooperation Project	1997-2002	- Develop improvement technology of acid soil - Develop technologies of selection of appropriate tree species, nursery and raising and prepare manuals - Develop model for demonstration of afforestation technology in the concerned soil condition
Other				
4	Project for Transboundary Biodiversity Conservation of Mekong Protected Forest Area (Cooperation with ITTO)	Grant Aid	2010-2011	- Introduce sustainable usage of biological resources by livelihood improvement of local residents - Enhance the capacity of stakeholders for biodiversity conservation - Improve identification and management of biodiversity priority areas
1	Third country training on reforestation and extension techniques for forester.	Technical Cooperation (Country focused training)	2007-2010	Training on afforestation and reforestation technologies, sustainable forest conservation and utilization of timbers and etc.

Table 6.5 shows the relationship between the issues organized in Table 6.3 and the JICA support organized in Table 6.4.

Table 6.5 Relationship between the issues and JICA support

No.	Issue grouping	Related JICA support	Contents of the support
1	Policy improvement, law enforcement and capacity development for forest sector staff	Cambodia: 1, 2, 3, 4, 5, 6 Lao PDR: 2, 3, 4, 6, 7, 8 Vietnam: 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15	・Support and capacity building for sustainable forest management, climate change measures including REDD +（Cambodia・Lao PDR・Vietnam）
2	Lack of funds	Cambodia: 1, 3 Lao PDR: 4, 6 Thailand: 1 Vietnam: 4, 6, 7, 10, 13, 14	・Promote access to external funds through REDD+（Cambodia・Lao PDR・Vietnam） ・Increase income source by introducing ecotourism (Thailand, Vietnam)
3	Capacity improvement, resilience enhancement, and life stability of the local people	Cambodia: 4, 5 Lao PDR: 2, 7, 8, 9 Thailand: 1, 2 Vietnam: 1, 3, 4, 6, 7, 15, 17 Other: 1	・Livelihood improvement for local people (Cambodia, Lao PDR, Thailand, Vietnam) ・Sustainable use of forest resources (Cambodia, Lao PDR, Vietnam) ・Participatory forest management (Lao PDR, Vietnam)
4	Enhanced forest monitoring and data accumulation	Cambodia: 2 Lao PDR: 2, 3, 5, 6 Vietnam: 4, 5, 10, 13	・Monitoring of forest cover and forest carbon (Cambodia, Lao PDR, Vietnam) ・Biodiversity information (Vietnam, Cambodia, Thailand)
5	Increased demand for forest resources (construction wood, fuelwood, NTFPs, etc.)	Cambodia: 5 Lao PDR: 7, 8, 9 Vietnam: 3, 8, 9, 11, 16, 17, 18	・Promotion of reforestation (Cambodia, Vietnam)
6	Immature technology for forest regeneration and forestry (forestation and processing)	Cambodia: 4, 6 Vietnam: 3, 8, 9, 11, 16, 17, 18 Other: 1	・Development of regeneration of natural forest (Vietnam) ・Selection of plantation tree species, raising seedlings and maintenance (Vietnam) ・Market research and wood processing (Vietnam)
7	Lack of sectoral arrangement	Cambodia: 3 Vietnam: 5	・Establishment of a Forest and Environment Technical Working Group (Cambodia) ・Use of a biodiversity database (Vietnam)
8	Lack of cooperation between nations	Other: 1	・Conservation of biodiversity (Cambodia, Thailand)
9	Increased occurrence of disasters (natural disasters and pollution)	Vietnam: 16	・Forest fire measures (Vietnam)
10	Decline of biodiversity	Vietnam: 1, 5 Other: 1	・Development of database (Vietnam) ・Identify important areas (Cambodia, Thailand)

Support for policy making, capacity building of forest sector staff, activities of the local people, and forest monitoring have been widely implemented in Cambodia, Lao PDR, and Vietnam, together with support for acquiring funds through REDD+ that will lead to results-based payment. Support for forest resource enhancement (reforestation and forest regeneration) and forestry promotion has been implemented on an especially large scale in Vietnam. Inter-sector and inter-country coordination, approaches to disasters, and biodiversity have been implemented partly, but few activities have been implemented widely.

6.1.3 Countermeasures on forest conservation

The forest conditions and forest policies of each country compiled in Section 3.2 indicate that each country is promoting various efforts for conservation and sustainable use of their forest. Sections 6.1.1 and 6.1.2 summarize the issues on the forest management pointed out through the field study and the activities on forest conservation supported by Japan so far. The forest conservation efforts implemented by each country and supported by Japan correspond to the issues pointed out in current LMB and should be continued in future. On the other hand, the following six activities were proposed as activities to be newly added in order to further strengthen and promote sustainable forest management and forest conservation in the future.

A. Procurement of sustainable funds for forest management and conservation
B. Implementation of activities required for monitoring and management of forest dynamics in the LMB
C. Mobilization of the private sector to engage in sustainable forest management
D. Active introduction of green infrastructure
E. Establishing a sustainable forestry system and value chain
F. Consideration on construction of sustainable use system of wood energy and conversion to alternative energy

6.1.3.1 Procurement of sustainable funds for forest management and conservation

Each LMB country is working to develop policies and programs, strengthen enforcement, and promote field activities for sustainable forest management. Japan has widely supported these policy development activities. The funds to carry out these activities, however, are in short supply, which will make it difficult to achieve all of the activities now planned. Even if a policy is well developed, it cannot achieve outcomes without the budget to carry it out. Thus, financing is an urgent precondition for achieving sustainable forest management. Meanwhile, there is also a need to reduce the cost of sustainable forest management. Table 6.6 summarizes the activities that are effective for funding and cost reduction. The progress of these activities differs among the countries. Table 6.6 includes activities that have already been implemented in some of the countries.

Table 6.6 Procurement of sustainable funds for forest management and conservation

No.	Activities	Examples of specific activities	Implementer	Related issues
A.1	Funding from domestic sources	a. Introduction of a PES (Payment for Environmental (Eco system) Service) system b. Increased tax revenue through vitalization of the forestry sector c. Improved access to the national budget by calculating the economic value of forests d. Mandatory CSR for companies that meet certain criteria	Each country	2-1, 2-2, 2-6, 4-1, 4-2, 4-3, 6-3, 6-4, 6-7, 3-4, 5-3, 6-5
A.2	Funding from overseas sources	a. Cooperation with international partners b. Promotion of REDD+ implementation and access to results-based payments (GCF, JCM, VCS, etc.) c. Access to external funds such as GCF and GEF	Each country	2-1, 2-2, 2-6, 4-1, 4-2, 4-3, 3-4, 5-3, 6-3, 6-4, 6-5
A.3	Funding as LMB Unit	a. Establishment and operation of an LMB forest and water management fund b. Procurement of donation funds through fundraising, implementation of events such as charity concerts, etc.	MRC	2-1, 2-2, 2-6, 4-1, 4-2, 4-3, 3-4, 5-3, 6-3, 6-4, 6-5

No.	Activities	Examples of specific activities	Implementer	Related issues
A.4	Cost reduction in sustainable forest management	a. Introduction of a wide-area forest monitoring system using drones b. Development of breeding technology for seedlings with high survival rates and competitive strength c. Promotion of a forest management system using ICT	Each country	1-2, 2-1, 2-2, 2-4, 2-5, 2-8, 5-3, 6-5, 6-6

Source：JST

(1) Activities related to funding from domestic sources (A.1)

As activities to raise domestic funds for forest conservation and management, Vietnam has already started to work on activities A.1.a and A.1.b. In Vietnam, the income from the Payment for Forest Environmental Services (PFES) and forestry sectors contributes significantly to the increases in forest sector income. PES systems are being implemented not only in Vietnam, but also in Cambodia, Lao PDR and Thailand on a pilot basis. The future trends in the LMB countries will have to be monitored. Each of the countries has also incorporated vitalization of the forestry sector into its forest policy. Forestry activities are explained in detail in section 6.1.2.4. As for activity A.1.c, other sectors will have to understand the function and value of forests in order to increase allocations from the national budgets. It will also be necessary to show the grounds by conducting a research like that described later in B.2.c. An example of activity A.1.d can be found in the revised Company Act[1] of India enacted in 2013. By legally requiring CSR activities, it will be possible to obtain an income source for sustainable forest management and forest conservation. In either case, the first priority for accessing domestic funds is to get the other sectors to understand. Coordination among sectors and the presentation of evidence such as data to promote policy decisions are required for this purpose.

(2) Activities related to funding from overseas (A.2)

Funding from overseas is already being sent into the four countries. Various international organizations, including some in Japan, are supporting the preparation and implementation of the REDD + scheme. For the GCF, Vietnam has already obtained funding for mitigation and adaptation projects in the Mekong Delta. In order to take advantage of these opportunities for access to external funds, it will be necessary to develop human resources who can grasp trends in international funds and prepare proposal documents for fund acquisition.

Green Climate Fund（GCF）

The GCF was set up by the 194 countries who are parties to the United Nations Framework Convention on Climate Change (UNFCCC) in 2010, as part of the Convention's financial mechanism. GCF aims to catalyze a flow of climate finance to invest in low-emission and climate-resilient development. The Fund has identified 8 impact areas that will deliver major mitigation and adaptation benefits and aims for a 50:50 balance between mitigation and adaptation investments.

[1] THE COMPANIES ACT, 2013 http://www.mca.gov.in/Ministry/pdf/CompaniesAct2013.pdf

■ Fund: 10.3 billion USD（Pledged）

■ Impact areas:

Mitigation (Low-emission development)	Adaptation (Climate-resilient development)
1 Low-emission energy access and power generation	5 Enhanced livelihoods of the most vulnerable people, communities, and regions
2 Low-emission transport	6 Increased health and well-being, and food and water security
3 Energy-efficient buildings, cities, and industries	7 Resilient infrastructure and built environment to climate change threats
4 Sustainable land use and forest management	8 Resilient ecosystems

According to the GCF website[2], by end of August 2019, there were 111 projects in the GFF portfolio. In addition, 5.2 billion USD (Mitigation 42%, Mitigation-Adaptation Cross-Cutting 34%, Adaptation 24%) has already been allocated for GCF projects.

■Projects approved in the LMB

- ✓ Improving the resilience of vulnerable coastal communities to climate-change-related impacts in Vietnam
- ✓ Scaling Up Energy Efficiency for Industrial Enterprises in Vietnam
- ✓ Climate-Friendly Agribusiness Value Chains Sector (Cambodia)

The pilot programme for REDD+ results-based payments

This program was launched by GCF as a pilot programme to pay for emissions reductions from REDD + activities in 2017. By meeting the 4 elements (Development of NRS, NFMS, FRL, and SIS) reflected in decision 1/CP.16 by UNFCCC, and submitting BUR, a country can submit the proposals for REDD+ results-based payments. Once a proposal has been reviewed and approved, payments will be made according to the amount of emission reductions achieved.

■ Size of funding Maximum amount of 500 million USD

■ Financial valuation of results 5USD/tCO_2

■ Allocation of payments 30% of the total payable volume (30 $MtCO_2$) per Country

■ Expected number of countries for payment Around 10 countries

■ Eligibility period for results 2014-2018

■ Application Period Submit a results-based payment proposal to GCF by 2020

The following shows the status of preparations of the four requirements for REDD+ and the BUR in LMB countries.

	NRS	NFMS	FRL	SIS	BUR
Cambodia	○	○	○	Under development	–
Lao PDR	△（draft）	○	○	Under development	–
Thailand	–	–	–	–	–
Vietnam	○	○	○	○	–
Myanmar	△（draft）	○	○	△（draft）	–

[2] GCF website https://www.greenclimate.fund/home4

(3) Activities related to funding as an LMB Unit (A.3)

Funding as an LMB Unit is an activity to access funds for forest management and conservation as a regional unit. Note that funding as an LMB unit does not compete with funding by the countries individually. Activity A.3.a is a way of introducing a scheme modeled on Japan's Green Fund[3] into the LMB. Activity A.3.b is as a way of introducing the funds necessary for watershed forest conservation by enhancing PR activities for LMB conservation.

(4) Activities related to cost reduction in sustainable forest management (A.4)

Along with funding for sustainable forest management and forest conservation, it will also be important to reduce the costs. Entities in Japan are researching ways to reduce the labor for forest management by introducing ICT and AI technology, improving seedlings technology, etc. It will be necessary to promote the construction of a low-cost sustainable forest system in the LMB while utilizing these technologies. These technologies can also contribute to the discovery of remote areas, inaccessible areas, and illegal logging at night, as well as the detection of armed illegal logging groups from safe remote locations.

6.1.3.2 Implementation of activities required for monitoring and management of forest dynamics in the LMB

Forest dynamics are currently being monitored on a country basis. No cross-border monitoring on an LMB-wide basis has been conducted so far. Thus, the forest resource dynamics of the LMB have not been accurately identified. When soil erosion occurs due to deforestation and forest degradation, the soil will cross the border and deposit in rivers and dams. These soil deposits will then degrade dam function and lead to the occurrence of floods. The monitoring of forest dynamics of the basin as a whole is therefore important for basin management. Dam development implemented as a component of basin development has also been pointed out as a factor underlying deforestation and forest degradation. Deforestation and forest degradation associated with basin development need to be understood and addressed with active measures in not only the forest sector, but also the basin management sector. Note that a system established to cope with deforestation and forest degradation in both the basin management sector and forest sector can serve as a model of inter-sector collaboration, thus remedying an area currently considered insufficient. The activities required for the monitoring and management of forest dynamics in the LMB are summarized in Table 6.7.

[3] National Land Afforestation Promotion Organization http://www.green.or.jp/english/green_fund/

Table 6.7 Activities required for the monitoring and management of forest dynamics in the LMB

No.	Activities	Examples of specific activities	Implementer	Related issues
B.1	Forest cover monitoring in the LMB	a. Implementation of forest cover monitoring with a unified forest definition in the LMB b. Monitoring of forest degradation in the LMB c. Grasping of data on forest fires and illegal logging in the countries of the LMB	MRC	2-5, 2-7, 2-10, 7-3
B.2	Accumulation of scientific knowledge for sustainable LMB Management	a. Accumulation of forest cover monitoring data b. Accumulation of scientific knowledge on forest hydrology and soil erosion from the forests in the LMB c. Research and calculation of the monetary value of forest functions that can be quantitatively evaluated	MRC / Each country	1-4, 1-5, 6-2 6-10, 7-1
B.3	Monitoring of development projects in the LMB	a. Monitoring of the implementation status of reforestation activities required under contracts with companies b. Disclosure of social and environmental impact assessment reports for development projects c. Strengthened monitoring of illegal logging when hydropower dams are constructed.	MRC / Each country	1-1, 1-2, 1-3, 1-6, 6-8, 6-10
B.4	Development of a database platform to disclose information	a. Disclosure of monitoring results and the information grasped through monitoring b. Assured transparency of development through information disclosure on LMB Development	MRC / Each country	1-1, 1-2, 1-3 1-6,
B.5	Recommendation and activity support for individual countries and companies	a. Recommendations and warnings to countries and companies based on the results of monitoring and data collection b. Corrective advice and guidance when inappropriate behavior is detected by monitoring. c. Support for countries and companies in their activities to develop LMB sustainably	MRC	1-1, 1-2, 1-3, 1-4, 2-7, 2-10, 6-2, 6-8, 6-10, 7-1, 7-3

Source: JST

(1) Activities related to forest cover monitoring in the LMB (B.1)

To monitor the forest dynamics in the LMB continuously, the monitoring and data collection activities should be continued using the information collected and forest cover map developed in this study. It will be especially important to also monitor the forest degradation, an activity that was not conducted in this study.

(2) Activities related to the accumulation of scientific knowledge for sustainable LMB Management (B.2)

The scientifically based policymaking data for Basin Management and forest management in the LMB is to include not only the information collected in activity B1, but also the data and scientific findings on the basins accumulated by MRC integrated with data on Mekong Basin Conservation studied by academic institutions in LMB region. These data will be organized to provide a scientific basis for the recommendation to be developed as activity B5.

(3) Activities related to the monitoring of development projects in the LMB (B.3)

At present, the forest sectors of the respective countries are the only entities working to reduce illegal logging associated with watershed development. The forestry sectors are also working to improve the tendency of companies not to implement the reforestation activities required under development contracts. The basin management sector has detailed information on basin development projects. Sharing this information with the forest sector will make it possible to take more effective measures against deforestation and forest degradation. As part of the overall sustainable watershed management effort, the watershed sector should join the forestry sector in managing the deforestation and forest degradation associated with development projects in the LMB. The monitoring system should be strengthened through cooperation between the watershed management sector and forest sector in tackling deforestation and forest degradation.

(4) Activities related to the development of a database platform to disclosure information (B.4)

It will be important to build a data platform to disseminate the information obtained in B1 to B4 in order to ensure the transparency of policy decisions and widely provide information for sustainable basin development. This activity can also be expected to mobilize the private sector to perform the sustainable forest management described later in 6.1.2.3. The spread of ESG investing in recent years has focused the efforts of companies into the environment (E), society (E), and governance (G). Companies are thus trying to collect relevant information on the local environment and society in order to better address them. Japanese companies working in the LMB, however, have reported difficulties in obtaining sufficient information on the environment and society in the region. Accumulating and disclosing information related to watershed environmental conservation will contribute not only to the decision-making of government officials but also to the activities of companies working on ESG.

(5) Activities related to recommendations and activity support for each country and company. (B.5)

Through the monitoring and data collection processes, it will be necessary not only to gather data, but also to point out ways to improve and correct the activities of each country and company from the viewpoint of basin management. If there are independent financial resources, it will be possible to offer funds for correcting the activities of each country and/or local government. If it becomes possible to not only make recommendations but also support funding, the recommendations will have greater influence. It will thus be desirable to obtain sustainable funding as an LMB unit as proposed in A3 of 6.1.2.1.

6.1.3.3 Promotion of private sector participation in sustainable forest management

The forest conservation activities conducted so far have been implemented mainly by the governments, local residents, NGOs, international partners, etc. Participation from the private sector has mainly focused on industrial tree plantation and a number of CSR activities. On the other hand, the activities that lead to deforestation and forest degradation, namely, development projects, illegal timber exportation, and

agricultural production, are largely linked to the activities of the private sector. The participation and cooperation of the private sector are therefore required for the control of the deforestation and forest degradation stemming from these private sector activities. With the spread of ESG investing and increased interest in SDGs in recent years, company forests and other "Zero Deforestation" efforts are growing. Prompt efforts with the private sector to establish a balance between sustainable economic activities and environmental management can create new strength and value for the LMB as a sustainable market. Activities to promote private sector participation in sustainable forest management activities based on these trends are summarized in Table 6.8.

Table 6.8 Promotion of private sector participation in sustainable forest management

No.	Activities	Example of specific activities	Implementer	Related issues
C.1	Promotion and utilization of CSR	a. Establishment of a CSR contact point within forest and/or basin management government agencies b. Matching of CSR activities based on government strategies and plans	MRC / Each country	2-2, 2-6, 3-4, 6-3, 6-7, 6-9, 6-10
C.2	Support of sustainable efforts by the private sector	a. Establishment of opportunities for dialogue and opinion exchanges with companies b. Clarification of forest classifications, forest boundaries, and land ownership c. Establishment of a production and transportation system for raw materials that are not required for deforestation d. Differentiation of raw materials that are not required for deforestation (establishment of a certification system, issuance of certificates, support for certification acquisition, etc.) e. Construction of an information platform for companies and provision of information and consultation services	MRC / Each country	3-2, 3-5, 6-2, 6-9, 6-10 . 6-11, 6-12
C.3	Introduction of an award system	a. Evaluation of the efforts of companies to conserve the environment and forests b. Commendation of companies that have contributed to the conservation of forests and the environment	MRC / Each country	2-4, 2-5, 2-7, 2-10, 3-2, 6-9, 6-10, 6-11

Source: JST

(1) Activities related to the promotion and use of CSR (C.1)

CSR has already been implemented in the LMB countries. In Thailand, the RFD and DNP coordinate the plantation activities conducted as private sector CSR efforts. In Vietnam, meanwhile, an environmental education activity started by a company in the name of CSR earned high praise and the support of the Ministry of Education and Training in Vietnam. On the other hand, many of the CSR activities currently being conducted are implemented by companies alone. To effectively utilize company CSR activities, it will be necessary to establish a coordination mechanism for activities. The first steps toward this end will be to set up opportunities for dialogue with companies and understand the kinds of information and support that companies engaged in sustainable activities need.

(2) Activities related to the support of sustainable efforts by the private sector (C.2)

Companies that are starting to build sustainable company activities are developing raw material procurement policies. Steps to prepare and support an environment for the activities of these companies will attract top companies that are already promoting sustainable activities and consistently show concern for the environment. Efforts to consider the environment will increase when companies that carry out activities focused on the environment, etc. are brought together, which in turn will lead to the sustainable development of the LMB. To provide companies with the information they want, the information that is accumulated in the LMB and that can be provided in the four countries of the region will have to be organized. To satisfy sustainable procurement by companies, it will also be necessary to establish a production system for raw materials that are not required for deforestation and forest degradation, and to ensure the traceability of the materials produced by the system. Companies are struggling with sustainable procurement because of the many challenges associated with these activities. Promoting the establishment of a sustainable market with companies is an advanced effort. With success, sustainable procurement will be a new strength of the LMB.

(3) Activities related to the introduction of an award system (C.3)

In the interviews with private companies, it was pointed out that when companies engage in sustainable activities, reaching consensus within a company is the first barrier. Although the spread of ESG investing in recent years has made it easier to gain an understanding of these efforts, assessing the efforts of companies and implementing awards will incentivize companies to engage in sustainable activities. And by establishing such an award system, it will be possible to disseminate a high interest in sustainable efforts in the LMB.

ESG investing

ESG investing is an investing method that considers not only financial information such as financial statements and financial results, but also non-financial information on matters such as the environment, society, and governance in the selection process of investment. It spread as a new index by which to measure the investment value of a company after being advocated the Principles for Responsible Investment (PRI) as an action to be taken by investors in 2006. ESG investing is based on the idea that emphasis on the environment, society, and governance leads to sustainable company growth and medium- and long-term returns while reducing investment risks that cannot be discerned from conventional financial indicators.

Zero Deforestation

According to an FAO report[4], large-scale commercial agriculture and subsistence agriculture accounted for 73 % of the deforestation in tropical and subtropical countries. This fact points to the fundamental necessity of halting deforestation while simultaneously enhancing food security for all. In recent years, there is a growing trend at the global level to voluntarily commit toward a deforestation-free supply chain involving commodity crops, known as 'Zero Deforestation'. The Consumer

[4] 2016 State of the world's forests (FAO) http://www.fao.org/3/a-i5588e.pdf

Goods Forum, an initiative established in 2009 with the participation of more than 400 retailers, manufacturers, service providers, and other stakeholders across 70 countries, including some of the world's biggest companies, committed to zero net deforestation by 2020 for palm oil, soy, beef, and paper and pulp supply chains. In 2014, the New York Declaration on Forests was endorsed at the United Nations Climate Summit. The declaration sets targets to 'cut natural forest loss in half by 2020, and strive to end it by 2030,' and to 'support the private sector in 'eliminating deforestation from the supply chains of major agricultural commodities by 2020.'

6.1.3.4 Active introduction of green infrastructure

Although there has been no uniform international definition for "green infrastructure" in recent years, the term is equated with "the idea of using the functions of the natural environment to solve various problems in society." The green infrastructure concept has been widely disseminated and promoted in Japan, EU countries, the United States, and elsewhere. Ecosystem-based Disaster Risk Reduction (Eco-DRR) has been an object of focus as one of the green infrastructures. The multifaceted functions of forests are known to contribute to mountain disaster control, flood alleviation, etc. One Eco-DRR practice will be to utilize these multifaceted functions of forests. Even before Eco-DRR was proposed, Japan made efforts to control mountain disasters and mitigate floods by exploiting the function of forests. Technologies related to Eco-DRR have been accumulated in the process. Increasing damage caused by floods, drought, air pollution, and riverbank and coastal erosion has been reported from many places in the LMB. Under these circumstances, the introduction of Eco-DRR concepts and technologies accumulated in Japan into the LMB will remedy forest functions through forest conservation and restoration. When this is accomplished, the region is expected to withstand the impacts of climate change and natural disasters more resiliently. Table 6.9 summarizes the Eco-DRR functions of the forest and the activities undertaken to exploit those functions.

Table 6.9 Active introduction of green infrastructure

No.	Activities	Examples of specific activities	Implementer	Related issues
D.1	Strengthening of the prevention of mountain disasters and soil preservation	a. Expansion of forests and root forest networks by reforestation and restoration in deforested areas b. Management measures for healthy forests such as thinning for artificial forests c. Installation of structures such as erosion control dams d. Reduction of bare land areas by the introduction of early greening technology	Each country (northern Lao PDR, Central Highlands in Vietnam)	6-1, 6-13, 6-14
D.2	Improvement of watershed protection (water resource storage, water purification, etc.)	a. Identification of watershed forests b. Conservation and restoration of forests to improve the watershed preservation function c. Appropriate forest maintenance measures such as thinning to improve the watershed preservation function d. Promotion of rainfall penetration by revegetation of bare land and bare slopes	MRC / Each country	6-1
D.3	Utilization of the damage	a. Alleviation of floods by the establishment and maintenance of detention basins	MRC / Each	5-1, 6-1, 7-2

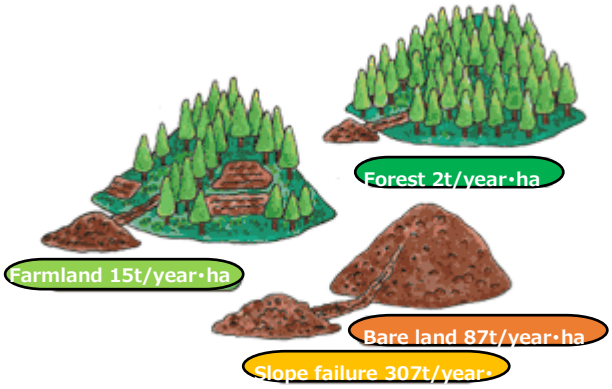
No.	Activities	Examples of specific activities	Implementer	Related issues
	mitigation function for disaster control	b. Mitigation of storm surges by developing coastal forests (watershed forests) c. Utilization of the air-purification function of forests by expanding green areas within urban and industrial areas	country	

Source：JST

(1) Activities related to strengthened prevention of mountain disasters and soil preservation (D.1)

Rises in the occurrence of mountain disasters were pointed out in the mountainous areas of northern Lao PDR and the Central Highlands of Vietnam, etc. Mountain disasters will have to be prevented by restoring forest vegetation and exploiting the surface collapse prevention function. The introduction of structures such as erosion control dams should also be considered, in addition to forests, when the soil quality and topographical conditions require it.

Next, regarding soil conservation, many slope failures and road slopes are left as bare slope in the LMB. Soil erosion proceeds when slopes are left bare. Figure 6.1 shows the variation in the amount of soil erosion on slopes with variable levels of vegetation. The soil erosion on slopes can be suppressed by early greening measures such as the introduction of herbaceous plants. Appropriate technologies to conserve soil by early greening will have to be introduced and disseminated.



Source: Maruyama Ganzo, "Forest Hydrology" (1970, University of Practical Forestry)

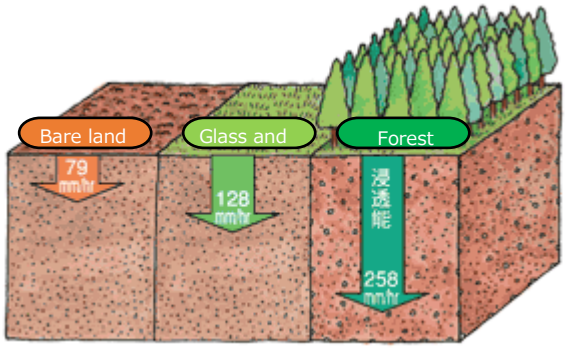
Figure 6.1 Difference in soil erosion amount due to the presence of vegetation[5]

(2) Activities related to improved watershed protection (water resource storage, water purification, etc.) (D.2)

Establishing a healthy forest improves the watershed protection capacity of the forest, as well as the mountain disaster prevention function and soil conservation function. In view of this, it will necessary to identify forests that are particularly important for the preservation of LMB as watershed forests and to promote their restoration and appropriate conservation. And as shown in Figure 6.2, the presence of vegetation affects the amount of rainfall penetrating into the soil. It thus becomes important to reduce

[5] Average of measured value in the slope where inclination is more than 13°

the amount land that is left bare.



Source: Hiroshi MURAI and Yuaku IWASAKI: Studies on the Water and Soil Conservation Function based on Forest Land (1975)[6]

Figure 6.2 Difference in the amount of water penetration into the soil due to the presence of vegetation

(3) Activities related to the use of the damage mitigation function for disaster control (D.3)

The multifaceted functions of forests include not only mountain disaster prevention and watershed protection, but also the control and mitigation of various disasters and damage of various forms through mechanisms that protect against wind, tides, sand, sound, air pollutants, etc. The effective use of forests to alleviate natural disasters and pollution must be considered.

6.1.3.5 Establishing a sustainable forestry system and value chain

With the increasing demand for timber in the LMB countries, it will be necessary to strengthen timber production and establish a sustainable timber supply system in order to conserve natural forests. In addition, the increase in timber production and activation of the forestry sector is expected to return funds to the forest sector, which in turn will facilitate the smooth implementation of other sustainable forest activities. Vietnam serves as an example in the good practices of forest industry development. The forest product processing industry in Vietnam had developed rapidly and stably in recent years, not only meeting domestic demand for wood products but also moving towards sustainable exports. Some 5,000 companies are now involved in the production and processing of wood products in Vietnam. In 2018, the country's exports of wood and forest products reached 9.4 billion USD. In order to vitalize sustainable forestry, it first becomes necessary to create plantations that will be able to supply sustainable resources. In Cambodia and Lao PDR in particular, no large-scale reforestation projects have been implemented so far. Table 6.10 shows the activities undertaken to meet the domestic and international demand for forest resources and promote the growth of the forestry sector under the current circumstances.

[6] Studies on Function of Water and Soil Conservation based on Forest Land
https://www.ffpri.affrc.go.jp/pubs/bulletin/251/documents/274-2.pdf

Table 6.10 Establishing a sustainable forestry system and value chain

No.	Activities	Examples of specific activities	Implementer	Related issues
E.1	Development of a forestry production Strategy	a. Domestic and international timber demand analysis and timber production plan formulation b. Building wood supply chains and value chains	Each country	2-6、2-9、2-11、2-12、6-3、6-11
E.2	Strengthening of timber production	a. Implementation of reforestation and appropriate management according to purpose (fast growing tree production, large diameter wood production etc.) b. Improvement of seedling production technology such as methods to produce seedlings with high survival rates c. Study on cost reduction in plantation forest management d. Improvement of the productivity and quality of plantation forests e. Growth management of plantation forests using ICT	Each country	2-6、2-11、2-12、6-3、6-12
E.3	Efficient use of timber	a. Promotion of the cascade use of wood - Stems as construction wood - Small-diameter logs and branches as chips for pulp -sawdust for wood pellets - bark as fuel b. Improvement of processing technology for small-diameter wood	Each country	2-6、6-3、3-3、3-5、6-12
E.4	Adding value to timber products	a. Introduction and improvement of wood processing technology b. Promotion of added value by acquiring certification, etc.	Each country	2-6、6-3、6-12

Source：JST

(1) Activities related to the development of forestry production strategy (E.1)

Respondents from each LMB country interviewed pointed out that domestic timber demand is increasing. Despite the increase in demand, the timber is not currently sold at a high price. In the case of the Vietnam Mekong delta, the decline in timber prices accompanying the higher timber supply stemming from the improved productivity of plantations has become a problem. Thailand, meanwhile, is working on wood processing to add value to harvested wood but faces difficulty in developing a new market for its products.

Going forward, reforestation activities for achieving the forest targets are very likely to be expanded in Cambodia and Lao PDR. It will be necessary to select reforestation species and manage the planation while anticipating future uses of timber, in order to both increase the forest rate and activate the forestry industry. It will also be important to take measures to advance strategic forestry, including the establishment of supply chains and value chains in the LMB countries.

(2) Activities related to the strengthening of timber production (E.2)

Interview respondents from Cambodia and Lao PDR pointed out that it has been very difficult to secure budget for management after planting. Some of the planted areas have in fact seen a lack of maintenance of planted trees. While the plantation areas operated by forestry companies in Thailand and Vietnam are sufficiently managed, some of the plantation areas planted by local residents in those countries are not. The production of large-diameter trees has been pointed out as a challenge in Vietnam.

It will be necessary to realize a timber production system designed by purpose, by introducing appropriate forestry technology and training human resources.

(3) Activities related to the efficient use of timber (E.3)

In order to improve the profitability of the forestry sector, it will be important to establish a system that uses the produced wood as much as possible. Regarding small-diameter timber produced in the process of growing plantations such as thinning timber, it will be necessary to develop technologies and a production system that can be used with as much value added by processing, etc. as possible

(4) Activities related to adding value to timber products (E.4)

Various approaches are taken to add value to the produced wood, such as processing within the country, acquiring certification, etc. With regard to wood certification in particular, the demand has been increasing in recent years mainly in Europe. The acquisition of wood certification is therefore being promoted In Vietnam, where the export of timber products to international market is expanding. The acquisition of FSC certification is also recommended in Thailand. The acquisition of wood certification creates added new values for wood, and in particular facilitates access to international markets. Table 6.11 summarizes the status of acquisition of FSC certification in the LMB countries. FSC certification is a useful step to improve competitiveness by increasing the value of the wood produced.

Table 6.11 Status of acquisition of FSC certification in LMB countries

Country	FSC		Chain of Custody (CoC) certificates
	Area (ha)	certificates	
Cambodia	7,896	1	4
Lao P.D.R	18,428	3	2
Thailand	76,051	19	188
Vietnam	206,166	45	746
Myanmar	―	―	5

Source: FSC[7]

[7] FSC worldwide website https://ic.fsc.org/en

6.1.3.6 Consideration on construction of sustainable use system of wood energy and conversion to alternative energy

Interview respondents from Cambodia pointed out that deforestation and forest degradation due to the collection of fuelwood are particularly serious. The problem largely stems from the collection of fuelwood from natural forests. This problem should be addressed by establishing a sustainable fuelwood supply system through either the prompt establishment of fuelwood forest or the introduction of alternative energy to control the demand for fuelwood, or both. Table 6.12 outlines such systems.

6.1.3.7 Table 6.12 Consideration on construction of sustainable use system of wood energy and conversion to alternative energy

No.	Activities	Examples of specific activities	Implementer	Related issues
F.1	Sustainable energy use by local residents	a. Development of a sustainable fuelwood forest plan b. Establishment of a fuel forest c. Dissemination and awareness-raising on the sustainable use of fuelwood forests d. Introduction of alternative cooking energy such as solar cookers	Each country（Cambodia）	3-2, 3-3, 3-4, 3-5, 5-1
F.2	Ensuring the sustainability of fuelwood for industrial use	a. Grasp the amount of fuelwood used at factories. b. Promote and/or mandate the creation of fuelwood forest to secure the sustainability of firewood use c. Examine conversion to solar energy, etc.	Each country（Cambodia）	3-2, 3-3, 3-4, 3-5, 5-1

Source: JST

(1) Activities related sustainable energy use by local residents (F.1)

In order to prevent the deforestation and forest degradation of natural forests stemming from the collection of fuelwood, there is an urgent need to establish fuelwood forests that can meet the rising demand for fuelwood as the population grows. It will also be important to join with residents, the users, to establish a system for the sustainable utilization of the fuelwood forest to be newly developed. At the same time, it will be effective to consider the introduction of an alternative cooking energy, such as solar cookers, in order to suppress the use of fuelwood.

(2) Activities related to ensuring the sustainability of fuelwood for industrial use (F.2)

For factories that use forest-derived energy, it will be necessary to take thorough steps to ensure that they never use the fuelwood collected from forests designated for preservation, such as natural forests. This can be done by grasping the amount of fuelwood to be used, establishing a fuelwood forest that can supply the needed amount of fuelwood, and promoting the conversion to alternative energy use, etc.

These activities should be linked with the activities shown in C.2. In constructing a sustainable industrial structure, enhancing the feasibility of these activities will facilitate both forest conservation and the sustainability of company activities.

6.1.4 Proposal on Forest Conservation

Based on the activities organized in Table 6.13, programs recommended for implementation in the LMB are proposed below.

Table 6.13 Basin forest monitoring programme

Proposed programme 1	Basin Forest Monitoring in the LMB
Overview	Introduce the basin forest monitoring function to MRC and establish a sustainable basin forest monitoring structure.
Proposal background	The need for basin forest management（ ☞ 6.1.2.2）
Target area	LMB, Basin-wide
Implementing agency	MRC Environment Management Division and Technical Support Division
Objectives	・For the purpose of sustainable basin management, grasp the forest dynamics of the LMB and make recommendations to each country on the forest conservation and regeneration measures necessary from the viewpoint of basin management. ・The basin management sector takes responsibility for unplanned deforestation and forest degradation associated with basin development and strictly ensures that contracted development companies carry out the reforestation and forest regeneration activities required to compensate for the planned deforestation taking place through development.
Contents of the activities	・Forest cover monitoring in the LMB（☞6.1.3.2 B.1） ・Accumulation of scientific knowledge for sustainable LMB Management（☞6.1.3.2 B.2） ・Monitoring of development projects in the LMB（☞6.1.3.2 B.3） ・Development of a database platform for information disclosure（☞6.1.3.2 B.4） ・Recommendations and activity support for each country and company（☞6.1.3.2 B.5） ・Funding as an LMB Unit（☞6.1.3.1 A.3）
Related policies	・MRC Strategic Plan 2016-202 Key Result Area 3: Better monitoring and communication of the basin conditions ・Siem-Reap –Declaration 23 Priority area ‘Strengthening the MRC basin-wide monitoring networks and forecasting systems for floods and droughts and the data and information management systems underpinning them’
Expected effects	・Prevention of sediment deposition in rivers and dams by controlling the sediment loss caused by deforestation and forest degradation ・Realization of cooperative management in the basin sector and forest sector for the deforestation and forest degradation caused by dam development, etc. ・Expansion of resources for basin forest management
Expected contributions from Japan	・Japan has rich experience in supporting forest monitoring systems. Japan’s technology and knowledge can be used to introduce the basin forest monitoring system. ・Japan can provide advice based on its knowledge of the Green Fund established in Japan.
Strengths	·The implementation of basin forest monitoring by MRC, an intergovernmental organization established to promote and coordinate sustainable management and development of water and related resources. MRC will show high interest in sustainable basin management and have a high impact on the relevant agencies. ・MRC already has a data portal that can be used to store and transmit collected data and information. ・MRC has information on dam development that the forest sector lacks. Through the sharing of this information, more effective measure can be implemented to reduce deforestation and forest degradation due to dam development.
Weaknesses	・There are no forest experts at present in MRC, so it will be necessary to secure human resources. ・Operation funds will be needed to gain the understanding of the respective countries and sectors. For that purpose, it will be necessary to present a system by which MRC can surely contribute to forest management and coordination among the related organizations. ・Fund management requires the establishment of a transparent fund management system.
Feasibility	Moderate (The feasibility depends on MRC’s level of interest.)

Source: JST

Table 6.14 Natural forest conservation and enhancement program

Proposed programme 2	Natural forest conservation and enhancement program
Overview	To grasp the status of natural forests currently existing in the LMB countries and to construct a sustainable conservation system involving the private sector.
Proposal background	・Forest resources are decreasing in the LMB, while forest degradation is progressing. The state of forest degradation has yet to be accurately identified in some LMB countries. (☞ 3.2.1 Status of the forests in LMB countries) ・In the international community, the "New York Declaration on Forests" adopted in 2014 sets the goal of "cutting natural forest loss in half by 2020, and striving to end it by 2030."
Target area	LMB countries
Implementing agency	Forest sector of each country
Objectives	・Accurately grasp and monitor the natural forest conditions in each LMB country. ・Establish a cooperation system with the private sector for the control of natural forest decline and degradation. ・Promote the conservation and regeneration of natural forests.
Contents of the activities	・Forest cover monitoring in the LMB（☞6.1.3.2 B.1.b） ・Procurement of sustainable funds for forest management and conservation（☞6.1.3.1 A） ・Support of sustainable efforts by the private sector（☞6.1.3.3 C.2） ・Sustainable energy use（☞6.1.3.6 F）
Related policies	・Forest policy of each country (☞ 3.2.1 Status of forests in the LMB countries) ・NY Declaration on Forests
Expected effects	・An accurate understanding of the status of deforestation and forest degradation and the provision of data ・Reduced deforestation and forest degradation of natural forests caused by farmland and plantation ・Reduced deforestation and forest degradation of natural forests caused by the collection of fuelwood
Expected contributions from Japan	・Japan has experience in supporting forest monitoring systems. Japan's technology can thus be applied to the development of forest degradation monitoring systems. ・ Japan imports products affected by deforestation and forest degradation in the LMB such as sugar, rubber, cassava, coffee, clothing, etc. Japanese companies are also required to participate and cooperate in building a sustainable production system for these products.
Strengths	・ The conservation of natural forests has attracted attention as an international issue in recent years. The proposed programme can facilitate the participation of the private sector. ・REDD is progressing in Cambodia, Lao PDR, and Vietnam, countries that have higher potential to receive results-based payments from emission reduction activities.
Weaknesses	・Deforestation in Thailand and Vietnam in recent years has been suppressed. It will thus be difficult to receive results-based payments in large amounts as financial resources for sustainable forest management. ・Private sector approaches to sustainable sourcing are just beginning and still lack good practices to which to refer.
Feasibility	Moderate

Source: JST

Table 6.15 LMB Green Infrastructure Program

Proposed programme 3	LMB Green Infrastructure Program
Overview	Promote the Eco-DRR function of disaster prevention and mitigation functions by forests and green areas and enhance the resilience of the LMB to climate change.
Proposal background	・An increase in floods and mountain disasters has been pointed out in the LMB. (☞6.1.2.4) ・Mitigation of and adaptation to climate change are international issues. Forest expansion and sustainable management will serve as mitigation and adaptation measures against climate change. ・Every forest technology is replaceable by other technologies, but no one technology can replace all of the multifaceted functions of forests.
Target area	LMB countries / MRC
Implementing agency	MRC and the forest sector and disaster management sector in each LMB country
Objectives	・Strengthened of resilience to disasters ・Reduced mountain disasters and soil erosion in mountainous areas ・Reduced carbon dioxide emissions through the expansion of forests and green areas ・Mitigation of air pollution
Contents of the activities	・Strengthening of soil preservation and the prevention of mountain disasters（☞6.1.3.4 D.1）

	・Improvement of watershed protection (water resource storage, water purification, etc.)（☞6.1.3.4 D.2） ・Utilization of the damage mitigation function against disasters（☞6.1.3.4 D.3） ・Accumulation of scientific knowledge for sustainable LMB Management（☞6.1.3.2 B.2）
Related policies	・The forest policy, climate change policy, and disaster management policy of each country ・Sendai Framework for Disaster Risk Reduction 2015-2030
Expected effects	・Reduction and mitigation of floods by controlling sediment deposition ・Prevention of mountain disasters ・Mitigation of air pollution and water pollution ・Enhancement of the forest carbon stock
Expected contributions from Japan	・Support for the restoration of forests, especially in mountainous areas, and technology transfer ・Technology transfer for erosion control and the prevention of mountain disasters ・Support for accumulating knowledge on forest and basin conservation
Strengths	・Conserving and expanding forests: Eco-DRR will benefit not only the disaster prevention function, but also climate change mitigation and biodiversity conservation. ・Technology accumulated in Japan can be effectively utilized.
Weaknesses	・Even if technology for the prevention of mountain disasters is transferred, shortfalls in implementation budgets in the target countries will make is difficult to disseminate the technology as long as the problems to be addressed go unrecognized. ・When Eco-DRR practices are implemented, the implementers must understand that forests cannot prevent and mitigate all disasters completely. ・When actually carrying out the work on mountain disaster control as project, the implementers must have a clear understanding of the methods to be used to handle the Moth.
Feasibility	High

Source: JST

Table 6.16 Forestry promotion in the LMB

Proposed programme 4	Forestry promotion in the LMB
Overview	Preserve the existing natural forests in the LMB by promoting reforestation to enable the procurement of sustainable timber from the production and economic forests of the LMB countries. Then promote a forest industry that utilizes plantation wood through tree maintenance, wood processioning, and the construction of a timber value chain.
Proposal background	・The demand for timber is increasing in the Mekong Basin and international community as populations grow. A sustainable system for timber production is necessary to meet the demand. (☞6.1.3.5) ・The demand for wood in Cambodia is increasing not only for building use, but for use as fuelwood material. The increasing demand for fuelwood material is one of the factors reducing natural forests. (☞6.1.3.6)
Target area	LMB countries
Implementing agency	MRC and the forest sector in each LMB country
Objective	・Establishment of a sustainable timber production system to meet the demand for timber accompanying population growth ・Construction of a value chain of manufactured timber and the securing of a market ・Creation of jobs by vitalizing the timber industry
Contents of the activities	・Development of a Forestry production Strategy（☞6.1.3.5 E.1） ・Strengthening of timber production（☞6.1.3.5 E.2） ・Efficient use of timber（☞6.1.3.5 E.3） ・Adding value to timber products（☞6.1.3.5 E.4） ・Cost reduction in sustainable forest management（☞6.1.3.1 A.4） ・Sustainable energy use by local residents（☞6.1.3.6 F.1.a, b, c） ・Ensuring the sustainability of fuelwood for industrial use（☞6.1.3.6 F.2.a, b）
Related policies	・Forest policy in LMB countries
Expected effects	・Promotion of natural forest conservation by establishing a sustainable timber supply system ・Contribution to the GDP of the forestry sector by vitalizing the forestry industry ・Contribution to poverty reduction by job creation
Expected contributions from Japan	・Transfer of Japanese forestry technology (seedling cultivation, planting, maintenance of planted trees, timber removal, processing, etc.) to each country in the LMB ・Support for research on timber market variables such as timber demand trends in the LMB, Japan, and the international market
Strengths	・In Vietnam, where the forestry industry is expanding, timber must still be imported from abroad

	because the timber supply has not kept pace with the demand. The timber market in the LMB therefore has big potential. ・Sustainable procurement is spreading in the private sector.
Weaknesses	・There is a risk that the produced timber will be traded at inappropriately low prices due to competition with illegally harvested timber. The suppression of illegal logging therefore becomes even more important. ・Certification is required to prove that the timber is sustainable, but the high cost of certification will burden the producers.
Feasibility	High

6.2 Private Promotion and Business Partnership

In section 6.1, the direction of the activities of MLB countries to mitigate the deforestation and degradation are precisely described. Instead, the directions of private sector and donor such as JICA are described in section 6.2. Therefore, there are some descriptions which are similar to those in 6.1, but this section describes the direction to be addressed by the Japanese side (mainly JICA and then the Japanese private sector) mainly, together with the background.

For the following, further steps will be required to verify the feasibility of the activities, including the procurement of the funds, the implementing body, the supporting body, the technology requires and the contents.

6.2.1 Possible Business Partnership

As mentioned above, while the development pressure on forest resources is strong, the budget of the forest sector is low, and as a result, administrative management capacity is very weak against the pressure. And therefore, it is very difficult to control all above stakeholders only by public sectors including foreign AID/Official Development Assistance (ODA). Especially for large scale companies which is one of the major sources of development pressure, regulatory approaches and investors evaluation relatively work well for environmental management. Under the circumstances, CDP can influence such companies strongly. CDP is an initiative with which institutional investors around the world requires private enterprises to disclose information on environmental strategies, CO_2 and greenhouse gas countermeasures and others. CDP sends questionnaires, analyzes and evaluates the answer, and discloses it to the signing organization on behalf of the investors who signed the initiative. For the cases in Japan, CDP Japan has requested private sector for responses to questionnaires regarding “Climate Change”, “Water” since 2010, and “Forest” since 2013. For conducting responsible investment by institutional investors, evaluating company’s activities for environmental issues has become more important in recent years, and thus, many institutional investors have signed CDP initiative. CDP aims to realize both long-term stable economic conditions as well as more sustainable societies by supplying information regarding to company’s medium to long-term perspective on environmental management responding to climate change which essential to decision making to institutional investors. CDP has been conducting this activity since 2003, and the number of institutional investors who support CDP continues to increase, and more than 900 institutional investors have already signed CDP. It is extremely difficult to control constituent members of supply chain toward environmentally sustainable business practices by regulatory manners due to its complexity of its constitution. Instead, the pressure or demands from the upstream of the chain works

better and thus, CDP reports works very efficiently by evaluating the enterprises which sit in upstream of the chain. As of the low evaluation, the institutional investors will divest and find another destination who performs better business practice regarding environmental sustainability. In 2018, questionnaires had been sent to 500 companies in "Climate Change" category, 300 companies in "Water" category, and 100 companies in "Forest" category. CDP becomes a big brand in this field, and therefore, companies recognize that taking an A list will lead to a big PR. In some European countries, it is obliged to submit an integrated report by laws and regulations. In this meaning, Japan is behind in comparison with Europe and the United States, so CDP considers that it is necessary to increase pressure on companies through laws and regulations.

Through the interview survey, it is confirmed that the CDP's attempt to provide information to investors for ESG investment has major impacts on the global economy. Although it seems difficult for public institutions, including JICA, to directly act on investment behavior considering its fairness, certification systems which sustain and contribute to realize environmentally sustainable business practices, can be supported by public sector. Therefore, it is necessary to have the activities which help promote such CDP scheme. Therefore, activities with the following directions are necessary.

- Support for establishment of certification system and activities related to acquisition of certification

  Promoting private companies (or NGOs) to obtain a certification system is a significant contribution to sustainable development. Besides, there are established certification systems (RSPO, etc.) for forests and palm oil, but international NGOs are seeking the similar system for natural rubber. Noticeable land use change in which shifting from forest to rubber plantation have been observed in Vietnam, Cambodia, and some Lao PDR, but enough certification system has not developed yet. Therefore, establishment of certain certification as well as management system for natural rubber are desired for sustainable natural resource management.

In addition, corporate CSR activities have begun to be linked to SGGs and have shifted to long-term forest conservation activities, rather than short-term tree planting activities which had been a major CSR activity by Japanese companies. On the other hand, companies are experiencing technical problems related to forest conservation such as selection of methods and necessary data collection, and having difficulty in acquiring in-house consensus to proceed proposing CSR activities. Therefore, activities with the following directions are necessary.

- Provision of data to the private sector

  It is quite useful to supply the archives of JICA conducted project regarding natural and social environment information acquired. Especially, basic information such as geographic information, geological data and others describing natural condition are quite important as well as useful to CSR conducting private sector who has difficulties to access such information in developing countries. Besides, mechanism or system for accessing above information from various sector shall be established for help promoting the CSR activities.

- Support of CSR activities

To help promote CSR activities, in addition to above activities, support for CSR activities such as forest monitoring including remote sensing, e.g. for oil palm, shall be positively considered. Especially, continuous monitoring and measuring of the forests, analyzing the results and validating forest amount are very helpful for CSR activities.

There is difficulty for internal decision making at the start of CSR activities for some companies due to the difficulty of appealing to the public because plantation can appeal to public while forest conservation activities do not appeal so well due to the difficulty of conveying the effects and results of preserving the existing forest in an easy-to-understand manner.

- Establishment of award system

To initiate CSR or corporate activities, evaluations from third parties are effective in promoting internal coordination and gaining consensus. Therefore, it is appropriate to create a commendation system such as "JICA Award" as annual business operation or conduct similar activities every year.

Some companies have achieved a measure of success by heightening added value and establishing supply chain connecting markets which have economic disparity. In this study, the successful businesses are established by creating supply chains and adding added value to coffee, pepper, charcoal, and organic cosmetics with sales channels. On the other hand, in the case of dealing only with part of the supply chain (e.g., only added value, only technology that guarantees added value), the continuity of business was not confirmed in this survey. Therefore, activities with the following directions are necessary. In addition, the effects of the business model for mitigating deforestation and degradation are uncertain for the case of pepper and organic cosmetic business while the business models of those are viable.

- Support successful businesses projects

The bamboo as well as charcoal project has the effect of decreasing deforestation to some extent by creating employment opportunities in the region. As for bamboo, this business model is unlikely to be expanded to other regions due to the scarcity of the target species. In addition, unlimited expansion may cause deforestation in both businesses. It is appropriate to quantitatively verify the profit-based scale and the effects of forest control, and then provide support in appropriate manner.

- Utilization of Database for commercial utilization of NTFPs developed by Forest Agency project: Utilization of sustainable forest management promotion projects in developing countries

In the above survey, a database was developed for promoting the utilization of NTFPs by evaluating the potential commercial value and applicability to the business for Japanese companies. For JICA project which is promoting small and medium-sized enterprises, the value of the database is indispensable. As for considering the business applicability, evaluation and validation of sales channel as well as channel of distribution shall be conducted in addition to utilizing the database. Especially, the existence or possession of the sales channel including market is essential for the business continuity as well as its sustainability.

Vulnerability of the local livelihood to the global economy has been confirmed in the MLB countries.

Dependence on cash crops through complex supply chains can often destabilize the livelihoods of local resident. Therefore, it is important to consider the situation where local resident can benefit from becoming part of the supply chain. Therefore, activities with the following directions are necessary.

- Supply chain construction within a small economic scope that contributes to improving the livelihoods of local resident

  Apart from the value chain construction of the private companies mentioned in previous section, consider supporting activities related to the creation of small-scale supply chains with heightening added value. In the cases of the projects in northeastern Thailand, livelihood has been improved by reducing expenditures for food and daily necessities using local resources including their side crops while increasing the income by selling surplus crops. This scheme "Regional Market" was applied to several local villages and those activities have been conducted for more than 15 years successfully. The villages have 100% ownership of the activities now. In addition, the scheme of establishing supply chain consisting organic foods productions, production adjustment, and establishment of a shipping group who ships those foods to the organic agricultural market in Bangkok have been proven to be successful. Besides, the NTFPs mentioned above will be considered as products for supply chain construction. Since the relationship between residents and supported NGOs is very important and essential to the success of the scheme, it is necessary to consider whether similar activities can be applied to Cambodia, Lao PDR, and Vietnam where there are similar issues. However, in the case of Lao PDR and Vietnam, it is necessary to pay enough attention as applying the scheme, other options for the role of the NGO shall be considered.

6.2.2 Consideration of Fund Source of Private Promotion and Business Partnership

In the ODA project, it is difficult to conduct the project in long term in the same region, and as a result, the activity ends when the project ends without its sustainability. Also, it has not been possible to extend the successful scheme in one region to neighboring regions. Besides, as working with local resident, the local language as well as building mutual trust are essential. The above-mentioned recommended activities need to be carried out from a long-term perspective, and the relationship with residents is also very important. Therefore, to implement these activities, it is difficult to realize them with only JICA funds in mind. Currently, available major international funding sources are GCF (United Nations), CTCN (United Nations) and GEF (World Bank). GCF scheme allow longer term as well as participation of variety of stakeholders for applied programs and projects. In addition, considering that the programs above apply to REDD+ scheme, only GCF can cover all the phases. In addition, JICA becomes an AE: Accredited Entity, and therefore, the possibility of access to GCF is very high comparing to other funds.

Regarding activities related to private promotion and business partnership, generally, it is necessary to implement small-scale activities over a wide area and in the long term instead of implementing large-scale as well as short-term projects. Therefore, for applying the above propose activities, one strategy is to put them into existing projects or programs, e.g. REDD+ strategy in each country. In addition, regarding the access method, necessary period, and applicability as well as feasibility of funds, trials and further studies are required due to the lack of experience in this current situation so far. In the

process of implementation, the fundraising review and response process is also to be carried out, and then the feasibility study of the implementation of these private serialization / promotion activities, including the technical situation, are also to be conducted.

- Support for establishment of certification system and activities related to acquisition of certification

  JICA technical cooperation scheme or bilateral support by the same scheme by other donors such as ADB.

- Provision of data to the private sector

  Internal conduction by JICA

- Support of CSR activities

  JICA technical cooperation project scheme of other donors such ADB, etc. For activities that contribute to forest conservation activities, possibility for adding to the existing REDD + scheme shall be examined.

- Establishment of awarding system

  Internal conduction by JICA

- Support successful businesses projects

  Support by JICA technical cooperation project or same scheme by other donors such as ADB.

  CTCN can be applied for the project considering energy conversion. Therefore, the applicability of this financial scheme will be examined in projects related to energy such as wood charcoal.

- Utilization of Database for commercial utilization of NTFPs developed by Forest Agency project: Utilization of sustainable forest management promotion projects in developing countries

  The utilization will be applied to JICA private promotion and business partnership project.

- Supply chain construction within a small economic scope that contributes to improving the livelihoods of local resident

  JICA grassroots grant scheme, other subsidies such as Nippon Foundation. Additional evaluation, validation as well as finding proper scheme will be required for projects consisting of small budget program in multiple regions for a long period (5 years, etc.) with the cooperation of NGOs.

6.3 Watershed management of LMB

In this Study, examined are the most likely dominant impacts on the socio-economic and natural environment of the LMB associated with the four basin external forces of: (i) the hydropower development, (ii) the agriculture development, (iii) the wastewater generated by the domestic and industrial water development and (iv) the climate change. From the results of examination on the impacts,

the following are concluded as the major concerns of the watershed management for the LMB:

6.3.1 Securing Ecology and Morphology of Mekong River

The hydropower development would largely contribute to the future economic growth of the LMB provided that all the nine planned hydropower dam projects on the mainstream of Mekong River are implemented. However, the economic growth brought by the hydropower dam project will accompany extremely significant damages to the river ecology as well as river morphology. That is, the hydropower development would cause the fatal impacts on the irreversible resources of the aquatic lives, especially the migratory inland fishes. The hydropower dam development would also trap large volume of the river sediment flow causing the serious river channel erosion downstream. Moreover, the flow regime of Mekong River would be significantly affected by the hydropower dams, depending on the design of dams. These adverse impacts by the hydropower dam projects are not counted in the above economic growth contributed by the hydropower dam projects.

Despite the above serious damages caused by the hydropower dam development, the drastic measures to mitigate the damages have not been invented yet. Hence, based on results of monitoring and evaluation on impacts caused by the two dams (Xayaburi and Don Shadon dams), effective mitigation measures and regulations for the sand trap and ecosystem conservation should be discussed in the MRC before implementing detailed design and construction of the nine planned dams.

6.3.2 Securing Food Security of the LMB

The agricultural development plays a principal role of sustaining the economic value of the LMB through exporting of the agricultural commodities especially the rice products in the LMB. At the same time, the agricultural development sustains the food security and the livelihood of the inhabitants in the LMB through supplying of the rice as the staple food and securing of job opportunities in agriculture.

The agricultural development may have another advantage such that it will have the marginal adverse impacts on the natural conditions of the LMB. (Note: the agriculture chemicals and fertilizers used for the agriculture contains the potential risk of polluting the river water quality of Mekong River. However, the risk has not been confirmed in the previous relevant studies yet)

Despite the important role of the agricultural development for the LMB as stated above, the agricultural development would gradually decline in the future due to the limit of the available land and labor forces for agriculture, while the population dependent on the agriculture in the LMB will gradually increase taking the demography of the member countries of LMR into account. Hence, the member countries of the LMB would be required to review agricultural area expansion policies in due consideration of securing the food security of the LMB together with the agricultural economic viability and the available labor forces for the agriculture sector in the future.

6.3.3 Securing Water Security of Mekong River

According to the data of water quality monitored by the MRC, the annual average concentration value of TOTP of Mekong River was 0.058mg/L in 2000, while the value in 2014 highly increased to 0.13mg/L, which has already reached threshold value. The high concentration values of TOTP monitored in Mekong River in 2004 suggests that the River has been somewhat polluted by the domestic/industrial wastewater and/or the agricultural chemicals. Moreover, the large increment of concentration values of TOTP from 2000 to 2014 suggests that the pollution of river water is getting worse year by year.

The MCR Study estimated based on its sample survey that about 82% of the inhabitant in Cambodia and 55% in Lao PDR still use raw water from the Mekong River for drinking (Ref. 9). Considering such water use of the Mekong River and the above aggravation of the river water quality, the holistic water quality management of Mekong River would be indispensable to ensure water security for the inhabitants in the LMB.

The MRC Study has already examined the impacts of the domestic/industrial wastewater on the water quality of Mekong River. However, the Study did not capture the impacts of the agricultural chemicals and fertilizer, which are largely increasing as the rice production increases. Accordingly, the holistic water quality management would need the approach to the whole major pollutant sources including the domestic/industrial wastewater as well as the agricultural chemicals and other major point/non-point pollutant sources, if any.

6.3.4 Adaptation of Climate Changes

Among the three scenarios, the C3 (dryer climate change) will cause the severest drought associated with the least precipitation and the largest reduction of agricultural products. The drought in the scenario C3 will also significantly lower the water level of the Tonle Sap Lake depriving the habitats of aquatic life. On the other hand, the C2 (wetter climate) will increase frequency of flood occurrences, the flood peaks and the flood duration causing the sever flood damage especially in the LMB. The most vulnerable areas to both the drought and the flood will emerge in the floodplain in and around Tole Sap Lake in Cambodia and the Mekong Delta in Vietnam. The Mekong Delta is also suffered from severe salinity intrusion during dry seasons.

The climate changes, especially changes of rainfall and sea level rise will be relatively slow and highly uncertain. The climate changes will also have the transboundary influences throughout all member countries of the LMB, whereby the climate change adaptations for the member countries will closely interrelate each other. From these points of view, the plan for the climate adaptations for the LMB will need to be formulated and implemented based on the common concepts and strategies of the member countries of the LMB. Hence, highlighted is the Mekong Adaptation and Strategy Plan (MASAP), which was jointly developed by the member countries of the LMB.

There is a need to confront the impacts of climate changes at national, regional and international levels through a coordinated way. The MASAP sets out the strategic priorities and actions at basin level through

which the Mekong River Commission (MRC) can contribute to addressing climate change risks and strengthen basin wide resilience. The MASAP identifies critical dimensions of development that need transboundary cooperation for the purpose of adaptation to climate change and enhances the capacity of member countries in implementing their own national strategies.

The MASAP provides initial direction for basin-wide climate change adaptation that will continue to be reviewed and updated by MRC based on the following seven strategic priorities

- Mainstream climate change into regional and national policies, programmes and plans;
- Enhance regional and international cooperation and partnership on adaptation;
- Enable preparation of transboundary gender sensitive adaptation options;
- Support access to adaptation finance;
- Enhance monitoring, data collection and sharing;
- Strengthen capacity on development of climate change adaptation strategies and plans; and
- Improve outreach of MRC products on climate change and adaptation.

Through the MRC, countries in Mekong River Basin should analyze current status/issues regarding the above items and discuss adaptation measures to handle the issues. Each adaptation measure should be clarified in terms of objectives, goal and implementation schedule for each country with the consistence for the overall goal of Mekong River Basin. It is recommended that developing partners/donors and experienced international/local consultants should participate in a series of discussions to formulate efficient adaptation activities from the aspect of the knowledge of processes from planning to implementation of the adaptation measures, with information of applicable financial sources (e.g. Climate change fund of multi development banks, Global climate fund, and UNDP's Global adaptation fund, and Asia-Pacific Adaptation Information Platform etc.).

6.3.5 Comprehensive Sediment Management for Mekong River Basin

Of 11 planned dams, the two dams are already constructed in the mainstream of Mekong River. The Council Study reported that the construction of dams in the Mekong River "main stream" will drastically deplete the sediment transportation amount to the LMB in the future. The situation will incur the reduction of river bed/water level which normally adversely affect ecosystem of the river and lateral/across river structures such as bridges and embankments, and lead to development of river bank/coastal erosion and impediments to water intakes.

On the other hand, in accordance with the Council Study Report, the runoff sediment from the LMB countries will increase in the future. Although the background of the increase is not clear from the MRC Study, commonly the increment of frequency and degree of sediment disaster will be a concern in case of augmentation of generation/runoff of sedimentation through land-use changes in each sub-basin of the Mekong River. However, in the current situation of the mainstream, the decline in supply of

sedimentation from the sub-basins will result in further difficulties/problems in maintaining conditions of the riverbank and coastal areas as well as the ecosystems of mainstream.

Therefore, a structuring of sedimentation transportation balance in the mainstream and sub-basins is essential to maintain appropriate conditions especially in terms of securing ecosystem, food security and water security as well as disaster management in the watershed of Mekong River Basin.

Along with the above-mentioned facts, further activities (including surveys, analysis, examinations, formulation of inventions and rearrangement of the scenarios) are recommended to MRC as follows (6.3.5.1 to 6.3.5.3):

6.3.5.1 For Mainstream of Mekong River

(a) Monitoring and analysis of mechanism/amount of sediment transportation (including effects by the constructed two dams),

(b) Examinations of inventions to mitigate the impacts by sand traps of planned dams based on results and findings through activities of item (a), and

(c) Planning and implementation of countermeasures for prevention and mitigation of bank and coastal erosion.

6.3.5.2 For Sub-River Basins of Mekong River Basin in Each Country

(a) Analysis of sediment runoff volume from tributaries (in each country) of the Mekong River, and

(b) Examination of mitigation measures to prevent/mitigate adverse effects on proper sediment transportation by water resources development (e.g. dam construction) and sand extraction in the river courses based on results of (a).

6.3.5.3 For Whole Mekong River Basin

(a) Information sharing about sediment transportation and generation
(b) Discussions toward to consistent sediment control among countries located in Mekong River Basin in MRC meetings
(c) Examination of adaptation measures by MRC and individual countries based on the consistent sediment control plan

6.3.6 Others (Recommendations regarding Basic Study and Analysis)

6.3.6.1 Risk Assessment Survey for Riverbank and Coastal Erosion

In order to clarify issues and effects caused by the construction of dams, the current/scenario basis dynamics of transportation and deposit of bed and suspended load should be scientifically/quantitatively analyzed in the mainstream of Mekong River. Based on the analyzed sediment dynamics, current potential risks and MRC-scenario basis risks regarding the erosions should be assessed with specific pictures in terms of locations and magnitudes along the river courses and coastal area. The specific pictures will contribute to the planning and implementation of countermeasures against the erosion.

6.3.6.2 Survey for Water Quality Conservation and Enhancement of the Monitoring System

The current water quality monitoring system of the mainstream of Mekong River does not have enough function to timely evaluate effects of agricultural activities on the water quality from the viewpoints of increasing usage of agricultural chemicals and fertilizers effects. Therefore, implementation of surveys is recommended to MRC in order to elucidate contamination sources and pollution materials for the following purposes: (1) setting proper monitoring indicators/parameters with their standard values and (2) installation of additional water quality monitoring stations to detect location contamination sources. The improved water quality monitoring system will contribute to examination and implementation of water purification measures in the Mekong River.

6.3.6.3 Improvement of Data Collection System and Update/Verification of SWAT and IQQM Models

The hydrological analysis in the Council Study (2018) was carried out utilizing the hydrological simulation model (SAWT and IQQM) which was completed in 2007. The model should be updated with recent hydrological data observed from 2008 in order to verify the model parameters in recent periods. In fact, JST could not collect the recent data as of April 2019. In addition, the establishment of systematic procedure or structure for data collection and storage in MRC is also recommended in order to smoothly make decisions on the watershed management in reference to issues facing the Mekong River Basin.

6.3.6.4 Enhancement of Hydrological Observation Network

Although the prehension for meteorological conditions including the impact of climate change is important for the watershed management of Mekong River, currently the density of hydro-met monitoring stations is relatively not enough in comparison with the vast area of the basin. In addition to the contribution to improvement of the model in 6.3.6.3, the enhancement of hydro-met monitoring station network is recommended to secure the accuracy of hydro-met analysis and regional climate change projections in the basin.

For areas where installing the stations is inapplicable, the radar rainfall and satellite observation rainfall might be covered instead of ground observation rainfall. For reference, in areas where flash floods and sediment disasters occurred frequently due to the short-term concentrated rainfall, appropriate type of rain gauges to measure short duration rainfalls and telemetry systems may be necessary for the purpose of flood control planning, flood warning and forecasting, early evacuation system etc. As pointed out above, the monitoring stations/system should be introduced and developed in consideration of characteristics and restrictions of/in target river basins.