



**JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)**

**MEKONG RIVER COMMISSION
(MRC)**

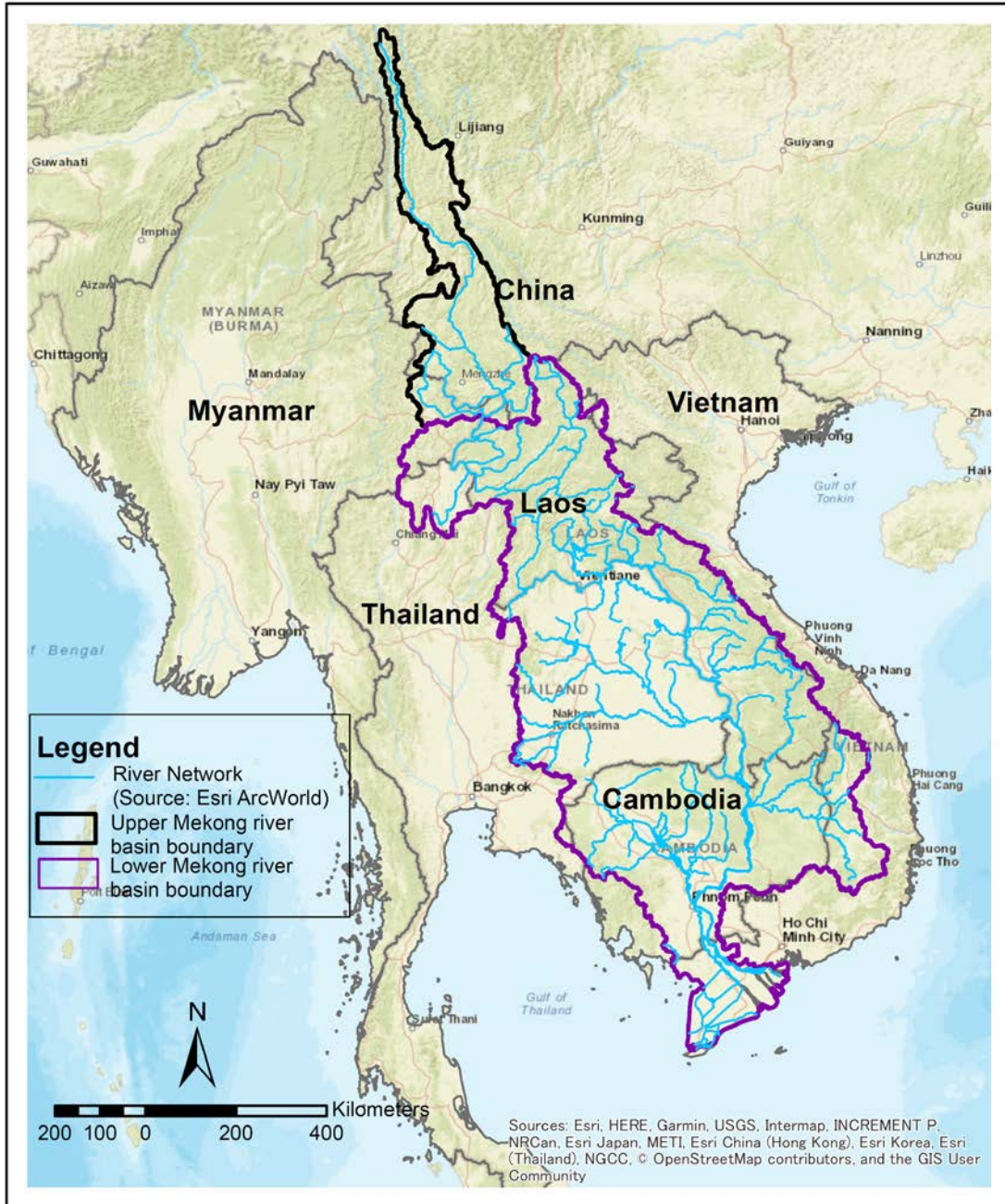
**THE STUDY ON
DATA COLLECTION SURVEY ON THE
BASIN MANAGEMENT AND
ENVIRONMENTAL CONSERVATION
IN MEKONG RIVER BASIN**

**INCEPTION REPORT
May 2018**

**CTI ENGINEERING INTERNATIONAL CO., LTD.
PASCO CORPORATION
JAPAN OVERSEAS FORESTRY CONSULTANTS ASSOCIATION**

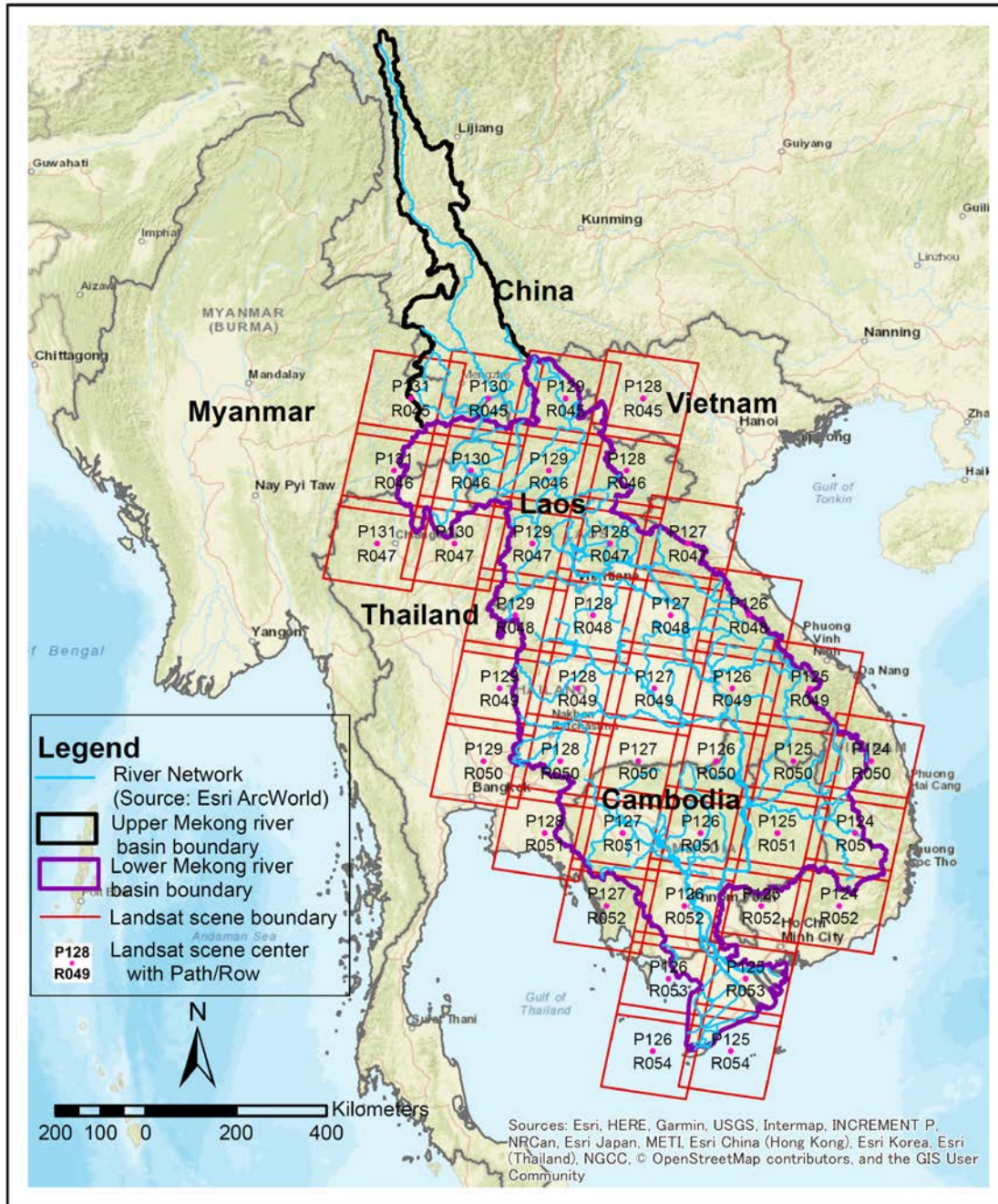
Mekong River Basin

(in 5 Countries: Thailand, Cambodia, Laos, Vietnam, and Myanmar)



Location Map

Landsat Index Covering Lower Mekong River Basin (in 5 Countries: Thailand, Cambodia, Laos, Vietnam, and Myanmar)



Location Map (Overlaying with LANDSAT Scene)

Location Map

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ANNEX

Annex 1 MoU Draft

ABBREVIATIONS

Organizations, Programs and Projects

CTII	:	CTI Engineering International Co., Ltd.
ICHARM	:	International Centre for Water Hazard and Risk Management
IPCC	:	Intergovernmental Panel on Climate Change
JICA	:	Japan International Cooperation Agency
JOFCA	:	Japan Overseas Forestry Consultants Association
JST	:	JICA Study Team
MRC	:	Mekong River Commission
NMC	:	National Mekong Committee
PASCO	:	PASCO CORPORATION

Technical Terms

EIA	:	Environmental Impact Assessment
GCM	:	Global Climate Model
IQQM	:	Water Quantity and Quality Simulation Model
RRI	:	Rainfall Runoff Inundation
SWAT	:	Soil and Water Assessment Tool

Others

C/P	:	Counterpart
D/FR	:	Draft Final Report
FR	:	Final Report
GIS	:	Geographical Information System
NGO	:	Non-governmental Organization
ODA	:	Official Development Assistance
SDGs	:	Sustainable Development Goals
UNDP	:	United Nations Development Programme

CHAPTER 1. INTRODUCTION

1.1 Background

The Mekong River is one of the major international rivers with a catchment area of 795,000 km² and its basin lays over six countries. The river originates in Tibet Plateau, flowing south in the mountainous areas in China's Yunnan Province, then formulates a national border of Republic of the Union of Myanmar (hereinafter referred to as "Myanmar") and the Lao People's Democratic Republic (hereinafter referred to as "Lao PDR"). It flows down south in the territory of Lao PDR then formulates a national border of Lao PDR and Kingdom of Thailand (hereinafter referred to as "Thailand"). The river further flows down in the southern areas of Lao PDR and through the territory of the Kingdom of Cambodia (hereinafter referred to as "Cambodia"), then formulates Mekong delta in the territory of Socialist Republic of Viet Nam (hereinafter referred to as "Viet Nam") and flows into the South China Sea. The Mekong River Basin is indispensable natural resources for the livelihood of the area's people in the aspect of food, water and transportation, and at the same time, it is one of world highest biodiversity areas.

In recent years, the scale of extremely heavy rainfall, prolonged draughts and flood disasters assumably resulted from climate change has being expanding in the Mekong River Basin. The expansion of the disasters gives a great influence on the local economy. Areal decrease and deterioration of tropical forests cause biodiversity loss and exhaustion of water resources in the area, as well as accelerating climate change in the worldwide scale through the emission of carbon dioxide accumulated in trees and soil. Deforestation for agricultural area increase, decrease in forest resources due to the development through population increase, and striking biodiversity loss necessitate collaborated implementation by the basin's countries for the early efforts for sustainable maintenance and management of biological function of the forests, e.g., disaster prevention and reduction, recharging function of water resources.

The Eighth Mekong-Japan Summit Meeting was held in Vientiane, Lao PDR on September 7, 2016. Mr. Shinzo Abe, Prime Minister of Japan expressed his intention to start a study to contribute to environmental conservation, and particularly protection of forest resources, in the Mekong River Basin. The intention was positioned as one of the Japan Mekong Connectivity Initiative Projects (JMCI Projects) and Japan International Cooperation Agency (hereinafter referred to as "JICA") accordingly decided the implementation of the present Study.

1.2 Study Objective

The objectives of the Study are:

- to collect and analyze basic information;
- to grasp present condition of forest conservation for the Mekong River Basin; and,
- to identify issues and possible future measures focusing on possible change by the climate change in the environment of the basin and in forest resources condition in the basin.

Output of the Study include the result of project formulation and best practices/recommendations for basin management of the Mekong Basin.

1.3 Study Area and Relevant Parties

The study area is the Mekong River Basin in Cambodia, Lao PDR, Thailand, Viet Nam and Myanmar.

Major counterpart organizations are the following:

- MRC: Mekong River Commission
- National Mekong Committees (NMC): Cambodia, Lao PDR, Thailand and Viet Nam
- Relevant ministries and agencies, and research organizations for water resources management and forest resources management in the countries in the basin
- Aid related organizations, e.g., Asian Development Bank, UNDP, United States of America
- MRC's dialog partner countries, namely, China and Myanmar
- Private sector including private enterprise and NGOs

CHAPTER 2. STUDY APPROACH

2.1 Technical Approach

2.1.1 Basin Environment Management Model

In order to evaluate and estimate the environmental impacts of deforestations and climate changes in the Mekong River Basin, hydrological and hydraulic models which can be utilized for basin environment management are required. JICA Study Team (hereinafter referred to as “JST”) finds that MRC has developed their Mekong Basin models using the approved basin simulation modelling package including hydrological and hydraulic models under Decision Support Framework (DSF) called as DSF models, and JST discussed whether MRC model can be utilized for this project or not, with MRC headquarters in the meetings in February 2018.

Figure 2-1 shows the outline of MRC model, which consists of three components such as SWAT, IQQM and ISIS. SWAT and IQQM are employed in the upstream area of Kratie, Cambodia, while for the downstream area of Kratie, ISIS model is employed, respectively.

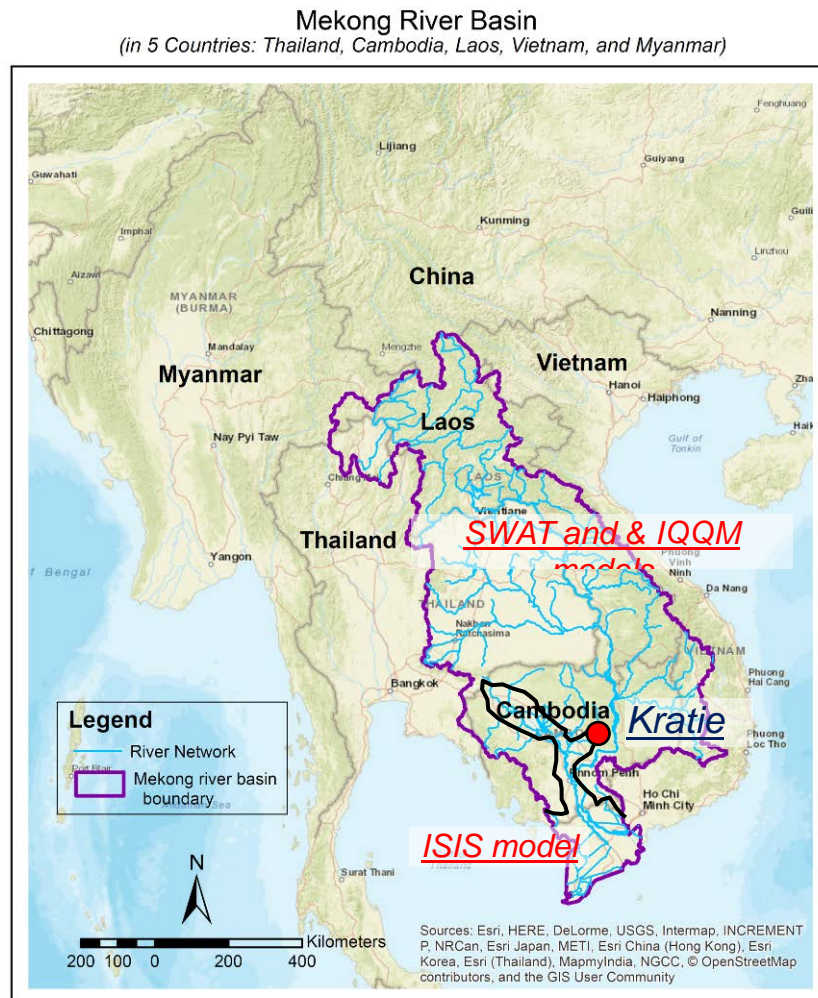


Figure 2-1 Schematic Diagram of DSF in MRC Tool Box

Table 2.1 shows the outline of each model.

Table 2.1 Explanation of Each Model

No.	Model	Description
1	SWAT	The SWAT developed by the United States Department of Agriculture has been set-up to generate sub-basin runoff from rainfall and climate data then provide inputs to a series of basin simulation models. The scenarios of land use change and climate change can be applied with this model.
2	IQQM	The Integrated Quantity and Quality Model (IQQM) is a basin simulation model, originally developed for the Murray-Darling Basin in Australia. IQQM used output from SWAT sub-basins to route through the river system, making allowance for control structures such as dams and irrigation abstractions.
3	ISIS	The ISIS is a hydrodynamic model, developed by HR Wallingford and Halcrow, is used to simulate the river system downstream part of the basin including Great Lake and Delta. The hydrodynamic model represents the complex interactions caused by tidal influences, flow reversal in the Tonle Sap River and over-bank flow in the flood season with the varying inflows from upstream.

DSF models were already utilized for evaluation of climate changes for the year 2010. In addition, this model was authorized by all National Mekong Commission (NMC) in member countries, so it could be said that DSF models are the most reliable models for the evaluation of the Mekong River. Though JST has to study and understand the DSF models more in cooperation with MRC, JST respects the DSF models and plans to utilize it basically for the project.

JST will investigate and clarify the following items regarding the environmental model, additionally.

(1) Input Data

In this project, JST shall conduct sensibility analysis on the river flow (flow regime) by deforestation and climate changes and clarify hotspots in the Mekong River Basin. Therefore, JST will basically utilize the existing data set such as rainfall data, land use data, water balance data and so on, which are stored in MRC Toolbox, and JST will only prepare input data regarding land use of forest areas.

(2) Data Format, especially Land Use Data

In this project, the impact of deforestation shall be estimated and hot spots (potential vulnerable areas) shall be identified. Therefore, the simulation considering the expected land use based on the scenarios of deforestation by JST will be carried out.

(3) Hot Spots Analysis upstream of Kratie

JST believes that DSF models do not conduct the flood inundation analysis in the upstream area of Kratie (Cambodia), judging from the basic specifications of SWAT and IQQM. In this project, hot spots in the whole Mekong River Basin shall be clarified. Therefore, JST would conduct the flood analysis partially by using another flood inundation model for evaluation of hot spots in the upstream area, if needed.

As of March 2018, JST is considering an employment of Rainfall-Runoff-Inundation (RRI) model developed by ICHARM (International Centre for Water Hazard and Risk Management), Japan.

Figure 2-2 shows the structure of RRI model. This model is a two-dimensional model simulating rainfall-runoff and flood inundation simultaneously (Sayama et al., 2012). RRI model can calculate together the water behaviours such as runoff including surface and ground runoff, river flow and flooded water flow. RRI model can be used for free and obtained from web site (http://www.icharm.pwri.go.jp/research/rri/rri_contract_e.html).

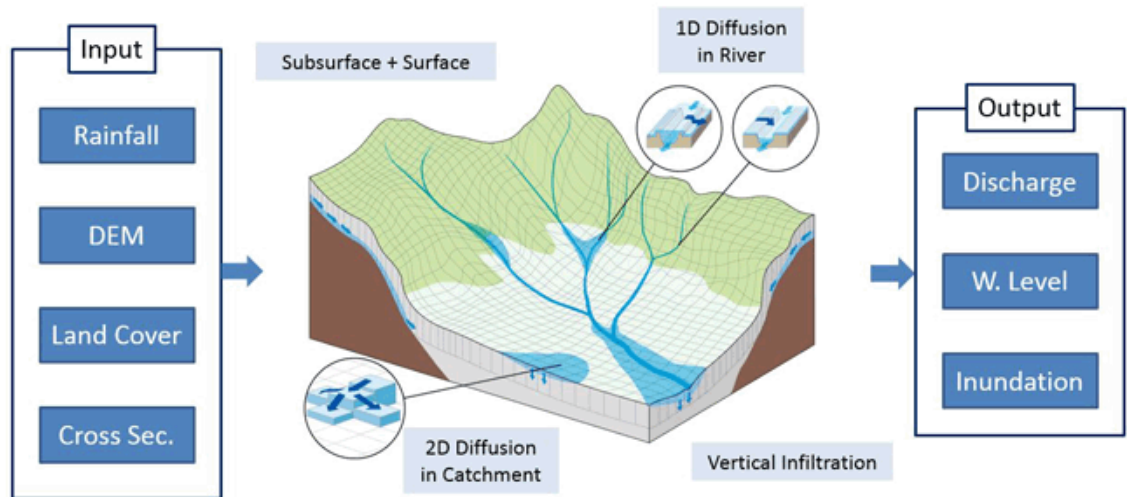


Figure 2-2 Schematic Diagram of Rainfall-Runoff-Inundation (RRI) Model

On the above discussion, MRCS commented as follows: DSF models (all models work together) can provide the expected outputs for this Study. However, it will take time and requires a lot of data to setup and run scenarios. Due to time limitation of the Study, MRCS encouraged JST to use RRI model for this Study. Some input data and modelled results can be used from DSF models.

JST will continuously discuss how to evaluate the hot spots by deforestation and climate change in the upstream areas of Kratie, and identify hot spots in cooperation with MRC, NMCs and relevant organizations.

In addition, MRCS reported that MRCS and each NMC has prepared hydrological and hydraulic analysis models for particular basins in the upstream area of Kratie such as the Lower Nam Ngum River Basin, the Sebangfai River Basin and the Sebanghieng River Basin in Lao PDR, the Nam Maekok and Nam Kam River Basins in Thailand. Hence, JST will consider utilizations of existing models which were prepared by MRCS and NMCs for detail evaluation of hotspots.

2.1.2 Projection of Change in Basin Environment by Climate Change

Regarding the climate changes, Intergovernmental Panel on Climate Change (IPCC) prepared a Fifth Assessment Report (AR5) and it was approved at the 31th IPCC sessions on 2009. MRC has already studied the AR5 and they determined the climate change scenarios for the Mekong River Basin based on Representative Concentration Pathways (RCP scenario, see Figure 2-3) by IPCC.

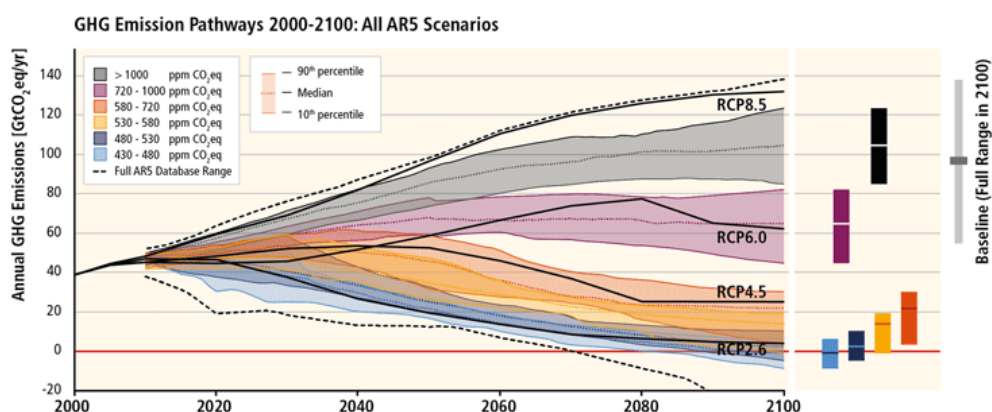
Table 2.2 shows the nine climate change scenarios of MRC. Basically, three Global Climate Models (GCM) were employed for evaluation of climate changes by MRC. This climate change scenarios are also authorized by MRC and NMCs. In addition, MRC has already conducted the impact analysis on climate changes under those scenarios, by using DSF models.

MRC has determined the target year of evaluation of climate changes as follows.

- Near-term future: 2030
- Medium-term future: 2060

Table 2.2 Climate Change Scenario (MRC)

No.	Emission scenario	Employed GCM mode
1	Low (RCP 2.6)	Drier overall: GISS-E2-R-CC GCM and low climate sensitivity
		Wetter overall: GFDL-CM3 GCM and low climate sensitivity
		Increase seasonality: IPSL-CM5A-MR GCM and low climate sensitivity
2	Medium (RCP 4.5)	Drier overall: GISS-E2-R-CC GCM and medium climate sensitivity
		Wetter overall: GFDL-CM3 GCM and medium climate sensitivity
		Increase seasonality: IPSL-CM5A-MR GCM and medium climate sensitivity
3	High (RCP 8.5)	Drier overall: GISS-E2-R-CC GCM and high climate sensitivity
		Wetter overall: GFDL-CM3 GCM and high climate sensitivity
		Increase seasonality: IPSL-CM5A-MR GCM and high climate sensitivity



Data source: IPCC AR5, 3rd Working Group

Figure 2-3 RCP Scenario by IPCC

JST basically respects the MRC’s scenarios and their simulation results. Next step, JST will verify the decision process of MRC’s scenarios, and prove the reasonability of those scenarios. In addition, JST will discuss about the climate change scenarios with Japanese well-known experts and provide useful inputs to MRC.

JST in cooperation with MRCS will review the existing simulation results of climate change impact on the Mekong environment, especially for forest ecosystem, to identify the necessity of further simulations for achievement of the objective of the study.

2.1.3 Forest Cover Map of the Lower Mekong Basin

(1) Preparation of Forest Cover Map by Maximum use of the Results of the Past Activities and Technique that each Country already has

(a) Situation of Forest Cover Map

Various donors including JICA have given various types of support including remote sensing technique in preparation of forest cover map in the Mekong Basin. Table 2.3 shows the situation of preparation of forest cover map of the lower Mekong Basin countries. Each of five countries has prepared forest cover map and some countries has conducted the accuracy assessment. The part of these forest cover maps has been utilized for calculation of emission volume in forest sector at GHG inventory of the country.

Table 2.3 Situation of Forest Cover Map for the Target Five Countries

	Cambodia	Myanmar	Lao PDR	Thailand	Viet Nam
Year of Map	1989 2006 1993 2010 1997 2014 2002 2016	1990 2000 2005 2010 2015	2000 2005 2010 2015	1961 1998 1973 2000 1976 2004 1978 2005 1982 2006 1985 2008 1988 2012 1989 2013 1991 2014 1993 2015 1995 2016 1998 2017	1995 2000 2005 2010 2016
EO Satellite	Landsat TM, ETM+ and OLI	2005:Landsat TM and ETM+ 2010: IRS Liss 2015:Landsat	2005:SPOT4/5 2010,2015 :RapidEye	Landsat, THEOS	2005:Landsat 2010, 2015:SPOT5 Refer:VNREDSat-1
Preparation method	Visual interpretation until 2002. After that segmentation by object based algorithm and manual interpretation.	Unknown	2010 was generated by object based segmentation and interpretation. 2000, 2005 and 2015 was generated by modification method based on extraction of change area from 2010.	Visual interpretation, Segmentation by object based algorithm and manual interpretation since 2013.	2010 was generated by object based segmentation with agro-Ecological zone and manual interpretation. 1995, 2000, 2005 and 2016 was generated by modification method based on extraction of change area from 2010.
Minimum Map Unit	25ha until 2010. After that 5ha	unknown	None	None	None

	Cambodia	Myanmar	Lao PDR	Thailand	Viet Nam
Geo-coordination system	Same as topographic map at 1/100,000	Unknown	Unknown	Same as topographic map at 1/50,000 (UTM, GGS84)	UTM, VN2000
Forest definition	Area : >0.5ha Crown density : >10% Tree height : >5m	Area : >0.5ha Crown density : >10% Tree height : >5m	Area : >0.5ha Crown density : >10% Diameter of breast height : >10cm	Area : >0.5ha Crown density : >10% Tree height : >5m	Area : >0.5ha Crown density : >10% Tree height : >5m
Land classification	22classes (forest classification 11 classes)	6 or7 classes (forest classification 3 classes)	22 classes (forest classification 6 classes)	Forest or Non-forest	17 classes (forest classification 12 classes)
Classification accuracy	Classification accuracy of 2006, 2010 and 2014 is 81.23%	Unknown	Target: forest/non-forest above 80% Classification of forest above 70%	More than 90% due to modification based on change area by visual interpretation and field survey with Google Earth	Forest//non-forest 5% Within forest category 20% Within evergreen broad leaf forest 26% (2010)
Emission Factor	Fixed	Not fixed yet	Not fixed yet	Not fixed yet	Fixed
References	JICA directions Initial FRL for Cambodia under the UNFCCC Framework (2016) Hearing from Ministry of Environment	Myanmar REDD+ Roadmap (2013) Myanmar development of NFMS (2016)	FCPF ER-PIN for Lao PDR -Revision (2016) Hearing from Ministry of Agriculture and Forestry	JICA directions FCPF R-PP Thailand (2013) Hearing from Ministry of Natural Resource and Environment	JICA directions Viet Nam's modified submission on REL for REDD+ result based payments under UNFCCC (2016) Hearing from Ministry of Agriculture and Rural Development

Remark: Information is added by JICA study team

(b) Consideration on Application of Existing Map and Preparation of New Map

As described above, existing forest cover maps are ready in five target countries. However, there is no uniformity in each country with respect to classification item, year of cover map, applied satellite image or classification method. Regarding the development of the whole multi-temporal forest cover map of the Lower Mekong Basin, Table 2.4 shows comparison of pros and cons is described.

Table 2.4 Pros and Cons between Use of Existing Data and New Data

	Use of existing data	New data
Content	Integration of existing maps of each country to develop Forest Cover Map of the lower Mekong Basin.	Development of new Forest Cover Map of the lower Mekong Basin
Pros	<ul style="list-style-type: none"> ● Definition of forest of each country is reflected and compatibility of the forest cover map between country forest map and Forest Cover Map of lower Mekong Basin is secured. ● Continuous utilization is available as each country develops the map for the purpose of monitoring the activities in forest sector including REDD+. ● Sustainability and publicness are maintained in future as the maps are developed by each country itself and approved. ● Change of forest area by forest type at each country is possible and more accurate analysis is possible at estimation of hotspot and vulnerability. 	<ul style="list-style-type: none"> ● Development by unified standard at whole watershed (land classification, used image, year of produce) is possible. ● Development of map at three deferent time which is most appropriate to compare the change of forest area is possible.

	<ul style="list-style-type: none"> ● Accuracy verification is conducted and accuracy of map is high level. ● Estimation of carbon stock accumulated in forest at each watershed is possible in accordance with the calculation standard set by each country. 	
Cons	<ul style="list-style-type: none"> ● Permission for procedure of use is necessary. ● As land classification and year of produce is different at each country, it is necessary to examine the integration method. ● Some country has incomplete forest cover map before 2015. 	<ul style="list-style-type: none"> ● Regarding classification of forest type, subdivision of forest/non-forest is difficult from the view point of cost and time. ● As for forest cover map before 2016, site investigation is impossible.

By maximum use of the existing forest cover maps, results of activities by JICA or utilized and achieved techniques with trained manpower or activities in each country will be continually utilized to develop forest cover map of the lower Mekong Basin onward. Especially forest cover map which has been developed by each country aiming at monitoring the activities in forest sector with regard to climate change including REDD+ is published after accuracy test and approved by the government. Therefore it could be considered to have reliability and publicness.

Forest cover map of the lower Mekong Basin developed by this task is to be used for understanding of actual status of forest conservation and extraction of the problems regarding watershed management in the area, thus it is desirable to develop the forest cover map continuously as a part of monitoring. Method of forest cover classification developed by each country and utilized satellite image reflect the forest cover map, so that it is possible to keep sustainability at each country.

Next topic is integration work which is a subject in utilization of existing forest cover map. As for the matter of difference of satellite images used by each country, they are mainly LANDSAT satellite image and other satellite images also include the wavelength range of blue, green, red and infrared which are used for forest cover classification. Classification method is a classification by object and interpretation instead of pixel base classification by means of mapping unit of resolution of satellite imagery. So that it is possible to integrate each component. Year of the forest cover map is different by country. It often happens that the target year's image cannot be used to develop forest cover map due to disturbance of cloud cover on the image. In such the case image of the one year before or after is used for the target year's image and these images are analyzed. It is therefore possible to use as a certain year's forest cover map if even specifying the year of image and integrate the images of which are one year before or after.

As described above it is proposed that the basic policy of this task is to develop the forest map of the lower Mekong Basin by use of existing forest cover maps and to conduct the change analysis.

(2) Setting the Classification Items to grasp the Change to be extracted and the Target Year

(a) Target Year to develop the Forest Cover Map

As shown in the Table 2.3 Development of Forest Cover Map at the Five Target Countries, there is some difference of the year of development at each country. Considering of the target year of the forest cover map at each country, this task chooses the year 2005, 2010 and 2015 as the target year and intends to integrate each of them. The reasons to propose above three points are as follows.

- Amount of change between the years is to be extracted on monitoring the change of forest cover; e.g. deforestation area from 2005 to 2010 is XX ha and from 2010 to 2015 is YY ha. It is required to develop the forest cover map at even interval in order to compare the amount of change between the years under the same condition.
- It is as much as possible necessary to develop latest forest cover map of the lower Mekong Basin. It is judged that it is possible to develop the forest cover map of the lower Mekong Basin of 2015 by the existing data.
- As far as buying and selling of credit of REDD+ is concerned, past reference period is past 10 years until commencement of the project and in case of JCM it is at least past 10 years. Therefore, at least 10 years period based on three reference years needs to be secured to develop forest cover map and the year 2005 is also the target in order to make the year 2015 as the latest year.
- Temporal axis to examine the impact assessment of climate change is 2050 and 2100, and it is different from the temporal axis to examine above described forest amount of cover change. Trend of forest cover situation is extracted from above three temporal axis future forest cover situation is set up taking into account of the impact of climate change.

(b) Types of Satellite Image to develop Forest Cover Map

It is a precondition in this task to utilize existing forest cover map. Satellite images shown in the Table 2.3 (LANDSAT, IRS, SPOT, Rapid Eye) are used for the forest cover map for each country. These satellite images have commonly the wavelength which is used for classification. Result of classification by the method used does not depend on resolution of satellite imagery, so that it is possible to integrate each satellite image without specifying the image

(c) Classification Item to Develop Forest Cover Map

As shown in the Table 2.5 main cause of deforestation in the countries of the lower Mekong Basin is conversion of land use (expansion of agriculture land, mining development, infrastructure development, etc.) and construction of hydropower dam, and especially illegal logging is largely picked up as the cause of degradation. According to the information in the reference information many countries pick up that agriculture land conversion is caused by conversion to the commercial products such as oil palm, natural rubber and sugar cane. Though it is not defined as deforestation some countries have done forest conversion from natural forest to plantation forest (Eucalyptus, Teak, etc.)

Table 2.5 Cause of Deforestation and Forest Degradation in the Countries in Lower Mekong Basin

Cause		Cambodia	Myanmar	Lao PDR	Thailand	Viet Nam
Deforestation	Conversion of agriculture land	○	○	○	○	○
	Permission of logging				○	
	Mining development	○	○	○	○	
	Maintenance of infrastructure	○	○		○	○
	Development of hydropower dam	○	○	○	○	
	Forest fire			○		
	Unsustainable logging	○		○		
	Unsustainable slash-and -burn	○	○	○		
Forest degradation	Illegal logging	○	○		○	○
	Over exploitation of NTFPs	○			○	
	Forest fire				○	○
	Firewood collection	○	○			
	Unsustainable slash-and burn / Small-scale subsistence agriculture		○			○
	Unsustainable forest management	○				○
References	National REDD+ Strategy draft (2016)	Myanmar REDD+ Readiness Roadmap (2013)	Lao PDR UNDP 1a National Strategy on Climate Change (2010)	Readiness Preparation Proposal (R-PP) For Thailand (2013)	ANALYSIS : Policies and measures - Support for the revision of Viet nam's NRAP - (2016)	

Forest Cover Map of the lower Mekong Basin to be developed in this task is required to exactly extract change of forest cover and monitor it. As for classification items, these are to be set up taking into account of classification situation of the countries in the Mekong Basin and IPCC standard which is the international standard. At the same time causes shown in the Table 2.5 are also considered and integration of forest cover map by means of extracted change is to be examined.

For instance, change from natural forest to plantation needs possible to extract. This task includes extraction of change and also collection and compilation of geospatial information (data of road network, GPS information on the area of dam construction) at each country and to conduct analysis of special information added by geospatial information is also the basic policy.

(d) Integration of Forest Cover Map which is Easy to use Continuously

After completion of the investigation, continuous update of the forest cover map of the lower Mekong Basin will be considered. It is a precondition to utilize established classification method and software is to be succeeded and as much as possible integrated map of forest cover map for the lower Mekong Basin is to be developed with minimum change. For example, it should be notified that special technique is not necessary to adopt in development of map.

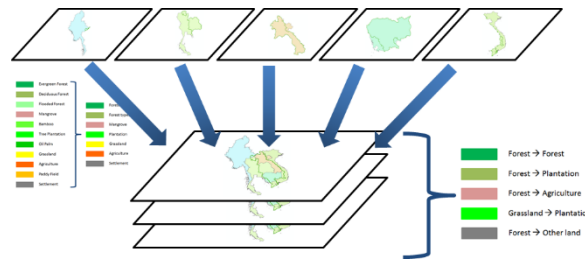


Figure 2-4 Image of Integration of Forest Cover Map

(3) Estimation of Hot Spot of Deforestation which utilizes Integrated Forest Cover Map in the lower Mekong Basin and Map of Change

In order to conduct analysis of forest cover in the lower Mekong Basin such as deforestation hot spot, it is necessary to conduct change analysis by use of integrated forest cover map in the lower Mekong Basin. And also integrated forest cover change map of lower basin will be developed after extraction of change between the times of reference at each country by means of precise classification items of the existing forest cover map. Regarding the classification items to utilize change extraction, screening and integration is carried out in accordance with objective of change extraction, e.g. for the purpose of area extraction of transaction from natural forest to commercial plantation forest classes are used such as natural forest or Teak plantation.

After this process hot spot is estimated where deforestation is in progress using spatial analysis such by overlay on GIS. In relation to above described watershed model degradation area is estimated at which more sensitively climate change might affect.

Regarding estimation of hot spot, deforestation happens to spread with certain trend, it is however difficult to grasp by only the past change of forest cover as it often begins with other causes such that rapid deforestation caused by improvement of access after road construction at the intact area in the natural forest where no access was permitted before. It is necessary to estimate the hot spot from various point of view based on the causes shown in the Table 2.5 and Table 2.6. As these causes are gathered from whole countries concerned, information on more specified situation in the lower Mekong Basin will be extracted by hearing from MRC or collection of other documents, then how these indirect causes appear in the forest cover map, e.g. correlation between increase in demand of resource material and land conversion from forest to plantation, or policy of agriculture enhancement and forest area, are to be analyzed in order to put in good use for estimation of the hot spot.

Table 2.6 Cause of Indirect drivers of deforestation and forest degradation

Cause	Cambodia	Myanmar	Lao PDR	Thailand	Viet Nam
National policy		○		○	
Weak governance	○	○	○	○	○
Unclear forest boundary	○		○	○	
Insufficient monitoring (short of finance and manpower)				○	
Lack of relation between sectors	○	○	○	○	○
Increase of community	○	○	○	○	

Lack of job opportunity	○				
Domestic and international increase of demand of source of material	○	○	○		○
Improvement of road network	○				○
Demand of energy such as electricity and fire wood	○	○			
Poverty (village area)	○		○	○	○
Lack of alternative living means	○	○			○
Lack of knowledge to understand the value of forest		○		○	
References	National REDD+ Strategy Draft (2016)	Myanmar REDD+ Readiness Roadmap (2013)	Lao PDR REDD+ Readiness - State of Play (2012)	Readiness Preparation (R-PP) For Thailand (2013)	ANALYSIS : Policies and measures - Support for the revision of Vietnam's NRAP - (2016)

2.1.4 Formulation of Future Projects

Output of this task is estimation of hot spot and degradation area based on overview of the whole lower Mekong Basin by use of watershed model taking into account of climate change and development and evaluation of multi-temporal forest cover map, and also includes consideration toward formulation of future projects. Regarding the project for hot spot and degradation area, various kind of schemes are expected, e.g., ODA project of Japan, donor agency's project of other country, project by the country concerned, cooperation in the private enterprise project, etc. In this task cooperation in the private enterprise project is to be mainly focused.

(1) Consideration to Formulate of Future Projects from a Wide Viewpoint

Regarding the formation of future projects, the current situation, targets, policies and tasks of each country's forest sector will be sorted out. Then the possibility of future cooperation towards the lower Mekong basin will be sorted out considering applicability of Japanese technology to the issues of the Mekong Basin, responsibility as well as the degree of involvement of Japan for deforestation, and activities, interests and inhibitory factor of the private sector. In this way, after gathering information from a wide viewpoint, the result is compiled to several assumed project type, and among them, further investigations on projects with higher priority and feasibility will be carried out. The criteria to select project with higher priority and feasibility is shown as below.

- Consistency with national policies and national goals
- Effectiveness to deforestation hotspot and to vulnerable areas due to climate change where are extracted by this study activity.
- Potential for activity expansion as good practice
- Sustainability of activities after project
- Interest of Mekong Basin countries
- Possibility to promote private investment

Figure 2-5 shows formulation of future project approach.

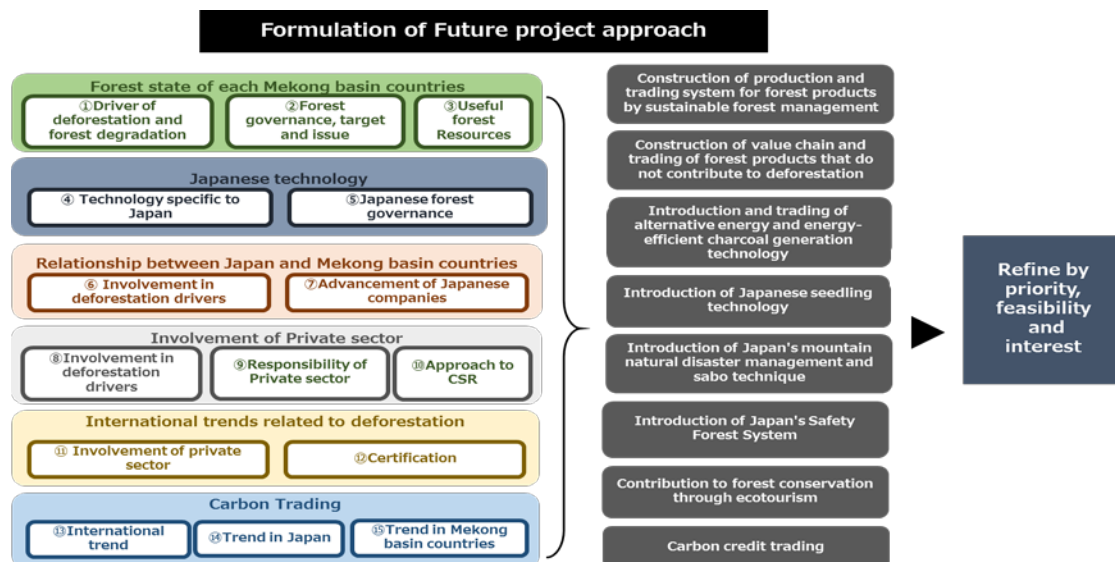


Figure 2-5 Formulation of Future Project Approach

(2) Consideration on Good Practice, Lesson Learnt, Excavation of Locally Existing Activities and their Application

It takes very long time to build consensus the agreement and establish the system to cope with cooperation for new project. Especially, construction of relationship of trust with community is important. There exist locally unique custom and rule and it needs not in a day to understand them. So that it is necessary to examine good practice, lesson learnt and excavation of locally existing activities and application in order to implement effective survey and collect accurate information. If there are local NGOs, enterprise or group which have already done effective activities these groups and activities are to be focused to examine positively the method of promotion.

Table 2.7 shows example of projects for forest sector by multiple donor. After collection of these survey reports new good practice which is applicable for cooperation in the private enterprise and lesson learnt are extracted from the contents of overview and results.

Table 2.7 Example of Projects for Forest Sector by Multiple Donor

Title	Implementing agency	Implementing period	Overview and results	Examination items for formulation of future project
Participatory land and forest management project to control deforestation (Lao PDR)	JICA	2009-2015	Development of deforestation control system through participatory land and forest management <ul style="list-style-type: none"> ● Design of the system for control deforestation through improvement of community support program tool (CSPT). ● Implementation of deforestation control system ● Monitoring of forest cover, amount of forest carbon stock and change of socio-economic situation of the site and surrounding area ● Proposal of deforestation control system for the measure to mitigate climate change. 	Examination of possibility to invite CSR through REDD+ by participatory land and forest management activities through community support program tool.

Title	Implementing agency	Implementing period	Overview and results	Examination items for formulation of future project
Survey on potentially matching site for measure to climate change in forestry sector(Viet Nam)	JICA	2009-2012	From the view point of the three aspects for carbon stock promotion project by AR, CDM, REDD and other method, to gather the information on land which has a potential to implement project through mainly satellite imagery analysis and to develop distribution map of whole country level, then to share the information.	To utilize the information on the land which has a potential to implement the project and extract the suitable site for cooperation in the private enterprise.
Sustainable forest management project in north west water catchment area. (Viet Nam)	JICA	2010-2015	Participatory forest management and community life improvement through the provincial REDD+ action plan. <ul style="list-style-type: none"> ● Verification of effectiveness and feasibility of the REDD+ action plan in the pilot site. ● Reinforcement of necessary technique and systematic ability of the implementing agency (central agency and supporting agency) to implement the provincial REDD+ action plan ● Preparation of necessary plan and technical data to implement REDD+ in the province. 	From the results of verification on feasibility to implement REDD+ activity at the pilot site according to the provincial REDD+ action plan, good practice and lesson learnt are to be extracted. Examination on possibility of cooperation in the private enterprise for the successful pilot project.
Conservation of biodiversity in lower Mekong Basin (one of the project of alive Asian forest)	WWF and TOYOTA Motor Co.,Ltd.	2016~2021	<ul style="list-style-type: none"> ● Execution of monitoring for forest ● Promotion of sustainable natural rubber production ● Reinforcement of illegal wildlife trading ● Policy proposal to dam construction 	Extraction of Good practice and lesson learnt from the policy proposal activity on sustainable natural rubber production and dam construction. Examination on cooperation in the private enterprise model for sustainable natural rubber production
GREEN Mekong Program (Cambodia, Lao PDR, Myanmar, Thailand, Viet Nam)	USAID RECOF TC	2012-2015	Capacity building to promote practice of policy for mitigation of climate change on forest by policy maker and grass-root stakeholder. <ul style="list-style-type: none"> ● Handbook for grass-roots facilitators ● Training manual ● Discussion Guide ● Videos 	Extraction of Good practice and lesson learnt from capacity building activity of the stakeholder like grass-roots which is applicable especially in cooperation in the private enterprise.

2.1.5 Best Practices/Recommendation

The following points will be considered for the formulation of best practices/recommendation.

(1) Establishment of Best Practices/Recommendation considering MRC's Strategy

Best practices/recommendations are the final output of the present Survey. Prediction of basin's environmental change by climate change and its impact analysis and identified forest reduction hotspots and vulnerable forest areas should be incorporated into actions and into national policies of the basin's countries. To this end, involvement of stakeholders, e.g., personnel of MRC and relevant counterpart

of each country for the preparation of best practices/recommendation is indispensable. In addition, much attention will be paid to maintain consistency to the ongoing plans, e.g., “Basin Development Strategy 2016-2020 for the Lower Mekong Basin” and “MRC Strategic Plan 2016-2020.”

More concretely, the Study Team will confirm requests from basin’s countries for the necessary measures on basin environment management and forest management, and formulate realistic best practices/recommendation for the environmental and forest conservation of the whole Mekong Basin.

Best practices/recommendation will be shared and proposed through the discussions among the stakeholders in the coming Workshop and Wrap-up Seminar.

(2) Image of Best Practices/Recommendation

Although best practices/recommendation will be identified and proposed through the results of the survey in the various fields, images of them are as follows:

As the hydrological model for the basin environment management for the entire Mekong River Basin, JST is going to use the existing software (DSF) stored in the MRC Tool Box. A hydrological model used for the simulation for the identified forest hotspots would be the one for smaller scale river basin and thus JST intends to introduce an appropriate one upon discussions with MRC. This would be a part of best practices/recommendation.

The preliminary investigation in this Study revealed that lack or malfunction of the monitoring system is one of the causes of deforestation. Recommendation of the appropriated forest monitoring system would be a part of best practices/recommendation. Through the present Study, various types of method of forest cover map preparation by country would be identified. Of these, most appropriate one for the integration of the maps of each country to the entire river basin would be identified and recommended. For this purpose, attendance of relevant personnel to the proposed meeting and workshop is deemed important.

About the best practices/recommendation for the private sector involvement, the following three approaches would be considered. Necessary regulations or system for the introduction of proposals will be identified and recommended. It will be discussed in the Kickoff Seminar.

Table 2.8 Approach of the Best Practices/Recommendation

Approach	Approach 1	Approach 2	Approach 3
Objective	● Forest Products	● Technique	● Carbon Credit
Activity	<ul style="list-style-type: none"> ● Sustainable Forest Management ● Landscape approach ● Satoyama Landscape 	<ul style="list-style-type: none"> ● Mountain Disaster Management ● Early Warning System 	● Reforestation, REDD+
Scheme	<ul style="list-style-type: none"> ● Private sector scheme ● JICA’s Partnership with the Japanese Private Sector 	● Public works, ODA	● GCF, JCM, CSR
Possible recommendation	● Knowhow for formulation of business model covering demand identification.	● Introduction of Japan’s forest management technique	<ul style="list-style-type: none"> ● Knowhow on REDD+ ● SWOT for the introduction of CSR by Japanese enterprise

	<ul style="list-style-type: none"> ● Information sharing on forest business in the Mekong Basin 	<ul style="list-style-type: none"> ● Technical cooperation on river basin management 	
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2.1.6 Sustainable Development Goals’ (SDGs’) Standpoint

Of the 17 goals of Sustainable Development Goals (SDG) of the 2030 Agenda for Sustainable Development adopted by world leaders in September 2015 and officially came into force on January 1, 2016, strongly related to the present Study are: Goal 13 Climate Action: Take urgent action to combat climate change and its impacts; Goal 15 Life on Land: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss. The present Study pays attention to them. Further discussion will be held in the Kickoff Seminar.

2.2 Operational Approach

2.2.1 Place Emphasis on Stakeholders’ Coordination

Coordination and collaboration between all the stakeholders are deemed important for smooth implementation of the present Study. The following will be taken into consideration.

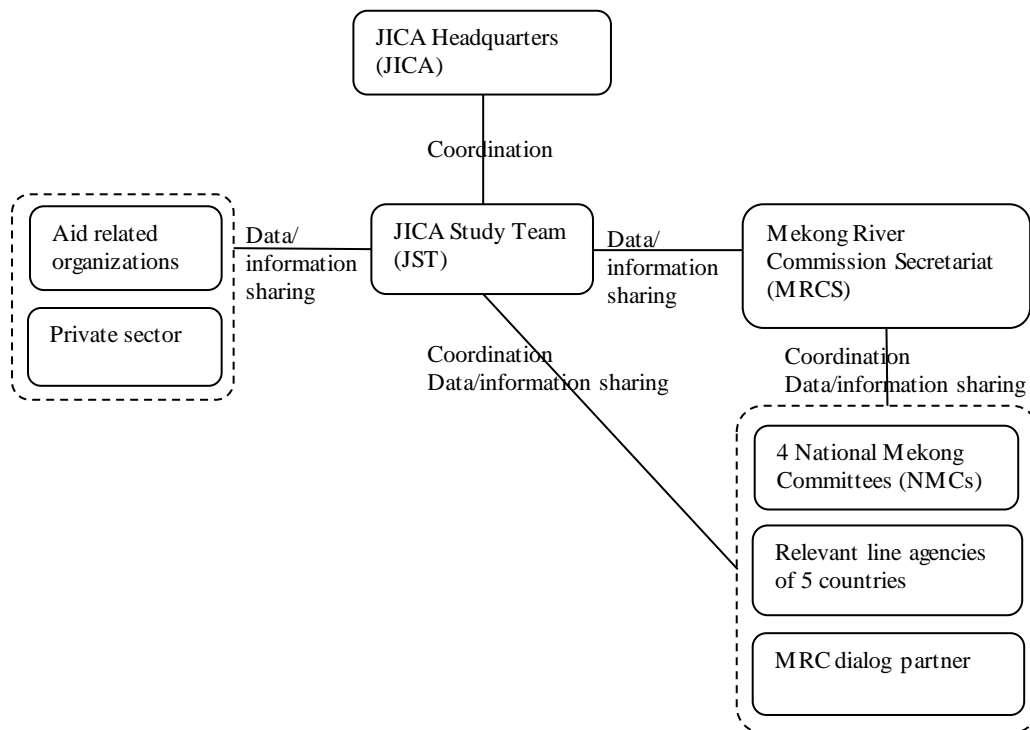


Figure 2-6 Coordination of JST, MRCS and NMCs

(1) Coordination with MRC and NMCs

JST stations an office in MRC headquarters, Vientiane, Lao PDR and it will be the headquarters of the Study. JST will establish a strong coordination with MRC Secretariat and representatives from local MRCs. Necessary information in the course of the Study will be shared with MRC and the Team exchange opinion in order to utmost use of the output of the Study.

Roles and responsibilities of MRC are as follows:

- Give necessary opinion/advice to JST during the Study
- Provide necessary data/information
- Give permission to use the results from the MRC Decision Support Framework (DSF) conducted by MRCS staff in cooperation with JST for the Study as appropriate
- Extend necessary supports for JST in terms of assignment of counterpart staff of the MRCS
- Provide office space with necessary equipment and running expense in the MRCS

Roles and responsibilities of NMCs are as follows:

- Give necessary opinion/advice to JST during the Study
- Provide necessary data/information

(2) Coordination with the Five Countries in the Basin

Various channels of the Study Team, e.g., liaison office of the consultants that composes the Study Team will be utilized for data collection and information exchange. Mutual agreement towards the formulation of agreement on the best practices/recommendation will be obtained through enough discussion with the relevant personnel of the five countries.

(3) Coordination with the other Stakeholders

JST will have discussion with stakeholders, e.g., Asian Development Bank, UNDP and other donors and embassies of key countries to share the direction of the Study and to obtain support to the final best practices/recommendations.

(4) Coordination with JICA

JST will keep close coordination with the headquarters and offices in the five countries of JICA. The Team will coordinate with the JICA experts in the five countries in the related fields for the successful establishment of best practices/recommendation.

2.2.2 Utilize Seminars and Workshops

In this Study, workshops and seminars will be held for the purpose of informing Study Team's strategy, exchanging opinion and obtaining agreement among the stakeholders. More concretely, the Study Team will held i) kickoff seminar, ii) study tour to Japan, iii) workshop, iv) wrap-up seminar, and v) seminar in Japan for Japanese enterprises.

Attention will be paid to the workshops and seminars as follows:

- It should be well organized.
- Objectives should be clearly identified.
- It should be designed to satisfy the participants.

Kickoff Seminar	<p>Objectives</p> <ul style="list-style-type: none"> • Present, discuss and finalize the Inception Report of the Project; and
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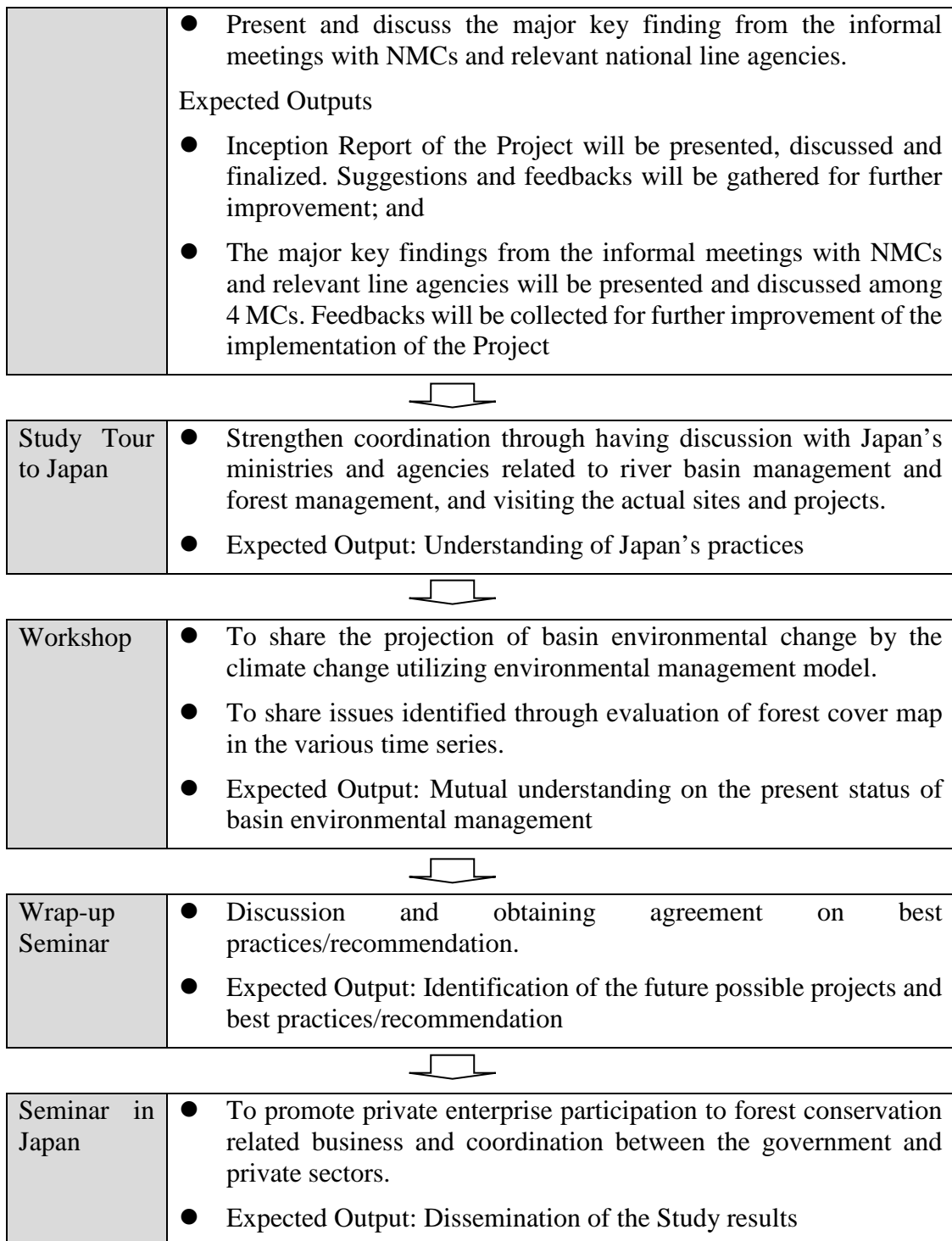


Figure 2-7 Flow of Seminars and Workshop

2.2.3 Safety Management

JICA gives the highest priority to the safety of the Study Team during the study period. JST always refers to the safety information of the Ministry of Foreign Affairs, Japan. Please refer to the Website: <https://www.anzen.mofa.go.jp/>. JST asks all the relevant stakeholders to join the study paying much attention to the safety management.

CHAPTER 3. PLAN OF OPERATION

3.1 Methodology of the Study

The Study consists of the following six phases as shown in Table 3.1.

Table 3.1 Phases of the Study

	Phase	Period
Phase 1	Preliminary Analysis and Preparation of Inception Report	December 2017 to March 2018
Phase 2	Grasp of Present Condition and Issues in the Mekong Basin	April to June 2018
Phase 3	Analysis in Japan and Study Tour in Japan	July to August 2018
Phase 4	Discussion on Approach against Issues	September to October 2018
Phase 5	Study for Best Practices/Recommendation	November 2018 to January 2019
Phase 6	Seminar in Japan	February to March 2019

3.1.1 Phase 1: Preliminary Analysis and Preparation of Inception Report

Item 1-1: Collection and Analysis of Existing Information

Existing data and information will be collected from relevant organizations, e.g., research institutes, governmental ministries and agencies, and donors, and accordingly present condition and issues on river basin management, forest conservation and climate change will be identified.

Lessons learned from JICA related projects on forest conservation and climate change fields and issues for the preparation of forest cover maps will be identified.

(1) Models for Basin Environmental Change by Climate Change

JST will basically use the models for basin environmental change simulation developed by MRC and stored for use in MRC Tool Box following the instructions for MRC data sharing in PDIES. In addition, RRI (Rainfall Runoff Inundation) Model developed by International Centre for Water Hazard and Risk Management under the auspices of UNESCO (ICHARM), Japan is a two-dimensional model capable of simulating rainfall-runoff and flood inundation simultaneously and deemed appropriate for the basin management. Models to be used in the present Study will be determined through discussion with relevant personnel.

(2) Collection of Climate and Hydrological Data

MRC stores climate data (rainfall, temperature, river water level and river flow) of the four countries, namely, Lao PDR, Cambodia, Viet Nam and Thailand) from the 1960s. These data are archived in the laboratory of MRC and used for the Study.

Data observed by the various organizations, e.g., Department of Meteorology and Hydrology, DMH, Lao PDR, in the basin countries will also be used.

(3) Forest Cover Maps

Existing forest cover maps already prepared by related agencies will be used. The Team will clarify the available data and propose those for use.

Item 1-2: Establishment of Coordination among the Team, Research Institute, University, etc.

JST will coordinate research institute, university upon discussion with JICA.

Item 1-3: Interview to Private Enterprise for Forest related Business

The objective of this activity is to identify commercial activities as well as NGO's activities which contribute to mitigate effects of deforestation drivers in sustainable manner in the Mekong Basin.

Thus, the team took two different approaches at the initial stage of the project. One is to identify the deforestation drivers in each country and the other is to identify Japanese related private enterprise or NGOs whose activities contributes to mitigate the deforestation drivers and could be applicable to the Mekong Basin.

After the initiation of the project in December 2017, the team has started the literature survey which focused on JICA studies mostly to grasp the general condition of each countries regarding the forestry and commercial activities related to forest products. Based on the survey, the following organizations were picked up as the candidate of hearing survey.

Table 3.2 The List of the Enterprises and NGOs for Hearing Survey: 1st Version

No.	Group	Country	Activities
1	WWF Japan	Universal	Sustainable production and procurement of natural rubber
2	WWF Japan	Universal	Certification of palm oil
3	MITSUI & CO., LTD	Cambodia	Reforestation of rubber and processing of raw materials for tire
4	Saraya Co., Ltd.	Universal	Development, manufacturing, sales etc. of household and industrial cleaning agents (use of palm oil)
5	NISSIN FOODS HOLDINGS CO., LTD.	Universal	Production and sales of processed food (use of palm oil)
6	Bridgestone Co., Ltd.	Universal	Sales of automotive parts such as tires, bike, bicycle etc.(use of rubber)
7	TOYOTA MOTOR CORPORATION	Universal	Cooperate with WWF to formulate sustainable natural rubber procurement standard
8	Sojitz Corporation	World Viet Nam	Formulation of timber procurement policy, afforestation project in Viet Nam
9	Japan Paper Association	Japan	A group of domestic paper pulp companies
10	From Far East Inc.	Cambodia	Reforestation in degraded areas and sales of NTFPS in Japan
11	Yamaha Corporation	Tanzania	Sustainable timber procurement from FSC certified forest
12	Usui Agriculture & Livestock Co., Ltd.	Viet Nam	Business construction of bamboo production for suppressing deforestation by slash-and-burn
13	Keizan Tsusho Corporation	Lao PDR	Procurement of sustainable coal products
14	Japan Flower Corporation Co., Ltd.	Lao PDR	Survey on conservation of medicinal plant resources and sustainable commercial use
15	OHKAWA CO.,LTD.	Lao PDR	Cultivation and processing manufacture of konnyaku potato

No.	Group	Country	Activities
16	Yamamoto Powder Coal Industry	Lao PDR	Efficient carbonization of biomass material, good quality pulverized coal
17	P.I.C. CO., LTD	Indonesia	Production of paper pulp by palm oil waste
18	TAIZEN . CO., LTD	Indonesia	Production of paper pulp by palm oil waste
19	Shin'yo Engineering Co., Ltd.	Indonesia	Pelletization of palm oil waste
20	SATOHAMA Energy. CO., LTD	Madagascar	Manufacture and sale of hybrid rocket cooking stoves and eco fuel
21	Sunwaspa	Cambodia	Bioethanolification of unutilized aquatic plants
22	TROMSO CO., LTD.	Tanzania	Demonstration project of solid fuel production equipment using rice hull
23	Takino Filter Inc.	Japan, Indonesia	Business of disaster prevention, environmental conservation technology
24	Oji Paper Co., Ltd.	Viet Nam, Lao PDR	Bio coke manufacturing and sales and peasant reforestation
25	RONTAI CO., LTD	Japan	Manufacture, sale and construction of greening materials
26	NITTO CONSTRUCTION CO., LTD.	Japan, Indonesia	Comprehensive construction industry (civil engineering, foundation, environment and geological consultant)
27	Shukutoku University	Philippines	Tourism business including ecotourism
28	Carbon Offset Forum	Japan	Promotion of carbon offset activities through J-ver etc.
30	CAPE.Co., LTD	Lao PDR	Organic Agriculture and reforestation
31	Petroleum Authority of Thailand Public Company Limited	Thailand	Reforestation activity as CSR
32	Electricity Generating Authority of Thailand	Thailand	Reforestation activity as CSR

Among the above listed organizations, the team conducted interviews to the followings. The outline of the hearing is summarized as Table 3.3.

Table 3.3 Outline of the Hearing Survey

Organization	Outline of the hearing	Hearing point
WWF	WWF is launching a project of establishing sustainable rubber production in Myanmar to minimize the deforestation. WWF recognizes the following areas as very important for securing biodiversity in Indo-China region. 1. Dawna Tenasserim: Thai, Myanmar 2. Eastern Plains: Cambodia, Viet Nam 3. Mekong Flooded Forest 4. Lao PDR: South Part, Viet Nam: Middle part	<ul style="list-style-type: none"> Status and measures of expansion of rubber plantation in Mekong Basin which is the biggest driver of deforestation. Gather information on biodiversity conservation in the Mekong basin
RONTAI CO., LTD	RONTAI CO., LTD is a company that manufactures and sells greening materials for civil engineering and planting works. RONTAI has worked in Japan. They have been working in Japan, but now they are considering expanding their business to overseas.	<ul style="list-style-type: none"> Japanese soil conservation technology

Organization	Outline of the hearing	Hearing point
Representative Office of MITSUI & CO., LTD. in Phnom Penh	MITSUI CO., LTD procures and imports rubber from Cambodia to Japan. Recently they are beginning to work to ensure transparency for sustainable procurement of Rubber.	<ul style="list-style-type: none"> • Efforts of Japanese company to ensure traceability in procurement of rubber materials which is the one driver of deforestation.
CAPE CO., LTD	CAPE CO., LTD is implementing agriculture and environmental initiatives in Lao PDR. Especially interest in the environment is high and they have experience of afforestation in Lao PDR.	<ul style="list-style-type: none"> • Interest and activity of Japanese private companies for forest conservation in the Mekong Basin

After above hearing survey, the team visited Cambodia, Lao PDR, Viet Nam and Thai to have courtesy call as well as hearing survey to collect the information of forestry, commercial activities related to the forestry and the governmental organization which possibly have relevant information. The hearing activities conducted in this stage are described in the following table and the outline of the hearing survey is summarized in the following (a) and (b).

Table 3.4 Surveys Conducted during the 1st Field Reconnaissance

Country	Organization	Attendants	Outline
Cambodia	JICA Cambodia Office	Mr. Nishikawa, Project Formulation Advisor of JICA Cambodia Office Ms. Takimoto, Forestry Expert	<ul style="list-style-type: none"> • Acquiring information of possible target organization or any bodies of the hearing survey. • Acquiring information of related ongoing/past related JICA projects • Hearing the general condition of the forestry and related commercial activities in Cambodia.
	NCDM	Mr. Sam Peou, Acting Director of Information and Relationship, NCDM and other 3 members of NCDM	<ul style="list-style-type: none"> • Hearing the availability of hazard map or any disaster related information in digital/hard copy.
	Ministry of Environment (MOE)-General Directorate of Administration for Nature Conservation (GDANCP)	Mr. Chivin LENG, Deputy Director of Department of Inspectorate and Law enforcement, Cambodia FRL/MRV Coordinator	<ul style="list-style-type: none"> • Hearing the general condition of the forestry and REDD+ progress in Cambodia.
	MOE-department of GIS	Mr. Touch Vina : Director of Department of Geospatial Information Service Mr. EK. MENRITH : DD of Department of Geospatial Information Service Mr. Kry Kirirath : Office Chief of Department of Geospatial Information Service	<ul style="list-style-type: none"> • Hearing the general condition of the forestry and the availability of forest cover map.

Country	Organization	Attendants	Outline
	Ministry of Land Management ,urban Planning &Construction general Department of Cadastre & Geography	Mr. SO VANNA : Director of Department of geography	<ul style="list-style-type: none"> Hearing the availability of Land use map, River network and administrative map in Cambodia.
	Ministry of Water resources and Meteorology	Mr. Masuo Manabu, JICA chief advisor of River Basin Water Resources Utilization	<ul style="list-style-type: none"> Hearing the current situation of water resource utilization in Cambodia
Lao PDR	JICA Lao PDR Office	Mr. Sakudo, Senior Representative Mr. Machida, Representative (Agriculture and Rural Development) Ms. Kunitsuka, Project Formulation Adviser	<ul style="list-style-type: none"> Acquiring information of possible target organization or any bodies of the hearing survey. Acquiring information of related ongoing/past related JICA projects
		Mr Kitamura, Forestry Expert	<ul style="list-style-type: none"> Acquiring information of related ongoing/past related JICA projects Hearing the general condition of the forestry and related commercial activities in Cambodia.
	Ministry of Agriculture and Forestry (MAF)Department of Forestry (DOF)	Mr. Soukanh Bounthabandid, Forest Inventory and Planning division Mr. Amphaaivah meuanghane Mr. Mr. Somphone Khamphanh, Deputy Director of monitoring and Evaluation Division, LNMC	<ul style="list-style-type: none"> Hearing the general situation of the forest governance in Lao PDR, Progress of REDD+ and the availability of forest cover map.
Viet Nam	JICA Viet Nam Office	Mr. Naoki Kataoka, Senior representative Ms. Yuko Kanto, Project Formulation Advisor Mr. Hiroki Miyazono, Chief Technical Advisor Mr. Baku Takahashi, Deputy CTA / Technical Advisor - REDD+	<ul style="list-style-type: none"> Acquiring information of possible target organization or any bodies of the hearing survey. Hearing the general condition of the forestry in Viet Nam.
	Ministry of Agriculture and Rural Development (MARD) Viet Nam Administration of Forestry (VNFOREST)	Dr. Nguyen Phu Hung, Director of Sciences, technology and International Cooperation Department Mr. Nguyen Nam Son, Forest Development Department Mr. Hanthi Ngan	<ul style="list-style-type: none"> Hearing the general situation of the forest governance in Viet Nam, Progress of REDD+ and the availability of forest cover map.
	Forest Inventory and Planning institute	Dr. Nguyen Dinh Hung, Mr. Vu Quang Hien	<ul style="list-style-type: none"> Hearing about the creation of forest cover map in Thailand and the availability of forest cover map.

Country	Organization	Attendants	Outline
	Ministry of Natural Resources and Environment (MONRE) Department of Survey, Mapping and Geoinformation Viet Nam	Dr. Nguyen Dai Dong, Chief of Science and International Cooperation Office	<ul style="list-style-type: none"> Hearing the availability of Land use map, River network map in Viet Nam. Hearing about the creation of Forest Cover Map in Thailand and availability of forest cover map.
Thailand	Royal Forest Department (RFD) Ministry of Natural Resource and Environment (MONRE)	Mr. Vissanu Domrongsutsiri Mr. Chonlanet Preechacharoensri, Forest Land Management Office Ms. Nattaporn Nakula, IT center Ms. Prapanpong Kongerirod, IT center Mr. Wee Sritippho, IT center	<ul style="list-style-type: none"> Hearing the general situation of the forest governance in Thailand and the availability of forest cover map.
	Department of National Parks, Wildlife and Plant Conservation (DNP), MONRE	Mr. Siri Akaakara, Director of Forest Protection and Fire Control Office Mr. Anuchit Ratanasuwau, Director of Geo-Informatics Division Mr. Natin Jarcenratranapork, Geo-informatics Division	<ul style="list-style-type: none"> Hearing the general situation of the forest fire in Thailand and Initiatives for forest fires
	Land Development Department (LDD), Ministry of Agriculture and Cooperative (MOAC)	Ms. Narumoc Ehomsang, Director of surveying and mapping technology Mr. Monton Suriyaprasit, Director of Surveying and Mapping research and development section Mr. Nvntapon Nongharnpitak, Policy and land use planning division Mr. Satira Udomsri, Expert on soil survey and classification Ms. Kaesorn Jumpa, Policy and land use planning division	<ul style="list-style-type: none"> Hearing the availability of Land Use map, soil map and DEM data in Thailand
	Department of Water Resource (DWR), Ministry of Natural Resources and Environment (MONRE)	Mr. Tanasak Prasertsri, Director of GIS sector, Department of Water resources	<ul style="list-style-type: none"> Hearing the availability of Land use map, River network and the availability of hazard map and/or data.
	REDD+ Office-REDD+ Task Force Secretariat Office, DNP	Dr. Prasaert Sornsathapornkul, Director division of Foreign Affairs Ms. Ratona Lukanawrakul, Office of Climate change Division of Foreign Affair	<ul style="list-style-type: none"> Hearing the general condition of the forestry and REDD+ progress in Thailand.
	Office of The Cane and Sugar Board, MOI (Ministry of Industry)	Mr. Sunai Piriyasagulpat, Head of Information Technology and communication Mr. Sarawut Sukmuang, Information Technology and communication	<ul style="list-style-type: none"> Hearing the state of the production of Sugar and possibility of the deforestation for expansion of sugar production
	Forest Department, Kasetsart University	Dr. Khwanchai Duangsathaporn : Head of Forest Management Faculty of Forestry Department Mr. Narapong Saung ram Ms. Chokdee Khantawan	<ul style="list-style-type: none"> Hearing current forest policy and state of deforestation driver in Thailand

Country	Organization	Attendants	Outline
	RECOFTC(Regional Community Forestry Training Center for Asia and the Pacific)	Ms. Warangkana Rattanasat	<ul style="list-style-type: none"> Acquiring information of participation in Forest sector by private sector and or local community
	JICA Thailand Office	Dr. Takahiro Otsuka, Representative Mr. Yasuyuki Endo, Representative	<ul style="list-style-type: none"> Acquiring information of possible target organization or any bodies of the hearing survey. Acquiring information of JICA environmental projects
	Department of Marine and Coastal Resources (DMCR), MONRE	Mr. Chatree Maknual, Director of Mangrove conservation office Mr. Trithip Promthong, Unit chief of Mangrove conservation and restoration Mr. Utai Dachyosdee, Mangrove restoration unit	<ul style="list-style-type: none"> Hearing about the ongoing/past Mangrove management in Thailand

(a) Collecting the Information regarding Deforestation Drivers

Based on the results from the literature survey, additional information regarding the forest conditions including deforestation drivers has been obtained through the series of the interview surveys listed on the above table. On the other hand, further efforts will be made for collecting information such as developing policies, internal report which contains the information of deforestation drivers and organization charts which are unavailable during the above survey.

(b) In Interview to Private Enterprise and NGOs

By the results of the collected information from the JICA offices as well as JICA experts in Cambodia, Lao PDR and Viet Nam, it is turned out that the strength and the weakness of the forest products in each country varies due to the labor costs, required energy and the policies for them. Therefore, the team decided to conduct further survey on good practices, collecting information on market trend and its risks in this region as well as collecting information from the enterprises which have pulled off from the regions.

Item 1-4: Preparation of Inception Report

Inception report will be prepared through examining and analyzing existing data and information. It will include background of the Study, objectives, technical and operational approaches and plan of operation.

Item 1-5: Discussion on Inception Report in Japan

Prior to the meeting with MRC and NMCs, the Study Team will discuss Inception Report with JICA headquarters and advisory panel.

3.1.2 Phase 2: Grasp of Present Condition and Issues in the Mekong Basin

Item 2-1: Kickoff Seminar

Kickoff seminar will be held as follows.

Table 3.5 Kickoff Seminar

Date	One day in the end of May 2018 (tentatively May 28th Monday)
Place	Meeting room, MRC headquarters, Vientiane, Lao PDR
Participants	Participants from MRC Secretariat, NMC from 4 countries, Relevant ministries and agencies from 5 countries
Contents	<ul style="list-style-type: none">● Explanation of the Study● Presentation of present status of river basin management and forest management, environmental change by climate change in each countries and sharing of issues.● Discussion of the needs for the river basin management and forest management

Item 2-2: Development of Basin Simulation Model, Projection of Change in Environment and Impact Analysis

Basically, DSF in MRC Tool Box and its results shall be utilized for the evaluations in this project. In addition, JST respects the climate change scenarios authorized by MRC and NMCs and fully utilize them. As mentioned in Chapter 2, MRC has already conducted the simulations under the climate changes scenarios. Since those results are approved by MRC and each NMC, JST will just check and verify the reasonability of them.

Regarding the evaluation of deforestation, additional simulation shall be conducted in cooperation with MRC and NMC. In concrete terms, JST will provide the information of forest cover areas which are expected at the target years, and MRC will conduct the hydrological and hydraulic analysis considering the future forest cover areas.

The numbers of simulations equal to nine climate change scenarios multiplied by the target years is required. However, it might be difficult to conduct all simulation due to manpower, capacity of PC, etc. Hence, JST will discuss with MRC and NMC and would select the simulation cases, if needed.

Allocations of this work in using DSF in MRC Tool Box among the MRC and JST shall be discussed and determined after Kickoff meeting. JST will be in charge of the building of additional hydrological and hydraulic models (RRI model) which is utilized for identification of hot spots (potential vulnerable areas) upstream of Kratie, Cambodia.

Item 2-3: Development of Forest Cover Map and Evaluation

Based on development of forest cover map at multi-temporal points and flow of estimation of deforestation area shown the Figure 3.1 and 3.2 practical work method is shown hereunder.

(1) Kickoff Seminar

Understanding and cooperation will be requested to each country in order to proceed works in use of existing forest cover map of the five countries in the lower Mekong Basin for development of lower Mekong Basin Forest Cover Map.

(2) Forest Cover Map related Works

Forest related ministry and line agency of each country, MRC and research institute will be visited, and reconfirmation of the information of the study approach at the Table 2.3 and unconfirmed information will be collected, at the same time utilization of existing forest cover map shall be requested. Especially, observation year of the satellite image used for development of forest cover map at each year explicated in the Table 2.3 will be confirmed and geo-coordination system, minimum map unit and classification item will be investigated precisely. The information are very important factors to integrate forest cover maps of each country. And geospatial information related institute will be visited and geospatial information which is available to use for analysis of deforestation and degradation is collected. After collection of reconfirmed or no-confirmed information, the information is compiled and integration of forest cover map is conducted in accordance with step shown in the Figure 3-2.

Regarding analysis of annual change between years of forest cover map in the lower Mekong Basin, detailed items of land classification are combined by integration so that it is expected to conduct detailed analysis insufficiently. In order to recover this matter detailed classification items at each country are used and change detection analysis is conducted along with the item by objective.

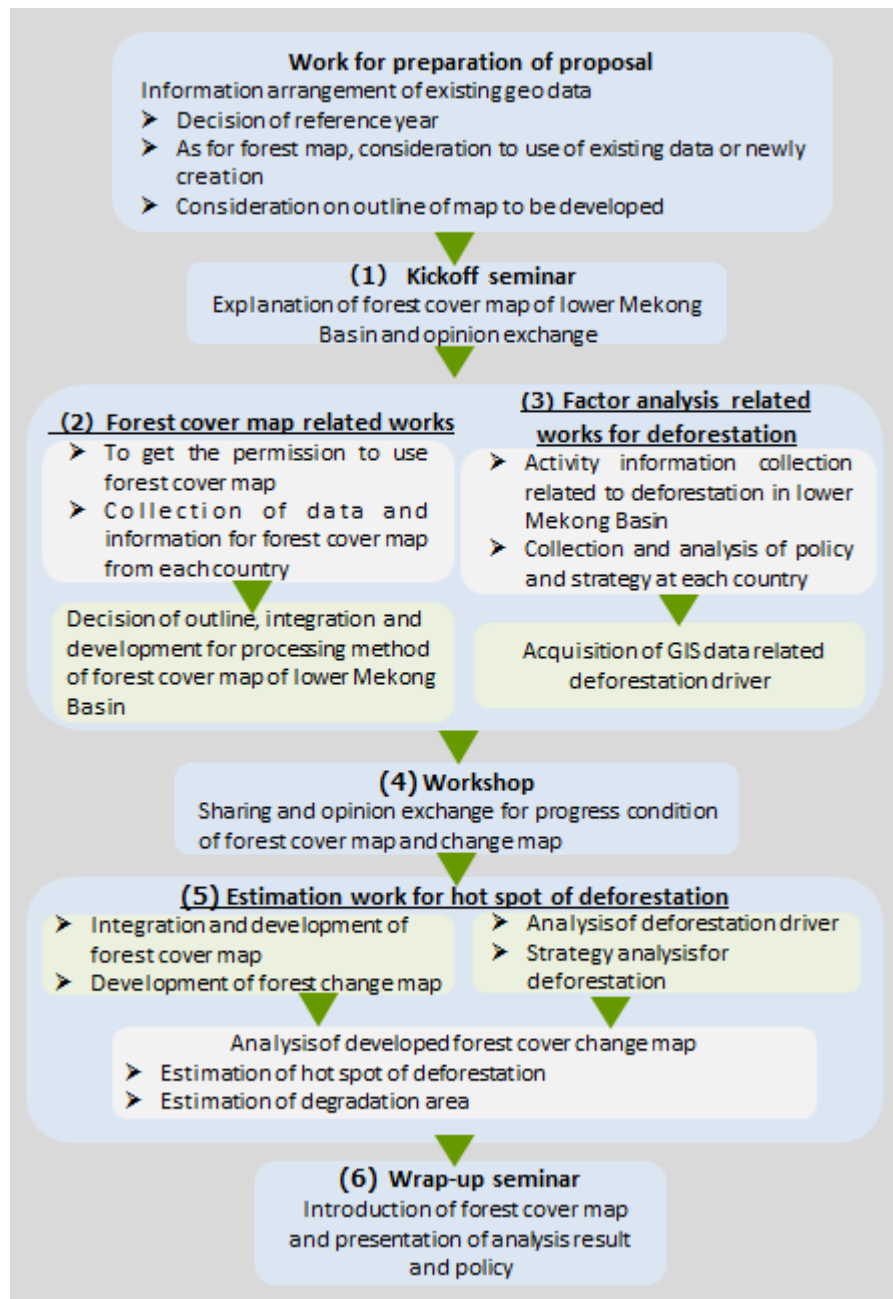


Figure 3-1 Flow of Development of Forest Cover Map and estimation of Deforestation Area

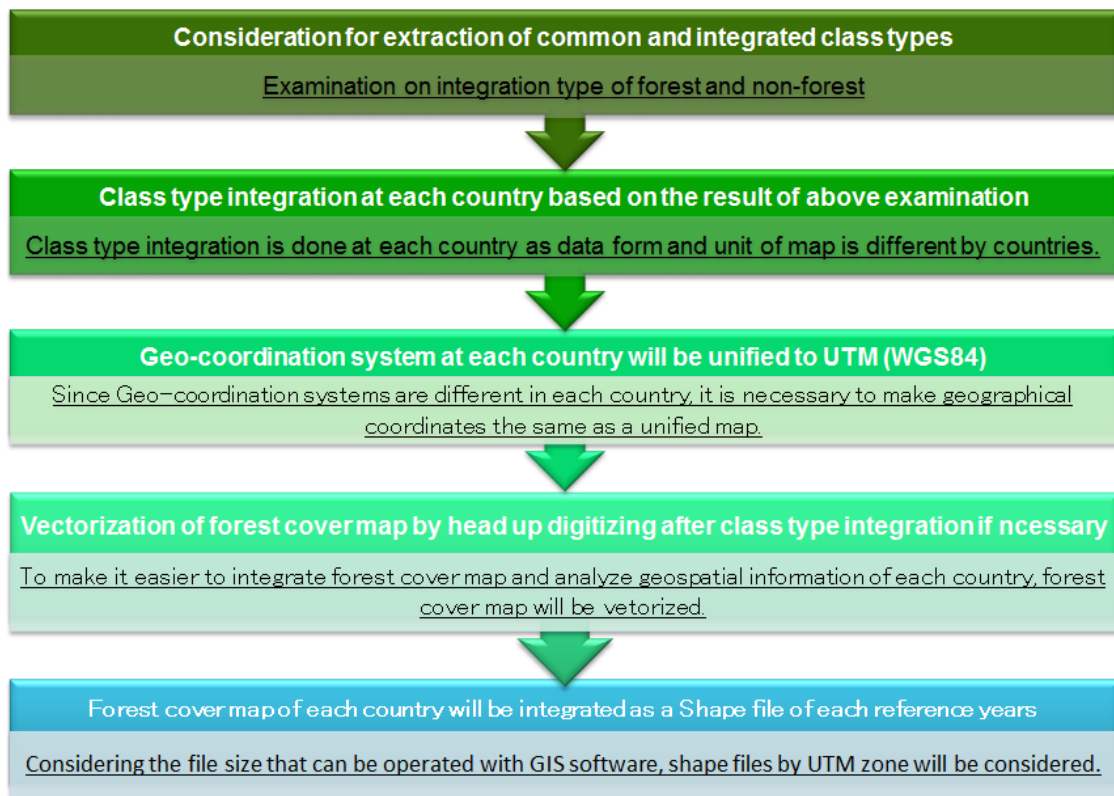


Figure 3-2 Step to develop Forest Cover Change Map

(3) Factor Analysis Work of Deforestation

Direct driver and indirect driver of deforestation and forest degradation shown in the Table 2.5 and Table 2.6 are understood as the information on each country in the present condition. In this project details on the factor of deforestation and degradation in especially the lower Mekong Basin is analysed and latest information will be confirmed and analysed.

Relation between direct factor and indirect factor will be examined and information on future trend of each factor is collected. For example, each country says that land use conversion to the commercial purpose plantation (natural rubber and oil palm) causes deforestation at the lower Mekong Basin and the increase of demand in the international market becomes the background of promotion of land conversion. From the data of FAO-SAT shown in the Figure 3-3 it is possible to grasp the trend of international demand.

The information will be overlaid on the forest cover map applicable data will be extracted to extract hot spot of deforestation such as GIS data (road network map or dam construction plan map so that analysis with diversified view point is going to be carried out.

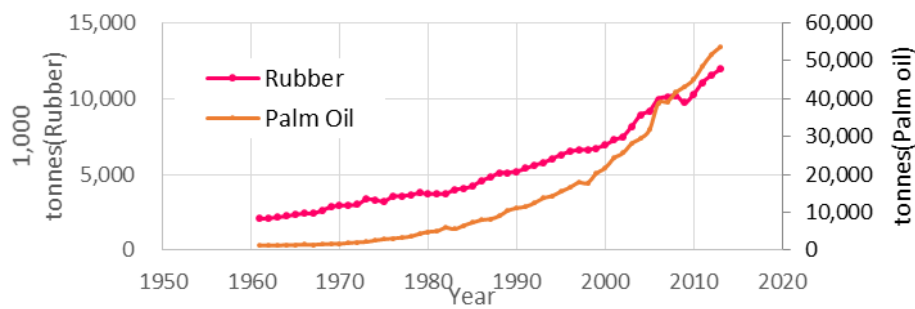


Figure 3-3 Trend on International Demand of Natural Rubber and Oil Palm (Prepared by JV based on FAO-SAT Data)

(4) Workshop at the Site

At the site workshop will be informed progress of the work for forest cover map and change map at the lower Mekong Basin, and will be shared by each other the collected and rearranged information. And then opinions will be exchanged among the representatives of MRC and each country to confirm for the future works. In order to utilize the achievement of the activity in this task for the lower Mekong Basin after completion of the tasks, enough time will be allocated to the workshop for discussion and exchange the opinions in order to reflect the inputs from the C/P.

(5) Estimation Work of Hot Spot for Deforestation

As for year change analysis of forest cover map and forest cover change map integrated by objective, area change by item and temporal change by special cover item will be extracted that is proposed in the study approach. After extraction of change event information will be overlaid with geospatial information on deforestation that is obtained by information collection of deforestation area and deforestation factor, and relation between internal factor such as natural phenomenon and external factor such as exploitation will be analyzed, and present forest conservation is understood, and the problem will be extracted. And trend will be derived from the information of change and future deforestation is estimated. Hot spot extraction and estimation of fragile area to which might be susceptible to the effect of climate change also will be conducted.

3.1.3 Phase 3: Analysis in Japan and Study Tour in Japan

Item 3-1: Analysis in Japan

The result of the Study up to the kickoff seminar will be presented to JICA headquarters and advisory panel and discuss on the necessary work in the Second Field Work. Key issues, e.g., applied basin environment simulation model, collected forest cover maps, will be confirmed.

Item 3-2: Study Tour to Japan

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

Table 3.6 Study tour in Japan (Draft Summary)

Date	One week from July to August 2018
Place	Relevant authorities such as ministry, research institute and local government in Japan
Participants	One person each from the five countries and two from MRCS
Contents	Lecture and Site Visit on skill, knowledge and experience in Japan for Basin management/conservation and Forest management
Schedule example	Day1: Arrival Day2~4: Kickoff and Study for water resource management, basin management and water catchment system at the eastern Japan Day5~6: Study for forest conservation at the western Japan Day7: Departure

Item 3-3: Preparation and Submission of Interim Report (IT/R)

Interim Report will be prepared compiling the results of the Study up to the First Home Office Work and presented to JICA headquarters and advisory panel.

3.1.4 Phase 4: Discussion on Approach against Issues

Item 4-1: Discussion on Approach against Issues

For aiming at best practices/recommendations at the Japan - Mekong Summit Meeting in 2018, based on the simulation results and forest cover chart analysis results measures to deal with the issues considered from these relationships are organized as best practices/recommendations to related organizations. Regarding the overall program plan for workshop, we will explain to the MRC, JICA and make appropriate modifications based on comments. Also, in consultation with MRC and JICA, in addition to various adjustment work, study team will provide necessary support such as seminar program and advice on the direction of discussion.

JST believes that effective approaches against issues shall be discussed scientific-basis. Therefore, issues on river basin management shall be clarified mitigations of deforestations will be discussed, and the best practices/recommendation for forest management shall be determined in cooperation with MRC and NMC, based on the existing outputs from MRC regarding climate changes, etc.

For evaluations for mitigations of deforestation quantitatively, additional simulations by using DSF in MRC Tool Box and/or additional model shall be conducted, if needed. The mitigations of deforestation include the activities of private sectors. Activities of governments and private sectors, etc. which contribute to re-creation of forest and repression of deforestation shall be evaluated as forest areas. In addition, the increases in forest areas will be considered in the model and their efforts should be evaluated quantitatively. Hence, how to evaluate the contributions of governments and private sectors as increases in forest areas and how to incorporate them in the model shall be also discussed with stakeholders through this project.

Item 4-2: Workshop

Workshop in Lao PDR is to be conducted in order to share the draft outputs and discuss the challenges on prediction and evaluation of basin environment change and forest cover. Summary is as follows,

Table 3.7 Workshop (Draft Summary)

Date	1 day from September to October 2018
Place	Vientiane, Lao PDR
Participants	Participants from MRC office, representatives of 4 NMCs, relevant national line agencies, relevant authorities in Japan and other stakeholders
Contents	<ul style="list-style-type: none">• Sharing the draft outputs of Basin Environment Management Model and Forest Cover Map• Discussion on the result of predicted simulation and analyzed evaluation• Exchanging opinions related to the best practices/recommendation

3.1.5 Phase 5: Study for Best Practices/Recommendation

Item 5-1: Survey on Best Practices/Recommendation

The results of the Study and proposed best practices/recommendation will be presented to MRC. Future potential of possible projects will be identified and selected concrete project will be proposed and implementation possibility and appropriateness will be discussed.

Item 5-2: Preparation, Presentation and Discussion on Draft Final Report

Draft Final Report will be prepared and presented to JICA headquarters and advisory panel.

Item 5-3: Wrap-Up Seminar

Wrap-up seminar will be held in the following matter:

Table 3.8 Wrap-up Seminar

Date	1 day from middle of January to the beginning of February, 2019
Place	Vientiane, LaoPDR
Participants	Participants from MRC office, representatives of 4 NMCs, relevant national line agencies, relevant authorities in Japan and other stakeholders
Contents	<ul style="list-style-type: none">• 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.

3.1.6 Phase 6: Seminar in Japan

Item 6-1: Seminar in Japan

Seminar in Japan is to be conducted in order to share the result of the Study and promote the participating of private sector and partnership in Japan. Summary is as follows,

Table 3.9 Seminar in Japan (Draft Summary)

Date	1 day in the end of February or beginning of March 2019
Place	Japan
Participants	100 people from relevant Industry, Government, Academia and Embassies.
Contents	<ul style="list-style-type: none"> • Presentation on the result of the Study • Exchanging opinions on the business development in Mekong Basin

Item 6-2: Preparation of Final Report

Final Report will be prepared compiling all the study results and presented to JICA headquarters and advisory panel.

3.2 Work Schedule

The work schedule of the Study is as follows;

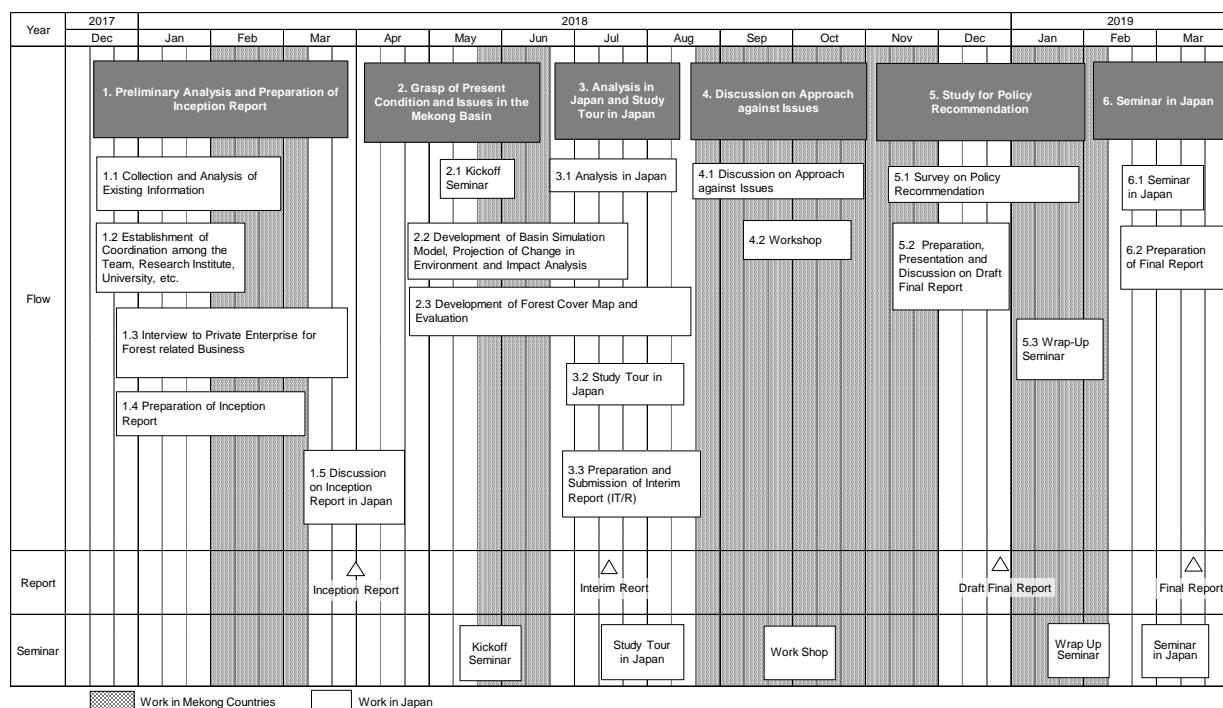


Figure 3-4 Work Schedule

3.3 Staffing and Assignment Schedule

The composition of the JICA Study Team is as shown in Table 3.10.

Table 3.10 Composition of the JICA Study Team

Name	Designation or Field of Specialty
Mr. SASABE Keiji	Team Leader / Basin Management 1
Mr. NAKAMURA Kazuhiro	Sub-Team Leader / Basin Management 2 / Climate Change / Hydrology
Mr. SATO Kei	Forest Cover Map
Mr. KIYOTA Daisaku	Private Promotion and Business Partnership
Ms. FUJIMURA Sahori	Sustainable Forest Management (Mitigation and REDD+)
Mr. ICHIKAWA Shumpei	Support for Seminar

3.4 Reports

The Study Team shall prepare and submit reports to MRC, in both hardcopy and digital copy, as listed in Table 3.11.

Table 3.11 Reports to be Prepared and Submitted

Reports	Submission Schedule	Number of Copies	Contents
Inception Report (IC/R)	April 2018	10 (in English)	Objectives, contents, methodology and schedule of the Study.
Interim Report (IT/R)	July 2018	10 (in English)	Promotion of the Study
Draft Final Report (DF/R)	December 2018	10 (in English) 5 (in Japanese)	Draft output of the Study
Final Report (F/R)	March 2019	30 (in English) 15 (in Japanese)	Final Output and evaluation of the Project

CHAPTER 4. UNDERTAKINGS OF BOTH PARTIES

4.1 Undertakings of JICA and MRC

Expenses related to the Study including consulting and advisory services by Japanese Study Team and travel expenses (Airfare and Accommodation, etc.) for participants in the related seminars/workshops, are borne by the JICA. In line with the MRC Procedures for Data and Information Sharing and Exchange (PDIES), the MRC will provide data that MRC owns¹ and give permission to use the results from the MRC Decision Support Framework (DSF) conducted by MRCS staff in co-operation with the JICA Study Team for the Study as appropriate. The MRC will also extend necessary supports for the JICA/Japanese Study Team in terms of assignment of counterpart staff of the MRC Secretariat, provision of office space with necessary equipment and running expense in the MRC secretariat and other in-kind contributions unless otherwise agreed upon by the Parties.

4.2 Mutual Consultation

JICA and MRC shall consult with each other whenever any major issues arise in the course of the Study implementation.

¹ Only the category of unrestricted data will be shared freely while the restricted data will be subjected to further consideration and approval including by member countries in line with PDIES.

ANNEX 1



< DRAFT >

Memorandum of Understanding
Between

The Mekong River Commission (MRC)

And

The Japan International Cooperation Agency (JICA)

On

The Study on the Basin Management and Environmental Conservation
in Mekong River Basin

1. Preamble

This Memorandum of Understanding (hereinafter referred to as 'MOU') is made and entered into by and between the Mekong River Commission (hereinafter referred to as 'MRC') and the Japan International Cooperation Agency (hereinafter referred to as 'JICA') in order to implement a collaborative study on the Basin Management and Environmental Conservation in Mekong River Basin (hereinafter referred to as 'the Study').

Whereas, MRC and JICA (hereinafter referred to as 'the Parties') will endeavor to cooperate and collaborate for the successful implementation of the Study.

2. Background

The MRC is the inter-governmental organization, established in 1995 by 1995 Mekong Agreement, that works directly with governments of Cambodia, Lao PDR, Thailand and Viet Nam in their common specific interests-joint management of shared water resources and sustainable development of the Mekong River Basin with the aim to ensure that the Mekong is developed in the most efficient manner mutually benefiting all Member Countries and minimizing harmful effects on people and the environment in the Mekong River Basin. The MRC serves its Member Countries with technical know-how and basin-wide perspectives; the MRC plays a key role in regional decision-making and the execution of river basin policies in a way that promotes sustainable development and poverty alleviation. The MRC consists of three permanent bodies: The council (overall governance), the Joint Committee (a management board) and the Secretariat (operational arm of the MRC).

JICA, established in 1974, is the Incorporated Administrative institution under the Act of the Incorporated Administrative Agency- Japan International Cooperation Agency (Act No. 136, 2002). JICA aims to contribute to the promotion of international cooperation as well as the sound development of Japanese and global economy by supporting the socioeconomic development, recovery or economic stability of developing regions, recalling the Vision of JICA, 'Leading the world with trust', and five actions: (1) Commitment: Commit ourselves with pride and passion to achieving our mission and vision; (2) Gemba: Dive into the field ("gemba") and work together with the people; (3) Strategy: Think and act strategically with broad and long-term perspectives; (4) Co-creation: Bring together diverse wisdom and resources; and (5) Innovation: Innovate to bring about unprecedented impacts.

The Eighth Mekong-Japan Summit Meeting was held in Vientiane, Laos on September 7, 2016. Mr. Shinzo Abe, Prime Minister of Japan expressed his intention to start a study to contribute to environmental conservation, and particularly protection of forest resources, in the Mekong River basin area. The Study is also positioned as one of the Japan Mekong Connectivity Initiative Projects (JMCI Projects).

3. Objective

The MOU is aimed at facilitating the implementation of collaborative study regarding the Basin Management and Environmental Conservation in Mekong River Basin in collaboration with the MRC and National Mekong Committees in targeted countries such as Cambodia, Lao PDR, Thailand and Viet Nam.

Through the Study, best practices/recommendations for basin management in Mekong River as one of the expected outputs, will contribute to achieving the MRC's vision and mission.

The key purposes of the MOU are to:

- a. Understand the existing condition of environmental conservation, and particularly forest conservation,
- b. Clarify the issues and challenges for sound basin management in Mekong River, and;
- c. Propose effective countermeasures as best practices/recommendations for basin management in Mekong River

4. Areas of Cooperation and Expected Outputs

The Parties identify the following areas of cooperation and expected outputs in the field of the basin management and environmental conservation in Mekong River Basin:

- a. Basin models (including hydrological analysis model)
- b. Historical forest cover maps
- c. Study reports including best practices/recommendations for improvement of basin management in Mekong River Basins, including inputs and support for the MRC in its ongoing development of the MRC's Basin-wide Environment Management Strategy and related environmental monitoring activities.

5. Costs

Expenses related to the Study including consulting and advisory services by Japanese Study Team and travel expenses (Airfare and Accommodation, etc.) for participants in the related seminars/workshops, are borne by the JICA. In line with the MRC Procedures for Data and Information Sharing and Exchange (PDIES), the MRC will provide data that MRC owns² and give permission to use the results from the MRC Decision Support Framework (DSF) conducted by MRCS staff in co-operation with the JICA Study Team for the Study as appropriate. The MRC will also extend necessary supports for the JICA/Japanese Study Team in terms of assignment of counterpart

² Only the category of unrestricted data will be shared freely while the restricted data will be subjected to further consideration and approval including by member countries in line with PDIES.

staff of the MRC Secretariat, provision of office space with necessary equipment and running expense in the MRC secretariat and other in-kind contributions unless otherwise agreed upon by the Parties.

6. Disputes Settlement

Any dispute arising out of the interpretation or application or implementation of the MOU should be settled amicably by consultation or negotiation between the Parties.

7. Duration

The MOU will be in effect on the date of its signing by the Parties until 31 March 2019. The MOU may be extended and modified by written mutual consent.

The MOU is done in two original copies in English language.

For the Mekong River Commission

For the Japan International Cooperation
Agency

*Dr. Pham Tuan Phan
Chief Executive Officer
Mekong River Commission
Secretariat Headquarters, Vientiane*

*Mr. Takahiro MORITA
Senior Deputy Director General,
Global Environment Department,
Japan International Cooperation
Agency*

Date

Date