

Republic of Indonesia  
Ministry of Forestry  
Forest Business Development

Preparatory Survey on  
West Kalimantan Province Reforestation  
and Forest Products Processing Project,  
Indonesia (PPP Infrastructure Project)

Final Report (Part III & IV)  
(JR)

April 2014

Japan International Cooperation Agency

Sumitomo Forestry Co., Ltd.  
Associated with  
Nippon Koei Co., Ltd.

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1 Japanese Yen = 0.0107 Indonesia Rupiah

1 US Dollar = 98.65 Japanese Yen

(Annual average TTS for 2013)

## Final Report (Disclosed Version)

### Structure of Report

<b>Main Report (Part I&amp;II)</b>	<b>Part I</b>	<b>Study Report</b>	<b>Separate</b>
	<b>Part II</b>	<b>Phase 1 (WSL • MTI) Implementation Plan</b>	
<b>Main Report (Part III&amp;IV)</b>	<b>Part III</b>	<b>Phase 2 (MW) Implementation Plan</b>	<b>This report</b>
	<b>Part IV</b>	<b>Contribution to the Climate Change</b>	

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## ABBREVIATION

Abbreviation	Bahasa Indonesia/Full word in English
3R	3R-Reduce, Resuse and Recycle
a.s.l.	Above See Level
A/R CDM	Afforestation and Reforestation Clean Development Mechanism
ADB	Asian Development Bnk
AFOLU	Agriculture, Forestry and Other Land Use
AMDAL	Indonesian Environmental Impact Assessment System
ANDAL	Indonesian Environmental Impact Assessment Main Report
AUD	Australia Doller
B/S	Balance Sheet
BAPPENAS	( <i>Badan Perencanaan Pembangunan Nasional</i> ) / National Development Planning Board
BAU	Business As Usual
BCTMP	Bleached chemi-thermomechanical pulp
BD, MD	Breasting Dolphin, Mooring Dolphin
BHKP	Bleached Hardwood Kraft Pulp
BOD	Biochemical Oxygen Demand
BOT	Build, Operate and Transfer
BPP	Biomass Power Plant
C/N	Carbon to Nitrogen Ratio
CIF	Cost, Insurance and Freight, named port of destination
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
COD	Chemical Oxygen Demand
COP	Conference of the Parties (to the UNFCCC)
CPI	Consumer Price Index
DBH	Diameter at Breast Height
DF/R	Draft Final Report
DSCR	Debt Service Coverage Ratio
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
Equity IRR	Internal Rate of Return for Equity Investors
ER	Emission Reduction
ESC	Environmental and Social Considerations
F/R	Final Report
FAO	Food and Agriculture Organization
FOB	Free On Board
FS	Feasibility Study
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
GEC	Global Environmental Center
GHG	Greenhouse Gas
GIS	Geographical Information System
GPS	Global Positioning System
HC	Hydrocarbon
HCV	High Conservation Value
HCVF	High Conservation Value Forest (An international standard for forest conservation)
HHs	Households
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome



## ABBREVIATION

Abbreviation	Bahasa Indonesia/Full word in English
HP-HTI	( <i>Hak Pengusahaan –Hutan Tanaman Industri</i> ) / Concession in the industrial forest area
HQ	Head Quarter
HWL, LWL	High Water Level, Low Water Level
IC/R	Inception Report
ICCSR	The Indonesia Climate Change Sectoral Roadmap
IDR	Indonesian Rupiah
IEE	Initial Environmental Examination
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPDP	Indigenous People's Development Plan
IPP	Indigenous People's Plan
IRR	Internal Rate of Return
IT/R	Interim Report
IUCN	International Union for Conservation of Nature
JCM	Joint Crediting Mechanism
JICA	Japan International Cooperation Agency
JVC	Joint Venture Company
KA-ANDAL	Preparatory documents for implementing AMDAL
LARP	Land Acquisition and Resettlement Plan
LULUCF	Land Use, Land Use Change, and Forestry
MAI	Mean Annual Increment
METI	Ministry of Economy, Trade and Industry
MM	Minutes of Meeting
MOE	Ministry of Environment
MOF	Ministry of Forestry
MP3EI	The Master Plan for Acceleration and Expansion of Indonesia's Economic Development
MRV	Measurement, Reporting and Verification
NGOs	Non-Governmental Organizations
NJOP	The Sales Value of the Tax Object
NO <sub>x</sub>	Nitrogen Oxides
O&M	Operation and Management
ODA	Official Development Assistance
OJT	On the Job Training
PAP	Potentially Affected People
PCB	Polychlorinated biphenyl
PHPL	( <i>Pengelolaan Hutan Produksi Lestari</i> ) / (Indonesian) Forest Certification on Sustainable Forestry)
PM	Particulate matter
PPP	Public-Private Partnership
PSIF	Private Sector Investment Finance
PT	( <i>Perseoran Terbatas</i> ) / Limited Corporation, Co., Ltd.
PT. MTI	( <i>PT. Mayangkara Tanaman Industri</i> )/ Name of JVC
PT. MW	( <i>PT. Mayawana Persada</i> ) / Name of SPC
PT. WSL	( <i>PT. Wana Subur Lestari</i> ) /Name of JVC
Q'ty	Quantity
RA	Reference Area
RAN-GRK	( <i>Rencana Nasional Penurunan Emisi Gas Rumah Kaca</i> ) / The National Plan for Greenhouse Gas Emission Reduction
RC	Reinforced-Concrete
REDD/REDD	Reducing Emissions from Deforestation and Forest Degradation in developing

## ABBREVIATION

Abbreviation	Bahasa Indonesia/Full word in English
+	countries/ plus
REL/RL	Reference Emission Level / Reference (Sequestration) Level
RKL	( <i>Rencana Kerja Lingkungan</i> ) / Environmental Management Plan
RKU	( <i>Rencana Kerja Usaha</i> ) / Business Work Plan
RPL	( <i>Rencana Pemantauan Lingkungan</i> ) / Environmental Monitoring Plan
SFC	Sumitomo Forestry Co., Ltd.
SFM	Sustainable Forest Management
SIGN	( <i>Sistem Informasi Gas rumah kaca Nasional</i> ) / National GHG Inventory System
SLK	( <i>Sertifikat Legalitas Kayu</i> ) / Certificate of legality of timber
SO <sub>x</sub>	Sulfur Oxide
SPC	Special Purpose Company
SPEC	Specification
SSP	Steel Pipe Pile
SST	Social Security Team
SSTs	Social Security Team Staff
STD	Sexual Transmitted Diseases
TDS	Total Dissolved Solid
TOR	Terms of Reference
TPK	( <i>Tempat Penumpukan Kayu</i> ) / Wood stacking area
TSP	Total Suspended Particulates
TSS	Total Suspended Solid
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WHO	World Health Organization
WWF	World Wide Fund for Nature

Unit	
km <sup>2</sup>	: Square kilometer
g	: Gram
Ha/ ha	: Hectare
J	: Joule
L	: Liter
m <sup>2</sup>	: Square meter
m <sup>3</sup>	: Cubic meter
GMt	: Green Metric ton (Woodchip)
BDt	: Bone Dry ton (Woodchip)
ADt	: Air Dry ton (Woodchip)
Mwh	: Mega watt hour (Power plant)
t-C	: ton (Carbon equivalent)
t-CO <sub>2</sub>	: ton (CO <sub>2</sub> equivalent)
T/hr	: Ton/ hour (Boiler)
kV	: Kilo-volt
KVA	: Kilo-volt-hour
kW	: Kilowatt
m <sup>3</sup> /SOB	: Cubic meter /Solid Over Bark

# **Part III**

## **Phase 2 (MW)**

### **Implementation Plan**



## CHAPTER 1 OUTLINE OF PROPOSED PROJECT

### 1.1 Purpose of the Proposed Project

The objectives of the proposed Project are to: (1) reforest degraded land, and (2) construct, operate and maintain a wood chip factory and related facilities in West Kalimantan Province. This will contribute to the managing of forests in an appropriate manner so that sustainable industrial forestation will be promoted.

### 1.2 Project Scope

#### 1.2.1 Project Area of the Proposed Project

The proposed project area is located in Kubu Raya, Sanggau, Ketapang and North Kayang Districts in West Kalimantan Province, Indonesia. The area is designated as Production Forest Area (*Kawasan Hutan Produksi*, in Bahasa Indonesia) of, approximately 251,000 ha. The Figure below shows the location of the propose project area.

The proposed project is divided into two phases (Phases 1 & 2). This Part III of this report covers Phase 2 (in MW areas) which totals approximately 135,000 ha.

#### 1.2.2 Outline of the Proposed Project

The proposed project is a large-scale plantation project which considers the environment. It is to be implemented in an area which the Ministry of Forestry Indonesia has given rights for industrial plantation (hereinafter “concession area”). The whole project area is composed of three areas (WSL area, MTI area and MW area) as shown in the Figure below. Sumitomo Forestry Group and Alas Kusuma Group (hereinafter “JV”) have established several local Special Purpose Company (hereinafter “SPC”) with shared investment (50-50) to implement the proposed project, which is composed of the industrial plantation and wood chip production based on the rights for the industrial plantation (HP-HTI; Hak Pengusahaan - Hutan Tanaman Industri, in Bahasa Indonesia).

The JV have established two SPCs: PT. Wana Subur Lestari (hereinafter “PT. WSL”) and PT. Mayangkara Tanaman Industri (hereinafter “PT. MTI”). PT. WSL started plantation activities in 2010 and PT. MTI started in 2011. The other SPC, PT. Mayawana Persada (hereinafter “PT. MW”) was established by Alas Kusuma Group, and it obtained the rights for industrial plantation in 2011. Sumitomo Forestry Group plans to share the stock of PT. MW with Alas Kusuma Group and to be managed jointly, the same as with PT. WSL and PT. MTI.

The outline of the Proposed project is shown in the Table below. The target projects of Phase 2 (Part III of this report) are highlighted in the table.

The proposed project is planned to be implemented by three SPCs. PT.WSL and PT.MTI that have been already been established and also the plantation activities have started. On the other hand, Sumitomo Forestry Group has not yet joined to the project of MW area. The level of maturity of PT. WSL & MTI and PT. MW is different; therefore, the whole proposed project was divided into two phases (Phase 1 and 2).

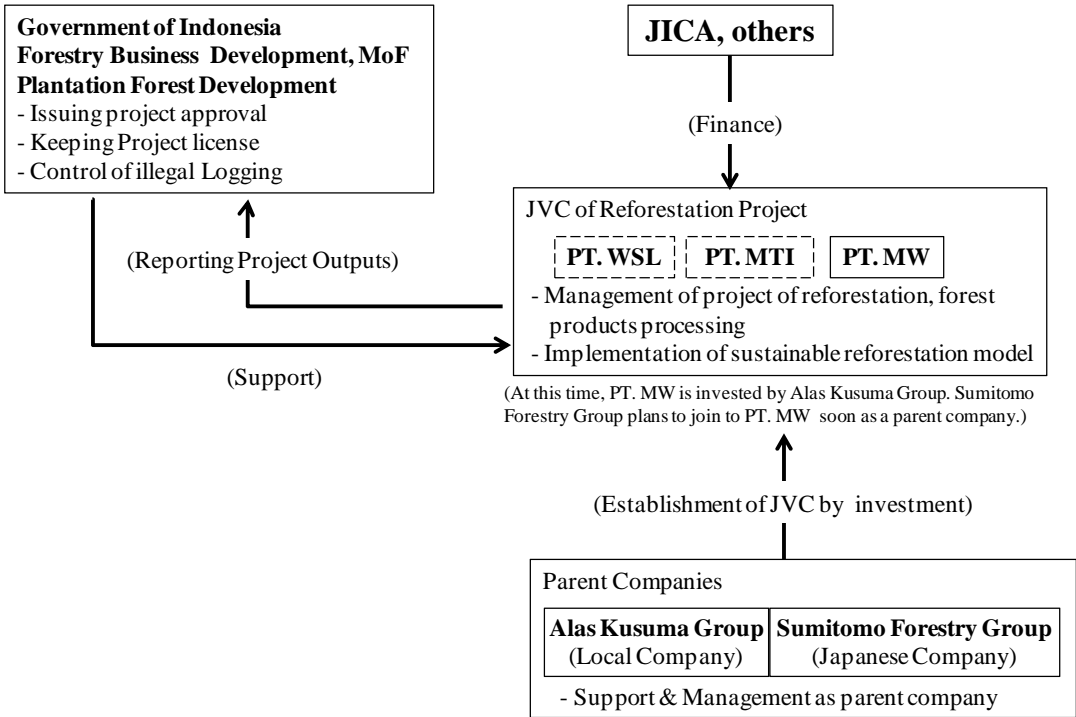
### Outline of the Proposed Project

Item	Phase-1	Phase-2
Target Area	WSL area, MTI area	MW area
Contents of Project	Keep sustainable forest management and healthy forest condition. Sustainable forest management consists of reforestation on degraded lands, harvesting logs for wood chip for pulp, selling wood chips, returning the benefits of reforestation.	Same as left.
Project companies	Established JVC (PT. WSL, PT. MTI)	JVC (PT. MW), planned to be established
Project period	2009 to 2038, 30 years	2015 to 2044, 30years
Existing plans	Detailed reforestation/ harvesting plans are prepared partially. Outline of wood chip production and marketing plan are prepared.	Outline of reforestation plan are prepared. Wood chip production and market plans are not yet prepared.
Cash flow components	<ul style="list-style-type: none"> <li>- Reforestation, log selling in WSL area</li> <li>- Reforestation, wood chip production and selling in MTI area</li> </ul>	<ul style="list-style-type: none"> <li>- Reforestation, wood chip production and selling in MW area</li> </ul>
Major survey items of this FS survey	Outline of designs and cost estimation of the following plans: <ul style="list-style-type: none"> <li>- Reforestation and harvesting plan</li> <li>- Wood chip production factory plan</li> <li>- Log and wood chip transportation plan</li> <li>- Wood chip production and selling plan</li> </ul> Following analysis and plans: <ul style="list-style-type: none"> <li>- Financial analysis and fund procurement plan</li> <li>- Risk analysis</li> <li>- Project feasibility analysis</li> </ul>	Survey items are same as left, design accuracy is still at outline level compared to Project-1.
Part of this report (IT/R)	Part II	Part III
Approval of the project by MoF	<ul style="list-style-type: none"> <li>- Industrial forestation concession was given to the project companies.</li> <li>- Outlines of project plans have been approved by MoF.</li> <li>- Three environmental documents (environment assessment report, environment management plan, environment monitoring plan) for concession areas of PT. WSL and PT. MTI were approved by the Ministry of Environment, Indonesia.</li> <li>- Wood chip production license was given to PT. MTI.</li> </ul>	<ul style="list-style-type: none"> <li>- Industrial forestation concession was given to the project company.</li> <li>- Outlines of project plan have been approved by MoF.</li> <li>- Three environmental documents (environment assessment report, environment management plan, environment monitoring plan) for concession areas of PT. MW was approved by the Ministry of Environment, Indonesia.</li> </ul>
Others	HCVF (High Conservation Value Forest) surveys of WSL area and MTI area are on-going.	HVCF survey has been conducted simultaneously.

Source: JICA Survey Team

### 1.2.3 Proposed Project Scheme

The proposed project will be implemented by the SPC, in which a Japanese company and Local company share the stock, using finance of JICA. The Ministry of Forestry Indonesia gave rights of usage of the project area and licence of industrial plantation. The project scheme is shown in the Figure below.



Source: JICA Survey Team

**Project Scheme**

**1.2.4 Division of Roles between Public and Private**

Indonesian Government (Public) will issue and maintains necessary business licenses for this project, and strengthens control against illegal logging, and at the same time, lead the sustainable HTI operation in order to realize the strategy of timber sector under MP3EI. At the same time, the government will enlighten the HTI License holder to obtain required government certificates such as certificate of timber legality (SLK), and forest certification to promote sustainable industrial plantation project to support the growth of wood production and wood processing business in Indonesia.

On the other hand, the Joint Venture Company (Private) which is established by Sumitomo Forestry Co., Ltd (hereafter referred to as “SFC”) and ALAS KUSUMA GROUP (hereafter referred to as “Alas”) will observe rules under HTI license and relative regulations, recover public forest function and stimulate local economy by promoting conservation of wellhead, soil, and biodiversity through executing sustainable industrial plantation project with minimal environmental burden through efficient forest management and high quality operation such as zoning conservation area (preserving natural forest) and plantable area (devastated land by illegal logging and unregulated swidden cultivation).

In MW area, the Private firms will utilizes knowledge from current plantation business experience in determining composition of tree species and plantation method appropriate to different land condition in plantable area (peaty marsh, hilly sloping land, and flat land).





## CHAPTER 2 GENERAL CONDITION OF THE PROJECT AREA

### 2.1 Natural Conditions

#### 2.1.1 Location of the Project Area

The target area of this FS study (MW area) is in Ketapang and Kayong Utara Districts in West Kalimantan Province, Indonesia. It is also located practically on the equator.

#### 2.1.2 Topography and Hydrology

The areas of MW consist of quite gentle slopes in the central and south western area and the north eastern hilly area from 43 to 577 m elevation. The peat soil and mineral soil are distributed in the gentle slope and hilly area respectively.

#### 2.1.3 Climate

The MW area is under the tropical rain forest climate which has high rainfall and temperature year round. The meteorology stations near the project area are at Pontianak Airport and Rahadi Osman meteorological station in District Kutapan. The Pontianak data was obtained far from the project site, but the Osman data is old (1997-2006). Therefore, the outline of climate of the FS study area comes from the meteorology station of Pontianak Airport.

##### (1) Rainfall

Ten years rainfall data from 2003 to 2012 indicates the average of annual rainfall was 3,182 mm, minimum annual rainfall was 2,547 mm in 2006 and the maximum was 3,666 mm in 2007. This is a large amount of rainfall. The season for lower rainfall is from July to September, with monthly rainfall of about 200 mm. The season for high rainfall is from October to December, with monthly rainfall of about 400 mm. The median monthly rainfall is during January to May.

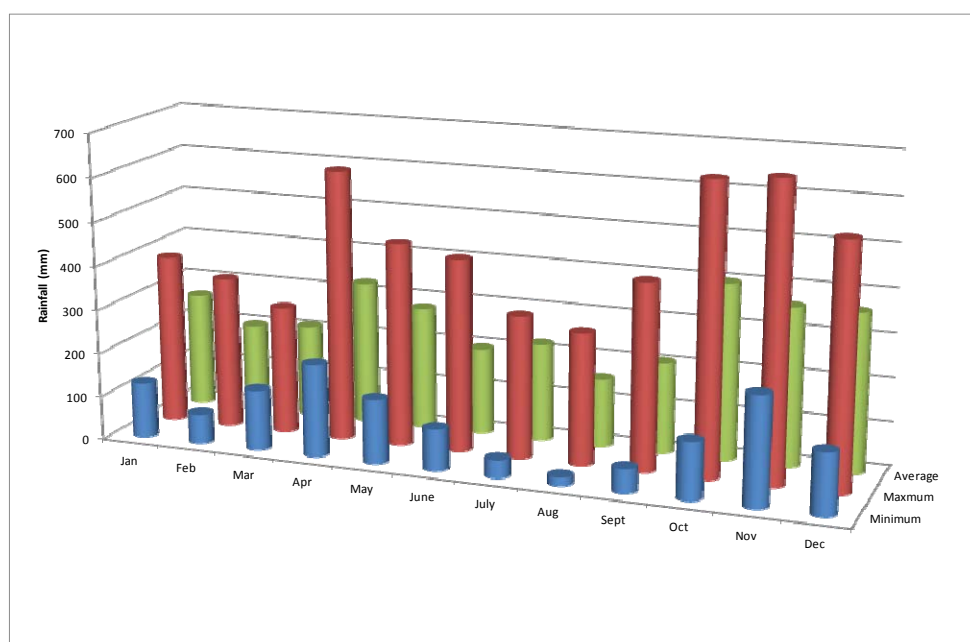
Due to the large amount of the rainfall year round, even during the lower rainfall amount season, the area is evaluated as advantageous for the growth of plants.

The negative point is that the lowest amount of monthly rainfall is once twice in 10 years. The low monthly rainfalls are listed below. Low rainfall leads dry air and also mountain fires. September is known as suitable for slash & burning, and many farmers use fire to shift cultivation fields, before the large rainfall that usually starts from October. There is increased risk that the fire from the shifting cultivation area will spread to neighbouring plantation areas in dry season. Hence, much caution should be paid to fire for the plantation project during the dry season.

#### Low Rainfalls in the Past 10 Years

Month	Lowest Monthly Rainfalls	Year
July	41 mm	2007
August	19 mm, 54 mm	2004, 2012
September	54 mm	2012

Source: JICA Survey Team prepared based on the data of Spadio Pontianak climate Station.



Source: JICA Survey Team prepared based on the data of Spadio Pontianak climate Station.

Note: Data from 2003 to 2012 is used.

### Range of Monthly Mean Rainfall Amount 2003-2012

#### (2) Temperature

Ten years data of temperature (from 2003 to 2012) was purchased and used for climate evaluation. The types of purchased data were monthly average of the daily average/ minimum/ maximum temperature. Tables II-2.1-2 to -4 shows the temperature data (monthly average of daily temperature).

Yearly maximum/ minimum and average values of monthly average of daily maximum/ minimum and average temperature are shown in the Table below.

Yearly average value of monthly average of daily average temperature does not have much fluctuation, the value has a range between 26 to 27°C. Daily minimum temperature is 23 to 26°C, and daily maximum temperature is 27 to 28°C. Yearly average of daily minimum temperature was 23 to 24°C during 10 years, and the yearly average of daily maximum temperature was 30 to 34°C. Although yearly fluctuation of temperature is not much, daily fluctuation of temperature is 7 to 10°C.

High fluctuation of temperature adversely impacts plant growth, and when severe, the planted trees can die. The yearly low or high temperature is also adverse to plant growth. The temperature of the project area is suitable for plant growth, and also fluctuation of the temperature is very small; therefore, the temperature condition of the FS study area can be evaluated as advantageous condition for the plantation project.

#### Ten Years Average Data - Daily Average/Maximum/Minimum Temperature

(Unit: °C)

Year	Daily Mean Temperature			Daily Minimum Temperature			Daily Maximum Temperature		
	Min	Max	Aver	Min	Max	Aver	Min	Max	Aver
2003	26.2	27.7	26.8	22.9	24.0	23.3	30.5	33.2	32.3
2004	26.0	27.4	26.7	22.5	23.6	23.1	31.6	33.4	32.5

2005	26.1	27.3	26.8	22.9	23.6	23.3	31.1	33.4	32.6
2006	25.8	27.9	26.8	22.9	23.6	23.2	32.1	33.6	32.7
2007	26.1	27.4	26.7	22.9	23.5	23.2	31.2	33.2	32.4
2008	24.5	27.1	26.4	22.9	23.9	23.4	30.6	33.1	32.0
2009	26.2	28.0	27.0	23.0	24.3	23.6	30.7	33.2	32.3
2010	26.3	27.9	27.1	22.9	24.5	23.8	30.8	33.4	32.1
2011	23.3	27.5	26.6	23.0	24.1	23.5	31.2	33.2	32.3
2012	26.4	27.8	27.1	22.1	23.9	23.5	31.9	33.8	32.7
Minimum	23.3	27.1	26.4	22.1	23.5	23.1	30.5	33.1	32.0
Maximum	26.4	28.0	27.1	23.0	24.5	23.8	32.1	33.8	32.7
Average	25.7	27.6	26.8	22.8	23.9	23.4	31.2	33.4	32.4

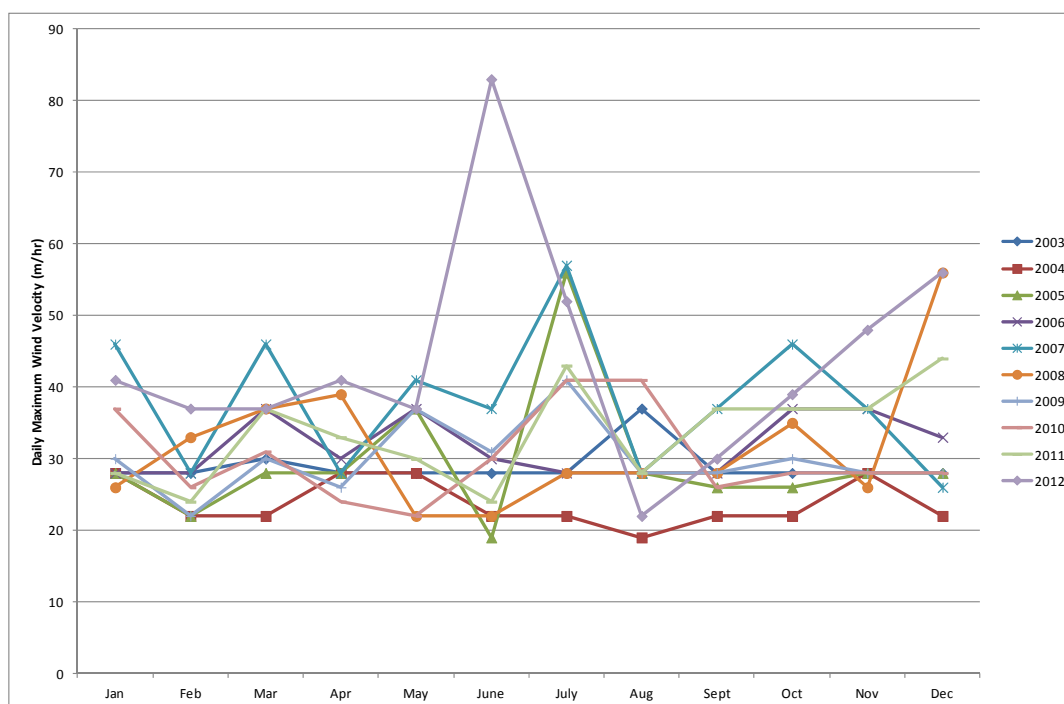
Source: JICA Survey Team prepared based on the data of Spadio-Pontianak Climate Station

### (3) Wind Velocity

Ten years data of monthly maximum wind velocity from 2002 to 2012 was purchased.

The range of the maximum wind velocity is from 20 to 40 km/hr. The range shows the area usually does not have much strong wind. However, it is noted that more than 80 km/hr was recorded in 2012. The strong wind tends to occur in July and December, especially in July more than 40 km/hr was recorded six times in 10 years.

The frequency of strong wind is not much around the study area and the wind condition is not a serious risk for plant growth. However, strong wind can knock down trees; therefore, it is necessary to beware of accidents for the plantation project. Additionally, strong wind tends to occur in dry season (July) and could spread fire to the plantation area from cultivation area; therefore, this should be noted.



Source: JICA Survey Team prepared based on the data of Spadio Pontianak climate station.

Note: The unit of purchased data was knot. The data was converted to unit of (km/hour) by multiplication of 1.852.

### Distribution of Monthly Maximum Wind

## 2.1.4 Soil

Soil condition is one of the most important factors for plant growth and should be considered for plantation project. There are seven soil types in the soil map. These soil types are classified to four types according to the FAO classification.

**Soil Unit 1 (Ultisol):** Ultisol called as mineral soil in this project is distributed in the Northern and North eastern hilly area. The properties of this soil are highly weathered, acidic and low fertility and completely differ from the peat soil distributed in the southern part of MW area.


**Soil Unit 2 (Inceptisol):** The properties and distribution of Inceptisol are intermediate between above mineral soil and peat soil. It is wet compare than mineral soil and also dry compared to peat soil.

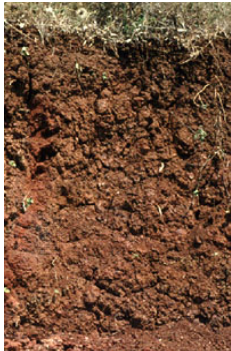


**Soil Unit 3 (Entisol):** Entisol is the immature soil distributed along with the river. This type of soil is quit a few in MW.


**Soil Unit 4 (Histosol):** Histosol called as peat soil in this project is distributed in north western area to southern area.

The major soil types in MW area are shown in table below.

### Major Soil Types in the MW Project Area

Soil Unit 1 Ultisol (Acrisol)	
<b>Soil Type 1-1 Kandiodults</b>	
<p><b>General Description :</b> Highly weathered soil which has clay accumulated layers in its subsoil. From the subsoil surface to 150 cm depth, clay contents differ less than 20 % among the layers.</p> <p><b>Distribution :</b> Highland and Hilly area and mountain areas in the tropics.</p> <p><b>Fertility/Productivity :</b> Low. Little of organic matter.</p> <p><b>Chemical Property :</b> Acid. Low performance of nutrient accumulation.</p> <p><b>Physical Property :</b> Low resistivity.</p> <p><b>Remarks :</b> Subject to lack of bases and phosphorus, and to have excess Aluminum and acidity problem.</p> <p><b>Adaptive species :</b> <i>Acacia mangium</i>, <i>Acacia auriculiformis</i>  <i>Eucalyptus pellita</i>, <i>Eucalyptus camaldulensis</i>  <i>Eucalyptus deglupta</i>, <i>Enterolobium cyclocarpum</i>  <i>Paraserianthes falcataria</i>, <i>Hibiscus macrophyllus</i>  <i>Gmelina arborea</i></p>	<p>Similar Soil Profile</p>  <p>(ISRIC, www.isric.nl)</p>
<b>Soil Type 1-2 Paleodults</b>	
<p><b>General Description :</b> Highly weathered and acid soil which has developed layers and clay accumulated layers in subsoil.</p> <p><b>Distribution :</b> Ditto.</p> <p><b>Fertility/Productivity :</b> Ditto.</p> <p><b>Chemical Property :</b> Ditto.</p> <p><b>Physical Property :</b> Low resistivity. Low water holding capacity. Good performance of drainage and water penetration.</p> <p><b>Remarks :</b> Ditto.</p> <p><b>Adaptive species :</b> Ditto.</p>	<p>Soil Profile Similar to the soil type 1-1</p>

<b>Soil Unit 2 Inceptisol</b>	
<b>Soil Type 2-1 Dystrudepts</b>	
<p><b>General Description :</b> Morphologically immature and sedimentary soil.</p> <p><b>Distribution :</b> Slope land. Wet environment near river bank.</p> <p><b>Fertility/Productivity :</b> Higher than those of highland/mountain soil.</p> <p><b>Chemical Property :</b> Acid.</p> <p><b>Physical Property :</b> Low resistivity. Low performance of drainage and water penetration.</p> <p><b>Remarks :</b> None.</p> <p><b>Adaptive species :</b> <i>Acacia crassicarpa</i>, <i>Anthocephalus cadamba</i> <i>Anthocephalus cinensis</i>, <i>Koompassia malaccensis</i></p>	<p>Similar Soil Profile</p>  <p>(ISRIC, www.isric.nl)</p>
<b>Soil Unit 3 Entisol</b>	
<b>Soil Type 3-1 Hydraquents</b>	
<p><b>General Description :</b> Immature soil whose layer of 20-50 cm depth from the subsoil surface is wet, always or sometime through the year.</p> <p><b>Distribution :</b> Estuary and river bank.</p> <p><b>Fertility/Productivity :</b> Higher than those of highland/mountain soil.</p> <p><b>Chemical Property :</b> Acid.</p> <p><b>Physical Property :</b> Clayey soil. High water holding capacity. Low performance of drainage and water penetration.</p> <p><b>Remarks :</b> None.</p> <p><b>Adaptive species :</b> <i>Acacia crassicarpa</i>, <i>Anthocephalus cadamba</i> <i>Anthocephalus cinensis</i>, <i>Eusideroxylon zwageri</i>, <i>Eusideroxylon malaganga</i></p>	<p>Similar Soil Profile</p>  <p>(ISRIC, www.isric.nl)</p>
<b>Soil Type 3-2 Fluvaquents (Fluvisol)</b>	
<p><b>General Description :</b> Immature soil formed on alluvial sediments.</p> <p><b>Distribution :</b> Ditto.</p> <p><b>Fertility/Productivity :</b> Ditto.</p> <p><b>Chemical Property :</b> Acid. Low performance of nutrient accumulation.</p> <p><b>Physical Property :</b> Low resistivity. Low water holding capacity. Good performance of drainage and water penetration.</p> <p><b>Remarks :</b> Subject to erosion.</p> <p><b>Adaptive species :</b> Ditto.</p>	<p>Soil Profile</p>  <p>(ISRIC, www.isric.nl)</p>
<b>Soil Unit 4 Histosol</b>	
<b>Soil Type 4-1 Sulfisaprists</b>	

<p><b>General Description :</b> Peat land soil with decomposed soil organic matter. Soil contains sulfides in the subsoil from the subsoil surface to 100 cm. depth.</p> <p><b>Distribution :</b> Near estuary, sea marsh, and delta.</p> <p><b>Fertility/Productivity :</b> Higher than those of highland/mountain soil.</p> <p><b>Chemical Property :</b> Acid.</p> <p><b>Physical Property :</b> Low resistivity. High water holding capacity. Low performance of drainage and water penetration.</p> <p><b>Remarks :</b> If water is drained, water holding capacity, hydrophilicity and erosion resistivity decrease. After soil reclamation, the land is highly degraded because soil nutrients leach out and acid sulfate soil is exposed if the peat layer is thin.</p> <p><b>Adaptive species :</b> Limited because of the necessity of planting without drain. <i>Melaleuca cajuputi, Melaleuca leucadendron, Garcinia bancana</i></p>	<p>Similar Soil Profile</p>  <p>(ISRIC, www.isric.nl)</p>
<b>Soil Type 4-2 Haplohemists</b>	
<p><b>General Description :</b> Peat land soil with decomposed soil organic matter. Surface tier is wet or water saturated for more than 30 cumulative days during the year.</p> <p><b>Distribution :</b> Near river bank and estuary. Constantly wet environment.</p> <p><b>Fertility/Productivity :</b> Ditto.</p> <p><b>Chemical Property :</b> Ditto.</p> <p><b>Physical Property :</b> Low resistivity. High water holding capacity. Low performance of drainage and water penetration.</p> <p><b>Remarks :</b> Ditto.</p> <p><b>Adaptive species :</b> Ditto.</p>	<p>Soil Profile Similar to the soil type 4-1</p>

Source: Based on US soil taxonomy 1999, FAO/UNESCO World Reference Base for soil taxonomy, Keys to Soil Taxonomy 2010, Nettai dojou gaku (Japanese), Kyuma et. al., 2001, and etc.

Note 1. Soil types are determined according to the existing soil map.

2. Soil properties are described referring to US soil taxonomy, FAO/UNESCO World Reference Base for soil taxonomy, Nettai dojou gaku (Japanese), Kyuma et. al., 2001.

4. Soil categories of the soil map are the same as soil type classification.

### 2.1.5 Vegetation

The peat swamp forests in Kalimantan Island including the study area, have been damaged much by commercial logging of the natural forest which started in 1990s and was logged by local people after that. Therefore, there is no primary forest in this project site and most of area is the secondary forest and shrub. The major species in this area are pioneer species which naturally regenerate on the logged land. Protected species are naturally regenerate in those secondary forest and shrub lands which consist of small and middle size trees.

Most of the area is covered by logged forest (Hutan Bekas Tebangan, in Bahasa Indonesia), followed by old shrubs (Belukar Tua, in Bahasa Indonesia) and young shrubs (Belukar Tua in Bahasa Indonesia).

## 2.2 Living Conditions in the Target Communities

This section describes the key features of living conditions in the target communities. It summarizes the data and information in ANDAL and KA-ANDAL with focus on the socio-economic conditions of the communities in and around the Project site.

## 2.2.1 Communities in and around the Project Area

Villages consist of adjacent rural communities (*Kampung, Dusun*). There are some rural communities, excluding communities composed by non-local residents, such as composed by immigrated peoples from Jawa Island, etc.

The villages are distributed inside and outside of the project site.

## 2.2.3 Living Conditions of the Target Communities

### (1) Land and forest uses

Actual land and forest uses by local residents in this area are not ownership based on the land relating law of the Indonesian government, but rather are occupied based on local customs. Local residents use the forest land according to the custom regulation of rural communities.

About 3,000 to 7,000 ha of agricultural lands which have irrigation facilities are distributed in each district (Kecamatan). The area of agricultural lands with no irrigation facilities is more than 10-times bigger than the land with irrigation facilities. One of the properties of MW area is the mineral soil area which is distributed in the hilly area. Continuous agricultural fields with perennial crops and temporary fields with annual crops are distributed as tessellated in the mineral soil area.

### (2) Agriculture

The Table below shows the major agricultural crops and fishery activities near the MW area.

**Agricultural Crop and Fishery Activity Near MW Area**

No.	District (Kecamatan)	Agricultural crop					Fishery
		Rubber	Coffee	Coconut	Rice	Others <sup>1)</sup>	
1	Simpang Hulu	+	+	+	-	-	-
2	Simpang Dua	+	+	+		-	-
3	Telok Batang	+	+	+		-	+
4	Simpang Hilir	+	+	+		-	+
5	Seponti	-	-	+	+	+	-

Source: ANDAL of PT. MW Project

Note: Corn, Cassava and Sweet potato

Rubber, coffee and Coconut are major commercial crops in this area. Fishery is also important cash income for local residents. In addition, raising livestock and small-scale farming such as corn, cassava and vegetables are conducted by local residents. The production volume of rice is the biggest in most districts. But it depends on the characteristics of local agro-ecosystem and socio-economic circumstances.

## 2.3 Development Situation of Project Area and Surrounding Area

Legal forests (industrial plantation forest, conservation forest, etc.), mining developments, oil palm developments, and residential areas are distributed in the area surrounding the Project area. Currently, the project plantation site is not overlapping with other activities such as oil palm and mining development. Therefore, the conflict with other developments in the same area is small. On the

other hand, government owned conservation area is distributed adjacent to MW area. It is important to ensure that this project does not cause negative effect to this conservation area.



## CHAPTER 3 PROJECT COMPONENTS

### 3.1 Project Components and Work Amount

#### 3.1.1 Project Components

The Project is composed of: 1) plantation and logging plan, 2) plantation infrastructure plan, 3) chip mill construction/chip production plan, 4) port facility development plan, 5) log and chip transport plan, 6) chip sales plan, 7) action plan related to local residents, and maintenance plans of items 2) to 4) above.

The outline of each component is shown below.

#### Outline of Each Project Component

Component	Objectives	Activities
Plantation and logging plan	Timber production	<ul style="list-style-type: none"> <li>➤ Seedlings production and supply to planting areas</li> <li>➤ Logging existing trees</li> <li>➤ Plantation</li> <li>➤ Logging planted trees (harvesting)</li> </ul>
Plantation infrastructure plan	Development of required facilities for plantation and logging works	Construction and maintenance of facilities below. <ul style="list-style-type: none"> <li>➤ Log pond</li> <li>➤ Site facilities</li> <li>➤ Canals and water level control facilities (canal, drain, peat dam, etc.)</li> <li>➤ Road</li> <li>➤ Nursery</li> </ul>
Chip mill construction/chip production plan	Construction of chip mill and chip production	Construction and maintenance of facilities below. <ul style="list-style-type: none"> <li>➤ Log yard (log reserve)</li> <li>➤ Chipping facility</li> <li>➤ Chip yard</li> <li>➤ Biomass power plant</li> <li>➤ Chip production</li> </ul>
Port facility development plan	Construction of port facilities for barges transporting logs and woodchips	Construction and maintenance of facilities below. <ul style="list-style-type: none"> <li>➤ Log yard berth/ revetment</li> <li>➤ Foundation of belt conveyor (in the river)</li> <li>➤ Chip berth</li> </ul>
Log and chip transport plan	Transportation of logs and chips	<ul style="list-style-type: none"> <li>➤ Log transportation from plantation area to chip mill (chipping facility), log handling at log yard</li> <li>➤ Chip transportation from chip mill to vessel (Note: chip will be sold FOB vessel)</li> </ul>
Chip sales plan	Sales of chips	<ul style="list-style-type: none"> <li>➤ Consideration of target purchasers</li> <li>➤ Consideration of sales unit price and amount</li> <li>➤ Sales estimation</li> </ul>
Activities related to local residents	Acceleration of understanding and cooperation to the Project with local residents and forest fire protection	<ul style="list-style-type: none"> <li>➤ Local residents training plan</li> <li>➤ Local residents support plan</li> </ul>

Source: JICA Survey Team

#### 3.1.2 Work Quantity

The work quantities of each component are shown below.

Component	Work Quantity			
1. Plantation and logging	Item		Total	
	Plantation area		79,014 ha	
	Annual plantation/ logging area*		13,227 ha	
	Annual logging amount (harvesting volume)*		1,872,858 m <sup>3</sup>	
	Annual seedling production*		22.861 million seedlings	
2. Plantation infrastructure (major facilities)	New construction			
	Category 1	Category 2	Quantity	
	Log pond		2	
	Site facilities (one set of site office, accommodation, and other facilities)	Base Camp specification	1	
		Temporary specification	5	
	Site facilities	Fire tower	12	
		Security post	6	
	Canal, water level control facility	Main canal	98 (thousand m)	
		Branch canal	471 (thousand m)	
		Outlet canal	849(thousand m)	
		Mid cross/ Cross drain	9(thousand m)	
		Infield drain	3,870(thousand m)	
		Peat dam	57	
		Adjustable gate	56	
		Flap gate	15	
Others	Sedimentation pond	98		
	Wood bridge	11		
Road	Road (wet area)	674(thousand m)		
Nursery	Permanent nursery	2		
3. Chip mill construction/chip production	Facility, equipments		Quantity	Unit
	<b>1. Chipping facility (major machines)</b>			
	Chain conveyor for log insert/ take, belt conveyor, rotary debarker, chipper, screen, conveyor / shuttle conveyor/ chain conveyor for chips		1	Set for each
	<b>2. Biomass power plant</b>			
	A set of power plant (7Mwh) (boiler, turbine, generator, others), piping, silo, building, steel structure, foundation, water treatment facility		1	Set
	<b>3. Civil work, buildings, other facilities</b>			
	Land preparation (12 ha)			
	- Land filling (height 3.5 m)	420,000	m <sup>3</sup>	
	- Compaction	12	ha	
	Piling work		1	set
	- Chipping facility area foundation (20,000 m <sup>2</sup> ), Biomass power plant area foundation : concrete pile			
	- Chip yard foundation (35,000 m <sup>2</sup> ), conveyor foundation: log pile			
	Log yard foundation			
- Land preparation: 6 units x 200 m x 100 m	120,000	m <sup>2</sup>		
- Log piling (1 pile per 1.5 m <sup>2</sup> )	80,000	Piles		
- Concrete works (120,000 m <sup>2</sup> x 40% x 12 cm thickness)	48,000	m <sup>2</sup>		
Chipping area, concrete works (thickness 12 cm)		20,000	m <sup>2</sup>	
Bark yard land preparation and concrete works (thickness 12 cm)		15,000	m <sup>2</sup>	
Infrastructure development				
- Road (length: 3,380 m, width 10 m)	33,800	m <sup>2</sup>		

	- Drainage, electricity related facilities, cabling/ lighting, piping for water supply, fire fighting, sedimentation pond (10 m x 20 m x 4 m) (thickness 30 cm)	1	Set
	<b>4. Buildings</b> Building for: chipper and screen, accommodation for workers, fuel server, weight scale for logs	1	Set
4. Port facility development	<b>Facility</b>	<b>Major Works</b>	<b>Quantity</b>
	Log yard berth / Revetment	SSP :installation	1,167
		Concrete :supply / installation	1,814m <sup>3</sup>
		Backfill :supply / installation	25,200m <sup>3</sup>
		Riverbed excavation	15,300m <sup>3</sup>
	Foundation of Belt conveyor	SPP :installation	6 nos
		Concrete :supply / installation	19m <sup>3</sup>
	Chip berth	SPP :installation	32 nos
Concrete :supply / installation		63m <sup>3</sup>	
Riverbed excavation		1,000m <sup>3</sup>	

Source: JICA Survey Team

### 3.2 Plantation/ Logging Plan

#### 3.2.1 Land Use Plan

##### (1) Consideration items for land use planning

Setting the criteria for area selection is important for plantation planning. The Project implementation is based on the licence granted by the Ministry of Forestry Indonesia. The criteria of land use of the Project area is set to follow the land classification and ratios of the standard of the Ministry of Forestry Indonesia. The land use classification is composed of five items a) to e) as described in the table below.

#### Standard of Land Use/ Classification (Minister's Decision)

Classification	Definition	Standard of ratio of area to the total Project area
a) Production plantation area (TP: Areal tanaman pokok)	Target area of log production. The area shall be set with 0 to 25% land slope, and also outside of protection area.	Approximately 70% of the total Project area
b) Indigenous tree area (TU: Areal tanaman unggulan)	Area for indigenous tree species. It is set at boundary of other areas. It shall not be set in the boundary of residential areas located outside of the industrial plantation forest area.	Approx. 10% of the total Project area
c) Community forestry area (TK: Areal tanaman kehidupan)	This classification is set as a buffer zone between the residential areas and other land use area. It will contribute to development of local economy. (Minister's Decision (70/Kpts-II/95). The planting tree species of this classification must be economically valuable, to be possible to grow in the area, and it's plantation techniques have been established as individual business. (Ministerial Decree, P.21/Menhut-II/2006)	Approx. 5% of the total Project area
d) Protection area (KL: Kawasan lindung)	The natural resources shall be conserved and maintained in this classification. (Minister's Decision, 70/Kpts-II/95) The following areas correspond to the protection area, peat land, water resource forest, both sides of river, surrounding area of reservoir, lakes and springs, and mangrove forest at seashore. (Minister's decision, 246/Kpts-II/1996)	Approx. 10% of the total Project area
e) Infrastructures, etc. (SP: Areal sarana dan prasarana)	This classification is for the infrastructures such as, base camp, road, road facilities, residential area, fire break facilities.	Approx. 5% of the total Project area

Source: JICA Survey Team prepared based on Minister's Decision (70/Kpts-II/95, 246/Kpts-II/1996) and Ministerial Decree

(P.21/Menhut-II/2006)

The Minister's Decision does not mention much detail; therefore, the following considerations are used for planning of land use in the Project.

### Considerations and Results for Land Use Planning of Project Area

Item	Consideration Point	Refer to Land Use Plan	Reference
(1) Current land use	All existing forests can be target of plantation area, except the following areas: i) 300 m wide on both sides of rivers, ii) water resource forest, iii) houses, residential area, existing roads, tec., iv) the area where local people do not agree to use for plantation. The peat land will be used with consideration of conservation.	i): KL ii): KL iii): TK iv): TK	Consideration with adding present condition to the Minister's Decision above)
(2) natural condition	Topographic, soil and climate conditions are almost same in the Project area; therefore, no specified areas to be appropriate or appropriate are found.	Natural conditions are not referred to land use planning	Results of JICA Survey Team study.
(3) Land use of surrounding area	i) The project area next to legal protection forest will be considered to be set as protection area when possible, or set as buffer zone. ii) Buffer zone will be set at the edge of the project area next to mining development area, then the inside area of buffer zone will be used for plantation. iii) The project area next to oil palm development: a) plantation area in case of buffer zone in the oil palm area has been set, b) setting buffer zone at edge of the project area and the inside will be used for plantation	i): TK or KL ii): TK and TP iii): TP or TK	Legal forest distribution, present land use condition (checked by JICA Survey Team)
(4) Results of Environmental assessment (AMDAL)	i) The protection area which was recommended by AMDAL report will not be changed basically. ii) The area of indigenous tree in AMDAL report will be followed when possible.	i): KL ii): TK or TP	AMDAL reports

Source: JICA Survey Team

#### (2) Land use plan

Based on the above considerations, the land use plan was established as shown below.

(Wet and dry area): The land of MW area can be divided into 2 types: i) wet area, which is same as the project area of Phase 1. Peat soil is spread widely, and ii) dry area, where dry hilly area with mineral soil. The dry area in MW is quite different from wet area: i) elevation is much higher than wet area, ii) slope is much steeper than wet area, iii) land is dry, and soil types are completely different. Due to difference of land conditions, planting methodology and operation are different in these 2 area types; therefore, plantation/logging plan, plantation infrastructure plan, and log transportation plan are considered for 2 types.

#### Land Use Plan (MW)

Project Site	a. Production plantation area(TP): Areal tanaman pokok	b. Indigenous tree area (TU): Areal tanaman unggulan	c. Community forestry area (TK): Areal tanaman kehidupan	d. Protection area (KL): Kawasan lindung	e. Infrastructures, etc. (SP): Areal sarana dan prasarana	Total
Area (ha)						
Total	79,014	18,533	7,227	30,509	156	135,439

Ratio of Area (%)						
Total	58.4	13.7	5.3	22.5	0.1	100.0

Source: JICA Survey Team

### 3.2.2 Plantation/ Logging Plan

#### (1) Plantation/logging area

The plantation areas are selected based on the criteria and considerations mentioned above. The plantation area of MW area is 79,014 ha. The plantation area shall be planted after logging works in the same year; therefore, the planned plantation area and logging area shall be same. The first logging work & planting work for the whole areas is called the first rotation. After finishing the first rotation, the whole plantation area shall be prepared.

(Block): The group of plantation areas planted in same year is called as “Block” in the plantation plan. As described after, the logging cycle is set as five years. The area planted in the first year of the Project will be logged at sixth year, the area planted in the second year will be logged in seventh year, and same operation will be continued. Then, a constant area will be logged/planted and constant amount of harvested logs can be expected.

(Compartment): An area will be divided as operational unit for plantation/logging operation. This is minimum unit of operation and operation management, and also minimum unit to be protected from expanding the forest fire, because one unit will be surrounded by canals. This minimum unit for operation is called as “Compartment”. Each compartment is set as approx. 30 ha, and a Block is composed of Compartments.

#### (2) Plantation work methodology

##### 1) Selection of planted tree species

The tree species of plantation is selected by consideration of matching of the purpose of the Project, and natural condition of the Project area (topography, soil, and climate). The Project purpose is production of wood chip; therefore, the following points are required for the planted tree species: i) the logs can be used for chips, ii) the planted trees grow fast, and iii) plantation techniques of the candidate species has been established.

(Planted tree species for wet area): Commonly, fast growing tree species and also useful for chip material are listed as follows<sup>1</sup>: Eucalyptus (*Eucalyptus globules*, *Eucalyptus camaldulensis*, *Eucalyptus grandis*, *Eucalyptus urophylla*), Acacia (*Acacia mangium*, *Acacia auriculiformis*, and hybrid of these). However, these species are suitable for dry soil area except *Acacia auriculiformis* and there is not enough data of plantation of these species in swamp land.

As candidate tree species which have been confirmed the possibility of growth in swamp area are listed as follows: Acacia (*Acacia crassicarpa*, *Acacia auriculiformis*), Mahang

<sup>1</sup> Quoted from “ Overseas Plantations for a Sustainable Society of the Future, - Forest Plantations and the Pulp and paper -, development, Japan Overseas Plantation Center for Pulpwood, August 2006”

(*Macaranga hypoleuca*), Meralueca (*Melaleuca spp*), Jerton (*Dyera costulata*), Meranti, and other indigenous tree species. Most of the candidates except Acacia grow slowly; therefore, they are not appropriate for industrial plantation for chip production. From the above and the actual results of planted in WSL area and MTI area from 2010 or 2011, planted tree species are selected.

(Planted tree species for dry area): *Eucalyptus globules*, *Acacia mangium*, *Acacia auriculiformis*, and Acacia hybrid are fast growing tree species and also useful for chip material. Planted tree species are selected by existing experiences of West Kalimantan plantation.

## 2) Planting methodology

### 2.1) Wet area

(Term of Planting): Planting is possible in all seasons based on successes of planting operation in WSL and MTI area.

(Distribution, density of planted trees): The general distance of planting trees in peat land in Indonesia (2.5 m x 3.0 m) is taken. The planting density is 1,333 seedlings per ha.

(Number of planting stocks): The dead ratio of planted trees must be considered. The dead ratio of planted trees in WSL and MTI area after one year from planting was approx. 10%. The number of planting trees is set as 1,500 seedlings per ha to keep 1,333 trees per ha after one year from planting.

(Land preparation): The logged tree stumps should remain, because a big hole would be generated after taking out a stump. Planting will be implemented to avoid stumps.

(Planting): The seedling is put in a plastic case used in WSL/MTI sites (quadrangular pyramid-shape, size of square base is 3.5 cm x 3.5 cm, height is 10 cm). Before planting, a small hole will be prepared by a stick, and a seedling taken from plastic case is inserted into a hole. After installing seedling, the soil surrounding seedling is tamped by foot. Manure and chemical fertilizer are not used, and the hole is also small. The planting operation is quite easy.

### 2.2) Dry area

(Term of Planting): Planting is possible in all seasons based on achievements of planting operation in MW area. However, during July to September the rainfall amount is relatively small. In this season, it is necessary to pay attention to the rainfall condition.

(Distribution, density of planted trees): The general distance of planting trees in Indonesia (2.0 m x 3.0 m) is adopted. The planting density is 1,600 seedlings per ha.

(Number of planting stocks): The dead ratio of planted trees needs to be considered. The number of planting trees is set as 1,800 seedlings per ha to get 1,600 trees per ha one year after planting.

(Land preparation): Setting planting holes on the same elevation line and taking out some obstacles. Since logs have basically been taken out during logging operation, it is necessary to put remaining branches on the same contour line. This operation will be implemented by manpower without machines).

(Planting): The seedling is put in a plastic case the same. Digging operation needs to be in the dry area due to hard soil condition. The planting hole should be at least big enough for the seedling and be bigger than that to accelerate growth of roots. Size of hole is 20 cm x 20 cm and 30 cm in depth. After digging a hole, 10 cm depth at the bottom is filled by loose soil. A seedling is put in and the remaining soil filled; finally soil surrounding the seedling is tamped by foot.

(3) Planting and logging plan

1) Logging cycle

(Wet area): The logging cycle is set as five years.

(Dry area): Seven years is decided as logging cycle, aiming to harvest when trees have grown to maximum.

2) Logging methodology

(Wet area): Logging operation in each compartment is implemented in steps which are: 1) felling and cutting trees by chain saw, 2) moving, piling and loading of logs to small barge, 3) transportation of logs to TPK (temporary loading site), 4) transportation of logs by truck to log pond, and 5) loading to big barge. Item 1) is done by manpower, whereas items 2) to 5) are done by machine.

(Dry area): Logging operation in each compartment is implemented in steps which are: 1) felling and cutting trees by chain saw, 2) moving, piling and loading of logs to truck, 3) transportation of logs to TPK (temporary loading site), 4) transportation of logs by truck to log receiving point, and 5) loading to log transportation truck. Item 1) is done by manpower, whereas items 2) to 5) are done by machine.

3) Estimation of harvesting volume

(Wet area): Harvesting amount is estimated by multiplication of logging area and MAI (Mean Annual Increment, where annual average growth is calculated by dividing growth of one term by number of terms). MAI was estimated by the growth curve of the initial growth in the existing plantation area and in WSL area.

(Dry area): The data of growth of planted species in “growth records of tropical forest (Vol. 2) (JIFPRO: Japan International Forestry Promotion and Cooperation Centre, March 1996)” was referenced for consideration on MAI<sup>2</sup>. The results of interview survey<sup>3</sup> also were used.

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<sup>2</sup> The data was quoted from JICA expert’s report in 1991 at Malaysia. 250 plots test were taken, then, growth of 1 years tree to 15 years tree were recorded at 3 cases (SITE 1 to 3). Estimated MAI for each site are 28, 20 and 13.

<sup>3</sup> With the growth records of A. Mangium with high density by 10 to 11 years logging cycle, 1) MAI success is 25

(4) Annual Plantation/logging plan

1) Rotation of planting/logging operation

The first rotation of wet area is from 2015 to 2019, and for dry area is from 2015 to 2021. After the first rotation, the same area will again be used for logging and planting.

**Planting / Logging Rotation Plan**

Site	Rotation Plan					
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>
Wet area	2015~2019	2020~2024	2025~2029	2030~2034	2035~2039	2040~2044
Dry area	2015~2021	2022~2028	2029~2035	2036~2042	2043~2044	

Source: JICA Survey Team

2) Annual plantation/logging plan

After logging, the same area will be planted; therefore, planting area is the same as logging area. Table below presents a summary.

**Annual Planting / Logging Area (Summary)**

(Unit: ha)

Site	Area (ha)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
(a) Logging operation of existing trees											
Total	79,014	13,227	13,227	13,227	13,227	13,229	6,438	6,439			
(b) Logging operation of planted trees											
Total	79,014						6,789	6,789	13,227	13,227	
(c) Planting operation											
Total	79,014	13,227	13,227	13,227	13,227	13,229	13,227	13,228	13,227	13,227	

Source: JICA Survey Team

3) Harvesting volume estimation

(Planted trees harvesting volume): Using MAI described above, annual harvesting volume is estimated.

**Estimation of Harvesting Volume of Planted Trees (Summary)**

(Unit: m<sup>3</sup>)

Site	Area(ha)	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total	79,014						611,010	611,0100	1,872,858	1,872,858

Source: JICA Survey Team

Note: After 2023, the volume will become same.

**3.2.3 Seedling Production Plan**

(1) Number of seedlings

1) Seedling production methodology

All operation of seedling production will be handled by MW, purchase from the outside is not planned. For the seedling production, one permanent nursery for each site (Wet area/dry area)

m3/ha/year. 2) In case of not high density & 6 to 7 years logging cycle, MAI would become 30 m3/ha/year.



will be constructed as a base of seedling production. In case of over capacity of the permanent nursery, some temporary nurseries will be planed to be set up to supply additional number of seedlings.

## 2) Estimation of number of seedlings

The number of seedlings to be produced is calculated by adding loss ratio to the required number of seedlings.

(Loss ratio): The seedlings produced at nursery will be transported to the planting area by small boat. After unloading from boat, the seedlings will be transported by manpower to plantation site and planted. The loss or damage of seedlings during this transportation is expected. The seedlings produced in the nurseries of PT. MW will be installed into a container with plastic case; therefore, loss ratio is expected to be lower than general. Thus, the loss ratio during transportation of seedlings is set as 5%.

Experience shows the following numbers: approx. 37,000 seedlings germinate from 1kg seeds. Approx. 52% of germinated seedlings will be lost/damaged or die. Finally, the number of seedlings for plantation sites is approx. 17,760 from 1 kg seeds (equal to approx. 48% of first gminated seedlings).

(Required number of seedling production): The required number of seedlings for plantation plan with consideration of loss ratio is calculated below.

Number of required seedlings production =

$$\text{Plantation area (ha)} \times 1,500/1,800 \text{ (seedlings/ha)} \times (1 + 0.05)$$

The amount of yearly required seedlings production is calculated and shown in the next table.

### Required Number of Yearly Seedling Production

(Unit: '000 seedlings)

Site	2015	2016	2017	2018	2019
Total	22,860	22,860	22,860	22,860	22,860

Source: JICA Survey Team

Note: Number will be fixed from 2019

## (2) Seedling production and supply plan

The permanent nurseries in MW area have enough capacity for plantation operation. The seedlings will be transported from the nurseries through canal or road to the planting sites.

For transport of seedlings, trucks are used on roads and small boats in canals. The seedling handling operation is planned to be done by manpower only.

### 3.3 Plantation Infrastructure Plan

The construction plan of Infrastructure such as Log pond, Accommodation and Office, Canal, Road and Nursery are reviewed in this chapter. The Infrastructure plan is based on the plantation plan explained in Section 3.2 of this report Part III.

### 3.3.1 Infrastructure Construction Plan

#### (1) Log pond plan

##### 1) Function & specification

Log pond is defined as the area containing Jetty and Log yards. Jetty is the place where loading and unloading logs and other equipments are conducted. The details of log pond plan are shown below.

Contents	Jetty, Log yard
Area	0.5~2.0 ha
Conditions	- Sufficient area for Log yard along the river -Sufficient river width for anchoring pontoon -Low potentiality of flood in the rain season -Exclude or minimize the negative effects for local residents
Jetty	Jetty is the place where the loading and unloading operational equipments and logs are conducted. In log loading to pontoon, the truck carrying logs is directly driven onto pontoon or loaded by excavator adjacent to the pontoon.
Log yard	Log yard is the place for stocking logs temporarily before loading to pontoon. In rainy season, the road condition will often become worse. At that time, logs will be transported from road side to log yard before the rainy day and transported from log yard to pontoon after the road condition becomes worse; this will prevent operational slowdown of shipping.

#### (2) Amount & location

The Table below shows the list of log ponds. The same specification of log pond as WSL and MTI in Section 3.3 of Part II of this report will be constructed in MW.

#### Log pond Construction Plan

	No.	Existing/New	Block	Log yard (ha)	Jetty (ha)
MW	MW-A	New	1	1.0	0.5
	MW-B	New	5	2.0	1.0

Source: JICA Survey Team

Two units of log ponds are to be constructed from 2015 to 2018. All of the log ponds will have periodic maintenance in every rotation year.

#### Annual Log Pond Construction Plan

Area	Block	Year					Remarks
		2015	2016	2017	2018	Total	
MW	1	1	—	—	—	1	
	5	—	—	—	1	1	
	Total	1	—	—	—	2	

Source: JICA Survey Team

#### (2) Site facilities plan

##### 1) Function & specification

The table below shows the Function & Specification of Site facilities. Figure II-3.3-4 - 6 shows the design of site facilities. The same specification of Site facilities as WSL and MTI in Section 3.3 of part II of this report will be constructed in MW.

### Function & Specification of Site Facilities

Facilities	Function	Remarks
(Base Camp) Office, accommodation and other facilities are constructed in the same location. (In the base camp, office, accommodation and other facilities are maintained by periodic maintenance.)		
office	Office is a base point for communication between flying camp and headquarters and equips the communication tools like radio control.	Wooden building Area: About 100m <sup>2</sup>
accommodation	Accommodation is utilized by WSL/MTI site staffs, containing the kitchen, bedrooms, guest rooms and recreation room.	Wooden building Capacity: 80 persons
Other facilities	Required facilities such as clinic and the warehouse for equipment.	Wooden building Area: About 20m <sup>2</sup>
(Normal Camp) Office, accommodation and other facilities are constructed in the same location. (In the normal camp, office, accommodation and other facilities will be rebuilt at every harvesting rotation.)		
office	Same as the office in base camp. Rebuilt at every harvesting rotation.	Wooden building Area: About 200m <sup>2</sup>
accommodation	Same as the accommodation in base camp. Rebuilt at every harvesting rotation.	Wooden building Capacity: 160 persons
Other facilities	Same as the other facilities in base camp. Rebuilt at every harvesting rotation.	Wooden building Area: About 20m <sup>2</sup>
Fire Tower : Iron construction, Not to be rebuilt at the harvesting rotation		
Fire Tower	Watching for the forest fires, invaders to the plantation and protection area, and illegal logging in the concession. It is possible to see out over 5 km in all directions from the fire tower.	Height: 25m
Security post : Rebuilt at every harvesting rotation.		
Security post	The security post is the simple wooden small office for guards. It is constructed in the entrance gate of jetty in each log pond. The guard will watch out for safety in the jetty area and invaders to the operational area.	Simple wooden building Area: About 25 m <sup>2</sup>

Source: JICA Survey Team

#### 2) Amount & location

(Site facilities in base camp): Base camp will be constructed at MW Block 1 in 2015. Office, accommodation, other facilities will be constructed as part of the set of facilities. Base camp will be maintained by periodic maintenance.

(Site facilities in normal camp): Office, accommodation and other facilities will be rebuilt at every harvesting rotation.

(Security post): Security post will be constructed in every Block and rebuild at every harvesting rotation.

(Fire Tower): Fire Tower will be constructed in every MW Block from 2014 to 2017.

The table below shows the amount of site facilities.

#### Annual Site Facilities Construction Plan

Facilities	Area	2015	16	17	18	19	20	21	22	23	24	25	26	27	28	
B.C.* <sup>1</sup>	MW	1	Periodic maintenance will be conducted from 2016.													
Normal* <sup>2</sup>		1	1	1	1	0	1	※								
S.P.* <sup>3</sup>		2	1	1	1	0	1	※								
Fire tower		2	1	1	1	0	1	Periodic maintenance will be conducted from 2020.								

※ Repeat the same rotation

Source: JICA Survey Team

Notes: \*1 Site facilities in Base Camp, \*2 Site facilities in Normal Camp, \*3 Security post

(3) Canals, water control facilities and wooden bridge plan

1) Function & specification

The Table below shows the list of canals and water control facilities. Same specification of Canals and Water control facilities as WSL and MTI written in Chapter 3.3 of Pat II of this report will be constructed in MW. The canals are distributed surrounding compartments, and they function to prevent expansion of forest fires.

**Function & Specification of Canals, Water Control facilities and Wooden Bridge**

Name	Function	Specification	Remarks
Canals (Main Canals, Branch Canals, Mid drain and Cross drain function to prevent expansion of forest fires)			
Main Canals	Transportation of logs, labor and other materials. Boundary of compartments.	Width : 10m, 12m Depth : 3m	Width 12 m is for frequently used route for barge transportation.
Branch Canals	Transportation of logs, labor and other materials. Boundary of plantation compartments.	Width : 8m, 10m Depth : 3m	Designed along topographical contours.
Mid drain Cross drain	Adjust water level of the plantation areas. Boundary of plantation compartments	Width : 2m Depth : 2m	—
Infield drain	Adjust water level of the plantation compartments.	Width : 1m Depth : 1.2m	—
Outlet Canals	Discharge of water from the plantation area to outside	Width : 8m, 10m Depth : 3m	Select the width of canals depending on the water flow.
Water control facilities			
Peat dam	Maintains the water level in plantation area.	Composed of i) peat dam part and ii) by-pass part.	When rapid rising of water level by huge rainfall occurs the additional water is lead by a bypass of the peat dam to the downstream.
Adjustable gate	Adjust water level of the canals.	—	—
Sedimentation Pond	Remove the soil and suspended particles from the water.	Width : 10 m Depth : 3 m Length : 140 m	Two (2) canals (Width: 10 m, Length: 140 m) standing in line.
Other facility			
Wooden Bridge	Simple wooden bridge for log transportation to pass through the small river.	Width : 6.0 m Length : 6.0 m	Simple wooden temporarily bridge. It will be rebuilt at every rotation year.

Source: JICA Survey Team

2) Amount & location

Canals are maintained by the periodic maintenance at every harvesting rotation. The Table below shows the amount of existing and new canals.

**Construction Amounts of Canals**

(Unit : m)

Area	Main Canals			Branch Canals			Outlet Canals		
	Existing	New	Total	Existing	New	Total	Existing	New	Total
MW	0	98,189	98,189	0	471,124	471,124	0	8,566	8,566

Area	Mid drain/Cross drain			Infield drain		
	Existing	New	Total	Existing	New	Total
MW	0	848,675	848,675	0	3,869,958	3,869,958

Source: JICA Survey Team

### Construction Amounts of Water Control Facilities and Wooden Bridge

(Unit : Unit)

Block	Peat dam			Adjustable gate			Sedimentation Pond			Wooden bridge		
	Existing	New	Total	Existing	New	Total	Existing	New	Total	Existing	New	Total
MW	0	57	57	0	56	56	0	15	15	0	11	11

Source: JICA Survey Team

#### 3) Annual construction plan

The Table below shows the annual construction plan of Canals and Water control facilities from 2015 to 2019.

#### Annual Canal Construction Plan

(Unit : m)

	2015	2016	2017	2018	2019	Total
Main Canals	28,622	17,516	11,486	18,189	22,376	98,189
Branch Canals	92,168	103,879	92,265	90,456	92,356	471,124
Outlet Canals	3,679	1,050	904	1,322	1,611	8,566
Mid drain Cross drain	169,725	169,725	169,725	169,725	169,775	848,675
Infield drain	773,946	773,946	773,946	773,946	774,174	3,869,958

Source: JICA Survey Team

#### Annual Water Control Facilities and Wooden Bridge Construction Plan

(Unit : Unit)

	2015	2016	2017	2018	2019	2020	Total
Peat dam	27	12	4	6	8	0	57
Adjustable gate	27	12	4	6	7	0	56
Sedimentation pond	7	2	2	2	2	0	15
Wooden bridge	0	4	1	0	4	2	11

Source: JICA Survey Team

#### (4) Road plan

##### 1) Function & specification

Roads are temporary infrastructure for logs and labor transportation from canal to log yard by truck. The same specification of Roads as WSL and MTI in Section 3.3 of Part II of this report will be constructed in MW. Roads have 2 specifications: in wet land and in mineral soil. Truck size is normally 2.6 m (width) and 8 m (length).

#### Function & Specification of Roads

Item	Function	Specification	Remarks
Road (Wet land)	Transportation of logs, labor and other materials	Width : 10 m	Composing basement to keep stability on the weak peat soil and the log yard between road and canal.
Road (Mineral Soil)	Transportation of logs, labor and other materials	Width : 6 m	Simple road, constructed by only using of excavator

Source: JICA Survey Team

In the wet land, there is 15 m log yard between road and canal. This log yard is for temporarily stocking logs before loading to pontoon. The truck can directly unload on the pontoon from this log yard, except for unloading at the log pond.

2) Amount & location

The Table below shows the construction amounts of roads.

**Construction Amounts of Roads**

(Unit : m)

MW	Existing	New	Total
Total	0	673,559	673,559

Source: JICA Survey Team

3) Annual construction plan

The Table below shows the annual construction plan from 2015 to 2021.

**Annual Roads Construction Plan**

(Unit : m)

	Block	2015	2016	2017	2018	2019	2020	2021
MW	1	6,265						
	2	3,319						
	3		3,327					
	4							
	5				4,826			
	6							
	Total	9,584	3,327		4,826			
	1	86,778	24,559					
	2		75,889	12,413				
	3			55,836	14,276			
	4				56,030	33,708		
	5					55,678	77,308	
	6						33,528	129,819
	Total	86,778	100,448	68,249	70,306	89,386	110,836	129,819
Total	96,362	103,775	68,249	75,132	89,386	110,836	129,819	

Source: JICA Survey Team

(5) Nursery plan

1) Function & specification

Two units of Nurseries which have the same specification of Nurseries as WSL and MTI in Chapter 3.3 of Part II of this report will be constructed in MW.

The permanent nursery area is planned to be constructed at the place which will enable distribution of the seedlings to all plantation areas. It is composed of greenhouse, open area, soil storage space, material storage, and water supply tower.

2) Amount & location

MW will provide the required amount of seedlings for plantation from its own nurseries. The capacity of nurseries is estimated by required number of seedlings which is calculated from the plantation area plan. The required numbers of seedlings for each year is shown below.

### Seedling Production and Nursery Capacity in MW

● MW Seedling production and Nursery capacity (unit: million pcs)

Block	Area (ha)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	
MW	1	13,649	20.7	3.4			8.5		12.2	3.4		8.5				
	2	10,139	2.2	14.0	1.4			2.2	5.3		8.7	1.4	2.2	5.3		
	3	12,601		5.4	14.0	2.7			5.4	3.2		10.7	2.7	5.4	3.2	
	4	14,817			7.5	12.7	5.7			7.5	3.3		9.4	5.7	7.5	3.3
	5	19,706				7.4	17.2	9.0			7.4	10.7		6.5	9.0	7.4
	6	8,102						3.1	12.2						3.1	12.2
<b>Total</b>	<b>79,014</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	<b>22.9</b>	
Nursery Capacity		23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	

Source: JICA Survey Team

In MW, the permanent nursery which can annually produce 11.5 million seedlings will be constructed in Blocks 1 and 2. It will be able to supply enough seedlings to all plantation areas in MW.

### Seedling Production and Nursery Capacity in MW

● Maintenance (Permanent nursery) (Unit: unit)

Block	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
MW	1		1	1	1	1	1	1	1	1	1	1	1	1
	2		1	1	1	1	1	1	1	1	1	1	1	1
	3													
	4													
	5													
	6													
<b>Total</b>		<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>

Source: JICA Survey Team

### 3.3.3 Infrastructure Maintenance Plan

#### (1) Log pond maintenance plan

##### 1) Maintenance items

The Table below shows the list of Log pond maintenance works.

#### List of Log Pond Maintenance Works

Item	Summary	Location	Period
Grading surface and additional Gravel and Silt.	Grading for improvement of transportation in log pond. Annual grading area is estimated as 0.2 ha for cost calculation.	Each log pond using in harvesting rotation.	Beginning of every harvesting rotation.
	Additional gravel and silt for repairing the surface of log pond. Annual repairing area is estimated as 0.2 ha for cost calculation.	Each log pond using in harvesting rotation.	Beginning of every harvesting rotation.
Replacement of wood piles for Jetty	Replacement of damaged wood piles in jetty to new wood pile. Annual replacement volume of wood pile is estimated as 95 m <sup>3</sup> for cost calculation.	Each jetty using in harvesting rotation.	Beginning of every harvesting rotation.
Dredging the berthing point	Dredging the berthing point to improve the ease of log barges approaching. Annual dredging length is estimated as 600 m (200 m×3 times) for cost calculation.	Each jetty using in harvesting rotation.	Three (3) times in every harvesting rotation.

Source: JICA Survey Team

2) Annual maintenance plan

Log pond maintenance will be conducted at every harvesting rotation. The Table below shows the annual maintenance plan.

**Annual Log Pond Maintenance Plan**

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
(Unit : m2)												
Grading						200			200		200	
(Unit : m3)												
Additional Gravel and Silt						1			1		1	
(Unit : unit)												
Wood piles replacement						1			1		1	
(Unit : m3)												
Jetty dredging						600			600		600	

Source: JICA Survey Team

(2) Site facilities maintenance plan

The Table below shows the maintenance plan of office, accommodation and other facilities in base camp and fire tower.

**List of Site Facilities Maintenance**

Facilities	Item	place	Period
Site facilities in base camp			
Office	Re-painting, Repairing the wall, roof, pillar and etc.	All facilities	Every year
Accommodation	Re-painting, Repairing the wall, roof, pillar and etc.	All facilities	Every year
Other facilities	Re-painting, Repairing the wall, roof, pillar and etc.	All facilities	Every year
Fire Tower			
Fire Tower	Re-painting, Repairing the floor.	All facilities	Every year

Source: JICA Survey Team

(3) Canals and Water control facilities maintenance plan

1) Maintenance items

The Table below shows the list of Canals and Water control facilities maintenance works.

**List of Canals, Water Control Facilities Maintenance Works**

	Item	summary	Location	Period
Canals	Main Canals	Dredging	All the canals	Beginning of every harvesting rotation.
	Branch Canals	Dredging	All the canals	Beginning of every harvesting rotation.
	Mid drain Cross drain	Dredging	50% of all the canals	Implement 50% of canals after 2 years from construction. Remained 50% will be implemented after 4 years from construction
	Infield drain	No maintenance	—	—
	Outlet Canals	Dredging	50% of all the canals	Implement 50% of canals after 2 years from construction. Remained 50% will be implemented after 4 years from construction
Water control facilities	Peat dam	Rebuild the damaged facilities	30% of all the facilities	Rebuild 30% of facilities in every harvesting rotation
	Adjustable gate	Rebuild the damaged facilities	50% of all the facilities	Rebuild 50% of facilities in every harvesting rotation
	Sedimentation	Dredging	50% of all the	Implement 50% of canals after 2 years



	Pond		facilities	from construction. Remained 50% will be implemented after 4 years from construction
Other facility	Wooden Bridge	Rebuilding	All the facilities	Rebuild all facilities in every harvesting rotation

Source: JICA Survey Team

## 2) Annual maintenance plan

The Table below shows the annual maintenance plan of Canals and Water control facilities.

### Annual Plan of Canal Maintenance

(Unit: m)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Main canal				28,622	17,516	11,486	18,189	22,376	28,622	17,516
Branch canal				92,168	103,879	92,265	90,456	92,356	92,168	103,879
Outlet canal	1,839	525	2,291	1,186	3,097	1,186	3,097	1,186	3,097	1,186
Mid and Cross drain	84,863	84,863	169,725	169,725	254,613	169,725	254,613	169,725	254,613	169,725

Source: JICA Survey Team

Note 1 : (Main and Branch Canals) Repeat the same rotation of 2020 – 2024.

2 : (Outlet Canals, Mid drain and Cross drain) Repeat the same rotation of 2020 – 2021.

### Annual Plan of Water Control Facilities and Wooden Bridge Maintenance

	Unit	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Peat dam	Unit	9	4	2	3	3	9	4	2	3	3	9
Adjustable gate	Unit	14	6	3	4	4	14	6	3	4	4	14
Sedimentation pond	m	980	280	280	280	280	980	280	280	280	280	980
Wooden bridge	Unit				4	1		4	2			4

Source: JICA Survey Team

Note 1 : (Peat dam, Adjustable gate, Sedimentation pond) Repeat the same rotation of 2020 – 2024.

2 : (Rebuilding Wooden bridge) Repeat the same rotation of 2023 – 2029.

## (4) Roads maintenance plan

### 1) Maintenance items

The Table below shows the list of road maintenance works.

### List of Roads Maintenance Works

Item	summary	Location	Period
Road (Wet land)	Resurfacing (Grading)	All the roads	Every harvesting rotation
	Additional gravel and silt for repairing the surface	50% of the roads	50% of roads in every harvesting rotation
Road (Mineral Soil)	Resurfacing (Grading)	All the roads	Every harvesting rotation
	Additional gravel and silt for repairing the surface	50% of the roads	50% of roads in every harvesting rotation
	Dredging of the drains both sides of road	20% of the roads	20% of roads in every harvesting rotation

Source: JICA Survey Team

## 2) Annual maintenance plan

The Table below shows the annual maintenance plan.

### Annual Plan of Road Maintenance

(Unit : m)

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Grading (Wet Land)	9,584	3,327		4,826		9,584	3,327		4,826	
Grading (Mineral soil)			86,778	100,448	68,249	70,306	89,386	110,836	129,819	86,778
Additional gravel & silt (Wet land)	4,792	1,664		2,413		4,792	1,664		2,413	
Additional gravel & silt (Mineral soil)			43,389	50,224	34,124	35,153	44,693	55,418	64,909	43,389
Dredging drain			17,356	20,090	13,650	14,061	17,877	22,167	25,964	17,356

Source: JICA Survey Team

#### (5) Nursery maintenance plan

The Table below shows the list of permanent nursery maintenance works. The maintenance of permanent nursery will be conducted annually.

#### List of Permanent Nursery Maintenance Works

Summary	Location	Period
Repair of greenhouse, warehouse, pump, water pipe and etc.	WM	Every year

Source: JICA Survey Team

### 3.4 Chip Mill Construction/ Chip Production Plan

#### 3.4.1 Chip Mill Plan

##### (1) Planned site for construction of MW chip mill

It will be built within the premises of the chip mill which is constructed in Phase 1, so that the mills are located next to each other.

##### (2) Quantity of chips that can be produced from MW wood

In accordance with this Report Part II, Main report Section 3.2.2, (4), 3), the harvesting volume from MW area for *A. Crassiparva* is 611,010 m<sup>3</sup> per year from 2020, and for *A. Mangium* 1,261,848 m<sup>3</sup> per year from 2022.

#### Estimation of Harvesting Volume of Planted Trees

(Unit: m<sup>3</sup>)

Site	2020	2021	2022	2023
Total	611,010	611,010	1,872,858	1,872,858

Source: JICA Survey Team

Estimation of chip production calculated by these figures is shown in the table below.

## Chip Production

(Per year)

item	Site	Unit	2020	2021	2022	2023	2024	2025
Harvesting Volume	Total	m <sup>3</sup>	611,010	611,010	1,872,858	1,872,858	1,873,038	1,872,858
Log volume for chip production	Total	BDt	521,192	521,192	1,597,548	1,597,548	1,597,701	1,597,548
Chip Production	Total	GMt	520,977	520,977	1,596,890	1,596,890	1,597,043	1,596,890
	Total	m <sup>3</sup>	276,118	276,118	846,352	846,352	846,433	846,352

Source: JICA Survey Team

Chip mill will receive approx. 1.9 million m<sup>3</sup> of logs, and produce approx. 1.6 million GMt (= approx. 850,000 BDt) woodchip per year. Available operation days is assumed as 300 days per year; thus, planned woodchip production is approx. 6,242 m<sup>3</sup> per operation day.

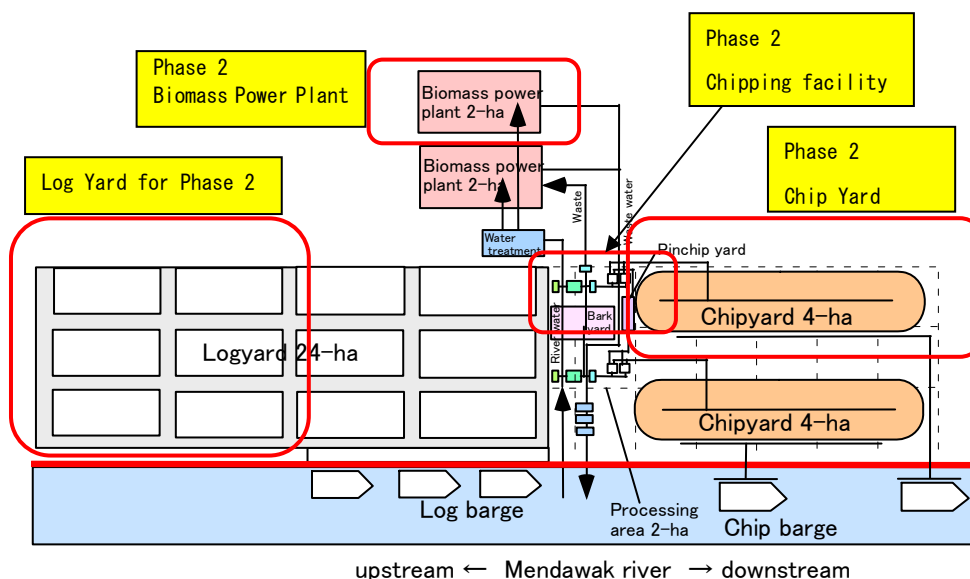
### (3) Composition, outline and layout of chip mill

The outline and layout of the chip mill are shown below. The same scale chip mill for Phase 2 is planned to be constructed next to the chip mill of Phase 1.

### Summary of Chip Mill Facility (Phase 2)

Items	Simple description of the facility, purpose and function
<b>i) Log yard</b>	A place to temporarily stock the logs brought from plantation Including a space for the heavy equipment and truck operation
<b>ii) Bark yard</b>	A place to temporarily stock the bark which is produced by chipping as semi-products The bark stock at the bark yard will be delivered to Biomass power plant (BPP).
<b>iii) Water treatment facility</b>	The water is used for: a) log washing at chip mill, b) make up water and cooling water for BPP, and c) daily use water for the office and accommodation facility (drinking and cooking water are prepared separately). This water will be taken in directly from Mendawak river then flow into sedimentation pond, and then delivered to each facility. Waste water is gathered at the sedimentation pond and returned to Mendawak river after obvious suspension is sedimented.
<b>iv) Biomass power plant</b>	An electric power generating system using bark as fuel mix together with coal. The proportion of bark and coal is planned as 75:25.
<b>v) Chipping facility</b>	
Feeder	A machine to feed the round logs into chipping line
Debarker	A machine pill the bark of the round logs Rotary type debarker was selected
Chipper	A machine to chop the logs into small piece. Horizontal feed type disc chipper was selected
Screen	A machine select the proper chip size There is not specific requirement except for capacity and price
<b>vi) Chip yard</b>	
Chip yard	A facility which temporarily stock the produced chip
Chip loading facility	A facility to load a chip into chip transportation barge. Manually handling type by wheel loader is selected

Source: JICA Survey Team



Source: JICA Survey Team

### Layout of Chip Mill (Summary)

#### 3.4.2 Lay Out of Chip Mill Facilities (MW)

##### (1) Design engineering conditions

Natural conditions of surrounding area of chip mill are shown below.

#### Natural Conditions of Surrounding Area of Chip Mill

<b>Topography</b>	Standard of elevation	Assuming the bauxite jetty at upstream as temporal BM.
	Available map	Topography map provided by WSL. Water depth map
<b>Underground condition</b>	Soil condition	Boring test has been carried out. N-value of mill candidate site was detected. Other soil condition has not been carried out; hence, the soil condition is estimated by the result of boring test.
<b>River condition</b>	Designed water level, water speed	Not utilized for design engineering
<b>Climate condition</b>	Temperature, wind, precipitation	Not utilized for design engineering
<b>Quake condition</b>	Seismic intensity	Seismic intensity is not consider for the structure used for this project

Source: JICA Survey Team

#### Utilization of Mill Design / Condition of Machine Selection

<b>Log yard</b>	The area of log yard is fixed based on the amount of round logs which is required by the MTI chip mill in a month.
<b>Bark yard</b>	Total bark yard area is fixed based on the bark amount which will be debarked from the plantation logs.
<b>Biomass power plant</b>	Biomass power plant which can cover all the required electricity for the MTI chip mill related facility will be installed. The facility consists of: a) electric power generating plant (7 Mw), b) coal feeding facility, and c) other attachment facilities.
<b>Chipping line</b>	
<b>Log feeder</b>	The capacity which can handle the plantation logs at the speed of 340m <sup>3</sup> SOB/hr.
<b>Debarker</b>	Rotary debarker which can handle the plantation logs at the speed of 340 m <sup>3</sup> SOB/hr after comparison between dram stle and rotary style debarker.
<b>Chipper</b>	Slice style horizontal disc chipper was selected, after coparison of slice type and crush type, horizontal type and vertical type. The required capacity is 300m <sup>3</sup> SUB/hr.
<b>Screen</b>	Two machines with capacity to handle 800 m <sup>3</sup> loose chips per hour are selected.
<b>Chip yard</b>	
<b>Chip yard</b>	Manual style chip distribution system was selected after the comparison between automatic distribution and manual style distribution.

Source: JICA Survey Team

(2) Decision of facility's structure

Structure of the mill facility and the specification of the machine are described in the table below.

**Structure of Mill Facility and The Specification of Machines**

<b>Log yard</b>	<p>Calculation of monthly required log amount <math>(m^3) = \text{Area}(m^2) \times \text{Effective area}(\%) \times \text{loadable height}(m) \times \text{Solid part}(\%)</math></p> <ul style="list-style-type: none"> <li>• monthly required log amount : 156,072 m<sup>3</sup>/month x 0.5</li> <li>• available area for log stock : 60%</li> <li>• loadable height : 3m</li> <li>• solid proportion : 40 (%)</li> </ul> <p>108,383 m<sup>2</sup> of log yard area is necessary. Based on this number, we are going to establish 120,000 m<sup>2</sup> = 12 ha log yard which include 15% margin area. Log waste which is not suitable to use for plywood is utilized for foundation work of log yard. The area which vehicle and heavy equipment operate will be covered by concrete.</p>
<b>Bark yard</b>	<p>Bark yard area is determined based on the bark amount which will be removed from the logs per month.</p> <ul style="list-style-type: none"> <li>• Monthly log amount to be fed : 156,072 m<sup>3</sup>/month</li> <li>• Weight base : 121,736 ton/month (log fresh weight : 0.78 GMt/m<sup>3</sup>)</li> <li>• Debarked bark amount at mill : 9,739 ton/month</li> <li>• volume base : 35,543 m<sup>3</sup>/month (bulk density : 0.274 GMt/m<sup>3</sup>)</li> <li>• bark pile height : 15 m</li> <li>• form of bark pile : continuous hill style</li> </ul> <p>Required area is estimated as 7,109 m<sup>2</sup>, 1.5ha is planned with allowance. Log waste which is not adequate to use for plywood is utilized for foundation work then concrete will be covered on it. Additionally the top of the bark yard will be covered in a future in case too much water caused by rainfall influences badly to the Biomass power plant operation.</p>
<b>Biomass Power plant</b>	<p>The facility consists of: a) electric power generating plant (7 Mw), b) coal feeding facility, c) other attachment facility.</p> <ul style="list-style-type: none"> <li>Capacity : 7 Mwh</li> <li>Combustion system : Travelling grate (chain grate)</li> <li>Boiler capacity : 40 T/hr×1</li> <li>Steam temperature : 450°C</li> <li>Steam pressure : 40 bar(g).</li> <li>Output from generator : 6.3kV</li> <li>Synchronised to 0.4kV, eventually, using 8,000KVA transformer</li> </ul>
<b>Chipping facility</b>	
Log feeder	Capacity 340m <sup>3</sup> /SOB/hr × 1
Debarker	<p>Model : DDR (Demuth)</p> <p>Capacity : 340 m<sup>3</sup>/SOB/hr × 1</p> <p>Debarking length : Total length 78,000 mm</p> <p>Module length : 13,000 mm</p> <p>Module number : 6 modules</p> <p>Roter number per module : 3 rotors</p> <p>Operational width per module : 2,800 mm</p> <p>Motor power per module : Upper rollers 30kW×1 Lower rollers 55kW×1</p> <p>Discharge gate power : 7.5kW×1</p> <p>Weight (Approx.) 450,000 kg</p>
Chipper	<p>Model : DPDI 3000 (Demuth)</p> <p>Capacity : 300 m<sup>3</sup>/SOB/hr × 1</p> <p>Rotor disc diameter : 3,000 mm</p> <p>Disc thickness : 220 mm</p> <p>Knives number : 14</p> <p>Nominal chip length : 25 mm</p> <p>Installed power : 700kW × 2</p> <p>Rotor weight (Heaviest part) : 20,200 kg</p> <p>Total weight (Approx) : 54,000 kg</p> <p>Feeding spout diameter : 835 mm</p>
Screen	Capacity : 800 m <sup>3</sup> loose/ hr × 2

	Length : 8,000 mm Weight : 5,400 mm Height : 3,220 mm Screen : 3 × 25 m <sup>2</sup> Screening area : 38 m <sup>2</sup>
<b>Chip yard</b>	
Chip yard	Length of shuttle conveyor 350 m Capacity 1,600 m <sup>3</sup> loose/hr Able to stock 250,000 m <sup>3</sup> loose

Source: JICA Survey Team

### 3.4.3 Chip Mill Construction Plan (MW)

#### (1) Summary of construction methodology

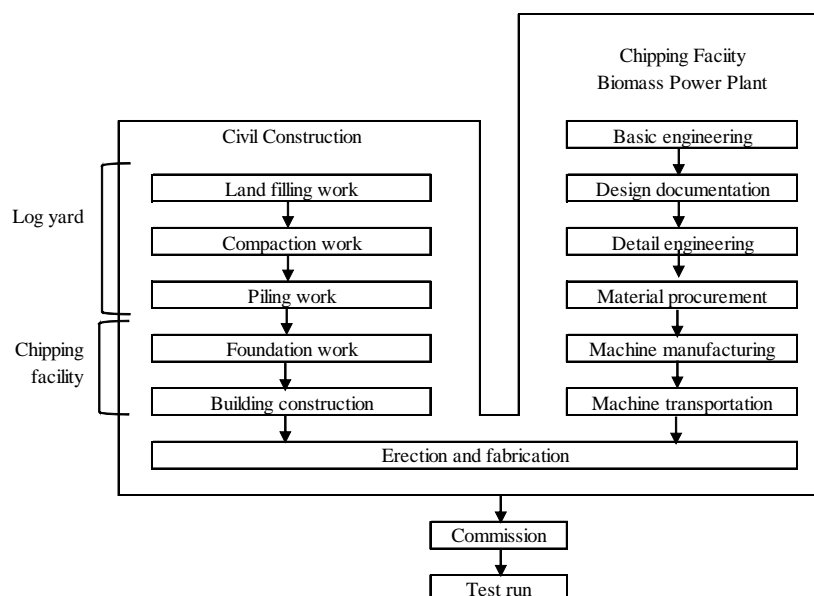
##### 1) Adopted conditions

Construction method was considered and decided based on following procedure.

- General method and previously used method at the planned region
- A method which was applied by ALAS Kusuma Group, a JV partner, when they have established a plywood factory at similar topographic area in the same region.
- To use material and machinery which is available in the region as much as possible.
- Among several candidate methods which can satisfy given quality, the one which ALAS Kusuma group considers economical and reasonable.
- Actual construction will be done by a company which has good experience and has satisfactory skill and techniques or is construction division of ALAS Kusuma group.

##### 2) Construction plan

Construction work flow of the chip mill is shown below.



Source: JICA Survey Team

#### Chip Mill Construction Work Flow

#### (2) Summary of Construction quantities

The Construction quantities based on the preliminary design are shown in the table below.

### Construction Quantities of Chip Mill

Facility · Machine	Quantity	Unit
<b>1. CHIPPING FACILITY (main machine)</b>		
LOG INFEED CHAIN CONVEYOR	1	Set
ROTARY DEBARKER	1	Machine
DISCHARGE CHAIN CONVEYOR	1	Set
ROLLER BARK SEPARATOR	1	Set
LOG FEED BELT CONVEYOR + METAL DETECTOR	1	Set
HORIZONTAL DISC CHIPPER	1	Machine
BELT CONVEYOR FROM CHIPPER + MAGNET SEPARATOR + BELT WEIGHT SCALE	1	Set
BELT CONVEYOR TO CHIP SCREEN	1	Set
CHIP SCREEN	2	Machine
ACCEPT CHIP CONVEYOR FROM SCREEN + BELT WEIGHT SCALE	1	Set
ACCEPT CHIP CONVEYOR TO SHUTTLE	1	Set
SHUTTLE CONVEYOR	1	Set
OVERSIZE CONVEYOR - 1	1	Set
OVERSIZE CONVEYOR - 2	1	Set
CHIP CRUSHER	1	Set
DEWATERING CONVEYOR	1	Set
BARK CONVEYOR UNDER DEBARKER + MAGNET SEPARATOR	1	Set
PIN AND FINE CONVEYOR	1	Set
CHIP RECEIVING CHAIN CONVEYOR	1	Set
CHIP CONVEYOR TO BARGE + BELT WEIGHT SCALE	1	Set
ERECTION, FABRICATION, ELECTRICAL SPECIFICATION, TRANSFORMERS, LV-SWITCHGEARS, MOTORS, CONTROL SYSTEM, ENGINEERING AND DOCUMENTATION, ELECTRICAL INSTALLATION MATERIAL, COMMISSIONING	1	Package
<b>2. BIOMASS POWER PLANT</b>		
ONE SET OF BIOMASS GENERATING SYSTEM (7Mwh) - BOILER - TURBINE - GENERATOR - OTHERS (MATERIALS, CHEMICALS, ERECIION, FABRICATION, ELECTRICAL SPECIFICATION, CONTROL SYSTEM, ENGINEERING AND DOCUMENTATION, ELECTRICAL INSTALLATION MATERIAL, COMMISSIONING) - PIPING	1	Package
SILO	1	Set
BUILDING (65 m x 150 m)	1	Set
STEEL STRUCTURE (FOR BOILER & POWER TURBIN, WATER TREATMENT, COAL CRUSHER, COAL CONVEYOR, and BIOMASS CRUSHER)	1	Set
FOUNDATION (CONCRETE WITH STEEL BAR : STEEL BAR 2 mm, 16 mm, 19 mm, 25 mm)	1	Set
WATER TREATMENT - CLARIFIER TANK (1000 m <sup>3</sup> /hr) - CLEAR WATER TANK (150 m <sup>3</sup> ) - STAINLESS WATER TANK (100 m <sup>3</sup> ) - SAND AND FILTER COMPLETE SET (50-60 m <sup>3</sup> /day) - ACTIVE CARBON FILTER (50-60 m <sup>3</sup> /day) - RAW WATER INTAKE PUMP (100 m <sup>3</sup> /day)	1 2 2 2 2 2	Set

- MULTI FILTER PUMP (60 m <sup>3</sup> /day)	2	
<b>3. CIVIL WORK, BUILDINGS, OTHER FACILITIES</b>		
LAND RECLAMATION (12 ha)		
- LAND FILLING HEIGHT: 3.5 m	420,000	m <sup>3</sup>
- COMPACTION	12	ha
PILING WORK	1	set
- FOR CHIPPING PLANT PILING (20,000 m <sup>2</sup> ) : CONCRETE PILE		
- FOR CONVEYOR PILING : WOOD PILE		
- FOR BIOMASS POWER PLANT PILING : CONCRETE PILE		
- FOR CHIP YARD PILING (35,000 m <sup>2</sup> ) : WOOD PILE		
LOGYARD		
- LAND PREPARATION FOR 6 UNITS × 200 m × 100 m	120,000	m <sup>2</sup>
- SMALL WOOD PILE (1 TREE PER 1.5 m <sup>2</sup> )	80,000	pole
- CONCRETE WORKS (120,000 m <sup>2</sup> ×40% ×THICKNESS 12 cm)	48,000	m <sup>2</sup>
CHIP PRODUCTION AREA PREPARATION	20,000	m <sup>2</sup>
- CONCRETE WORKS (THICKNESS 12cm)		
BARK YARD PREPARATION	15,000	m <sup>2</sup>
- 75 m × 200 m, THICKNESS 12 cm		
INFRASTRUCTURE		
- ROAD WORKS (TOTAL LENGTH 3,380 m × WIDTH 10 m)	33,800	m <sup>2</sup>
- DRAINAGE SYSTEM	1	set
- ELECTRICAL INSTRATION, CABLING, LIGHTING	1	set
- WATER SUPPLY PIPING	1	set
- FIRE FIGHTING SYSTEM	1	set
- SEDIMENTATION POND (10 m × 20 m × 4 m) (CONCRETE THICKNESS 30 cm)	1	set
<b>4. BUILDINGS</b>		
- BUILDING FOR CHIPPER&SCREEN	1,200	m <sup>2</sup>
- (H=12 m) 2 units × W 30 m× L 20 m		
- BUILDING FOR STAFF (H=4 m) 150 rooms × W 5 m × L 5 m MTI STAFF 200 PERSONS+ CONTRACT HEAVY MACHINERY OPERATOR 200 PERSONS (FAMILY NOT INCLUDED)	3,750	m <sup>2</sup>
- BUILDING FOR FUEL STRAGE (PUMP, TANK 150 TONS, DISTRIBUTION PIPE, VALVE SYSTEM)	1	set
- LOG WEITH SCALE (50 TONS)	3	set

Source: JICA Survey Team

### (3) Tentative construction period

Tentative construction period is estimated by dividing the work quantities by assumed number of teams, productivity and ratio of operation. The team numbers are estimated by consideration of critical works, waiting time and securing safety of work space, and to be feasible and effective. The Table below shows the tentative construction period.

#### Tentative Chip Mill Construction Period

	Tasks	Unit	Quantity	Team	Work Quantity	Operation Ratio	Work Days	Work Period (month)
1	Preparation							
1.1	Purchase of rent of heavy equipments and materials for initial stage of construction	L.S.	1	-	-	-	-	2
1.2	Preparation	L.S.	1	-	-	-	-	1
2	Whole area							
2.1	Land filling	m <sup>3</sup>	875,000	1	2,431	0.80	450	18



Preparatory Survey on West Kalimantan Province Reforestation and Forest Products Processing Project, Indonesia  
(PPP Infrastructure Project)

2.2	Compaction	m <sup>2</sup>	250,000	1	4,167	0.80	75	3	
	Chipping line								
3	3.1	Pilling	nos	1,746	1	15	0.60	200	8
	3.2	Concrete works	m <sup>3</sup>	16,076	1	51	0.60	525	21
	3.3	Pavement construction	m <sup>2</sup>	33,800	1	423	0.80	100	4
4	Biomass power plant								
	4.1	Pilling	nos	1,091	1	9	0.60	200	8
	4.2	Concrete works	m <sup>3</sup>	2,400	1	23	0.60	175	3

Source: JICA Survey Team

#### (4) Tentative construction schedule

Tentative construction schedule based on the work flow and work period is shown below.

#### Chip Mill Construction Schedule

Tasks	Months	2017												2018												2019																	
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12									
Civil work for chipping line	12																																										
Manufacturing and transporting of facilities of chipping line	13																																										
Erection of facilities of chipping line	8																																										
commissioning of chipping line	3																																										
Civil work of biomass power plant	7																																										
Manufacturing and transporting of facilities of BPP	11																																										
Erection of facilities of BPP	6																																										
Commissioning of BPP	3																																										
Construction of buildings	16																																										
Construction of other buildings	21																																										
Start of harvesting logs	4																																										
Test of production	3																																										
Start of sales	2																																										

Source: JICA Survey Team

#### (5) Schedule for chip mill construction and internal procedure

Period for internal decision, financing to MW chip mill and schedule to commence chip production is shown in the figure below.

#### Schedule for Chip Mill Construction and Internal Procedure

Tasks	Months	2017												2018												2019																		
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12										
Negotiation with suppliers	4																																											
Contract and order	7																																											
Construction	21																																											
Commissioning	6																																											
Start of harvesting logs	4																																											
Test of production	3																																											
Start of sales	2																																											

Source: JICA Survey Team

### 3.5 Port Facility Development Plan

The development plan of the port facilities for mooring the barges for transport of logs and chips to/from chip mill of MW project is described below. The transport system of logs/chips to/from chip mill of MW project is the same as the system of Phase 1; therefore, the port facility for Phase 2 is planned the same as that of Phase 1. Hence, basic design, structural design of Phase 2 are the same as

those of Phase 1 (please see the Part II, Chapter 3.5 of this report). The construction quantities and schedule of port facility are shown below.

### 3.5.1 Port Facility Plan

#### (1) Construction quantities

Construction quantities calculated based on the preliminary design are shown in the Table below.

**Construction Quantities**

Facility	Work Item	Unit	Quantity
Log yard berth / Revetment	SSP :supply	ton	1,367
	SSP :installation	nos	1,167
	SPP :supply	ton	481
	SPP :installation	nos	292
	Tie rod :supply	ton	117
	Tie rod :installation	nos	292
	Re-bar :supply / installation	ton	145
	Concrete :supply / installation	m <sup>3</sup>	1,814
	Backfill :supply / installation	m <sup>3</sup>	25,200
	Riverbed excavation	m <sup>3</sup>	15,300
	Bollard :supply / installation	set	14
	Fender :supply / installation	set	13
	Foundation of Belt conveyor	SPP :supply	ton
SPP :installation		nos	6
Re-bar :supply / installation		ton	2
Concrete :supply / installation		m <sup>3</sup>	19
Other steel :supply / installation		ton	2
Chip berth	SPP :supply	ton	70
	SPP :installation	nos	32
	Re-bar :supply / installation	ton	5
	Concrete :supply / installation	m <sup>3</sup>	63
	Riverbed excavation	m <sup>3</sup>	1,000
	Bollard :supply / installation	set	6
	Fender :supply / installation	set	4
	Other steel :supply / installation	ton	10

Source: JICA Survey Team

#### (2) Tentative construction period

Tentative construction period is calculated based on the Construction quantities, team number, assumed progress and productivity rate. Team number is assumed to be suitable based on consideration of the critical works, standby time and working area so that all works are carried out smoothly and effectively.

Calculated working period of the main works are shown in Table below..

### Tentative Working Period

No.	WORK ITEM	Unit	Q'ty	Team Number	Productivity (/day)	Act Ratio	Duration (day)	Year / Month
<b>1</b>	<b>Preparation works</b>							
1-1	Mobilization	L.S.	1.0	-	-	-	-	2.0
1-2	Preparation works	L.S.	1.0	-	-	-	-	1.0
<b>2</b>	<b>Log Yard Berth / Revetment</b>							
2-1	SPP installation (Retaining Wall)	nos	292	1	10.0	0.63	46	1.5
2-2	SSP installation (Face line)	nos	1,167	1	10.0	0.63	185	6.2
2-3	Tie Rod installation	set	292	1	5.0	0.63	93	3.1
2-4	Backfill	m3	25,200	1	700.0	0.63	57	1.9
2-5	Riverbed excavation	m3	15,300	1	500.0	0.70	44	1.5
2-6	Superstructure concrete	m3	1,814	4	5.0	0.55	165	5.5
<b>3</b>	<b>Foundation of Belt conveyer</b>							
3-1	SPP installation (offshore)	nos	6	1	2.0	0.63	5	0.2
3-2	Superstructure concrete (offshore)	m3	19	1	5.0	0.55	7	0.2
<b>4</b>	<b>Chip Berth</b>							
4-1	River bed excavation	m3	1,000	1	500.0	0.70	3	0.1
4-2	SPP installation	nos	32	1	2.0	0.63	25	0.8
4-3	Superstructure concrete	m3	63	1	5.0	0.55	23	0.8
4-4	Utility installation	L.S.	1.0	-	-	-	-	2.0
<b>5</b>	<b>Finishing works</b>							
5-1	Finishing works	L.S.	1.0	-	-	-	-	2.0
5-2	Demobilization	L.S.	1.0	-	-	-	-	1.0

Source: JICA Survey Team

### (3) Tentative construction schedule

Tentative construction schedule based on the calculated working period and work flow is shown in Figure below

No.	WORK ITEM	Unit	Q'ty	Year / Month	1st Year												2nd Year											
					1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
<b>1</b>	<b>Preparation works</b>																											
1-1	Mobilization	L.S.	1.0	2.0	■																							
1-2	Preparation works	L.S.	1.0	1.0		■																						
<b>2</b>	<b>Log Yard Berth / Revetment</b>																											
2-1	SPP installation (Retaining Wall)	nos	292	1.5		■	■																					
2-2	SSP installation (Face line)	nos	1,167	6.2		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
2-3	Tie Rod installation	set	292	3.1				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
2-4	Backfill	m3	25,200	1.9						■	■	■	■	■	■	■	■	■	■	■	■	■	■					
2-5	Riverbed excavation	m3	15,300	1.5											■	■	■	■	■	■	■	■	■					
2-6	Superstructure concrete	m3	1,814	5.5														■	■	■	■	■	■					
<b>3</b>	<b>Foundation of Belt conveyer</b>																											
3-1	SPP installation (offshore)	nos	6	0.2																	■	■	■					
3-2	Superstructure concrete (offshore)	m3	19	0.2																		■	■					
<b>4</b>	<b>Chip Berth</b>																											
4-1	River bed excavation	m3	1,000	0.1																								
4-2	SPP installation	nos	32	0.8																								
4-3	Superstructure concrete	m3	63	0.8																								
4-4	Utility installation	L.S.	1.0	2.0																								
<b>5</b>	<b>Finishing works</b>																											
5-1	Finishing works	L.S.	1.0	2.0																								
5-2	Demobilization	L.S.	1.0	1.0																								

Source: JICA Survey Team

### Tentative Construction Schedule

### (5) Tentative project schedule

Tentative Project Schedule of the Loading Port Facilities is shown in Figure below.

No.	ITEM	Year / Month	1st Year												2nd Year												3rd Year																													
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12																		
<b>1</b>	<b>Design and Permission</b>																																																							
1-1	Detailed Design	6	■																																																					
1-2	Permission	2							■																																															
<b>2</b>	<b>Selection of the Contractor</b>																																																							
2-1	Preparation of Tender	2							■																																															
2-2	Tender period	1													■																																									
2-3	Tender evaluation	1																			■																																			
2-4	Contract negotiation	1																									■																													
<b>3</b>	<b>Construction</b>																																																							
3-1	Construction period	20													■																																									

Source: JICA Survey Team

### Tentative Project Schedule (Loading Port Facilities)

## 3.6 Log/Chip Transportation Plan

### 3.6.1 Summary of Transport Plan

Transportation of plantation logs from plantation site to log yard, chip transportation from chip mill to offshore loading point and chip loading to a chip carrier (vessel) are planned. These tasks are divided into 5 categories and planning of each category is discussed. Chip transportation by vessel and chip unloading at destination port which is included in ocean freight is not determined in this project

### Outline of Log and Chip Transportation Plan

Log/Chip	Task of Transportation	Plan
<b>Log transport</b>		
(1)Wet area	Log transportation from plantation log pond to mill jetty	Log barge transportation plan (Location: Mendawak River)
	Log unloading, loading and transportation at jetty, log yard and feeder	Log transportation plan (Location: Mill jetty, log yard, log feeder)
(2)Dry area	Log transportation from plantation log pond to mill jetty	Log barge transportation plan (Location: existing road)
	Log unloading, loading and transportation at jetty, log yard and feeder	Log transportation plan (Location: Mill jetty, log yard, log feeder)
<b>Chip transport</b>		
(3)	Chip loading at chip mill jetty (chip loading facility)	Chip loading plan (Location: chip yard)
(4)	Chip transportation from chip mill to offshore loading point	Chip barge transportation plan (Location: Mendawak River)
(5)	Chip unloading from barge to vessel	Chip handling plan (Location: vessel)

Source: JICA Survey Team

### 3.6.2 Log Transport Plan

(Wet area): The harvested logs are transported to a barge mooring at log pond. The transport plan of the loaded logs on the barge until the log yard of the chip mill is planned in this chapter.

(Dry area): The harvested logs are transported to a truck at a delivery point. The transportation plan of the loaded logs on the truck until the log yard of the chip mill is planned in this chapter.

#### (1) Transportation route

(Wet area): The logs are transported to the log yard through Mendawak River which flows in the centre of MTI project area.

(Dry area): The logs are transported to the log yard through an existing road passing the bauxite mining area.

(2) Outline of log transportation plan

(Wet area): The size of the barge for log transportation from log pond is 230 ft based on the consideration of river water level, required water level for the barge with logs. Annual log transportation plan is prepared based on considerations of: i) round trip time, ii) loading log volume, and iii) planned transport volume. Two barges are planned to be used.

(Dry area): The truck for transportation is assumed as Hino FM260JD or the one with the same specifications.

### 3.6.3 Log Handling Plan (Log Yard in Chip Mill)

(1) Procedure of log unloading, loading and transportation

Trucks and heavy equipment will be used for log handling (loading, transporting and unloading) plan in the chip mill the same as the plan of Phase 1. Each parameter is planned based on Phase 1. The transporting distances of logs are set as shown below.

- Jetty to log yard: 1,400 m for round trip
- Jetty to feeder: 1,000 m for round trip
- Log yard to feeder: 500 m for round trip

Log transportation by truck is planned.

### 3.6.4 Chip Handling Plan (Chip Yard)

Methodology of chip handling is planned the same as Phase 1.

Planned amount of chip handling is 846,352 BDt per year (the same as annual production amount), which means monthly 70,529 BDt, and daily 2,821 BDt.

The produced chip is piled at chip yard first, and will be loaded to a barge by chain conveyor. Dozers will be used to handle chip to chain conveyor; also chips will be compacted by dozers on the barge. The dozers will be moved from chip yard to a barge by crane. The number and planned machine type are shown below.

#### Machines for Chip Handling

Machine	No.	Type
Chain conveyor	1	
Wheel loader	3	Wheel loader CAT G980
Crane	1	Crane P&H 550AS
Dozer	2	CAT Dozer 966F

Source: JICA Survey Team

### 3.6.5 Barge Operation Plan

The cost and transportation trips of vessels is huge. Therefore, the transportation operation by barges must be considered with much efficiency. In 2020, the chipping production of logs from WSL/MTI will be in operation; therefore, the total amount of chips of Phase 1 and 2 will be considered to be transported effectively. The annual planned chip amount is 1,394,748 BDt (548,396 + 846,352). The capacity of one barge is 2,915 BDt; therefore, 478 round trips of barges are required.

In case of 7 barges will be considered as one set and 66 round trips will be taken a month, it comes 462 round trips per year, which is a shortfall of 16 round trips. To supplement this shortfall, one additional barge is planned to be used. The additional barge is planned conservatively to take 3 round trips per month (36 round trip per year).

(1) Specification of barge and operation route

The specification of barge for chip transportation is the same as Phase 1.

**Specification of Chip Transportation Barge**

Specification	Figure.	Unit
300-ft barge with tug boat		
Sideboard: Length	85.0	m
Width (inside)	22.0	m
Height	5.0	m
Height for over loading (theoretically)	3.0	m
Height for over loading (plan)	2.5	m
Volume of chips on barge	14,025	m <sup>3</sup>
Weight of chips on barge	5,500	GMt
	2,915	BDt

Source: JICA Survey Team

**Distance of Barge Transportation and Barge Speed**

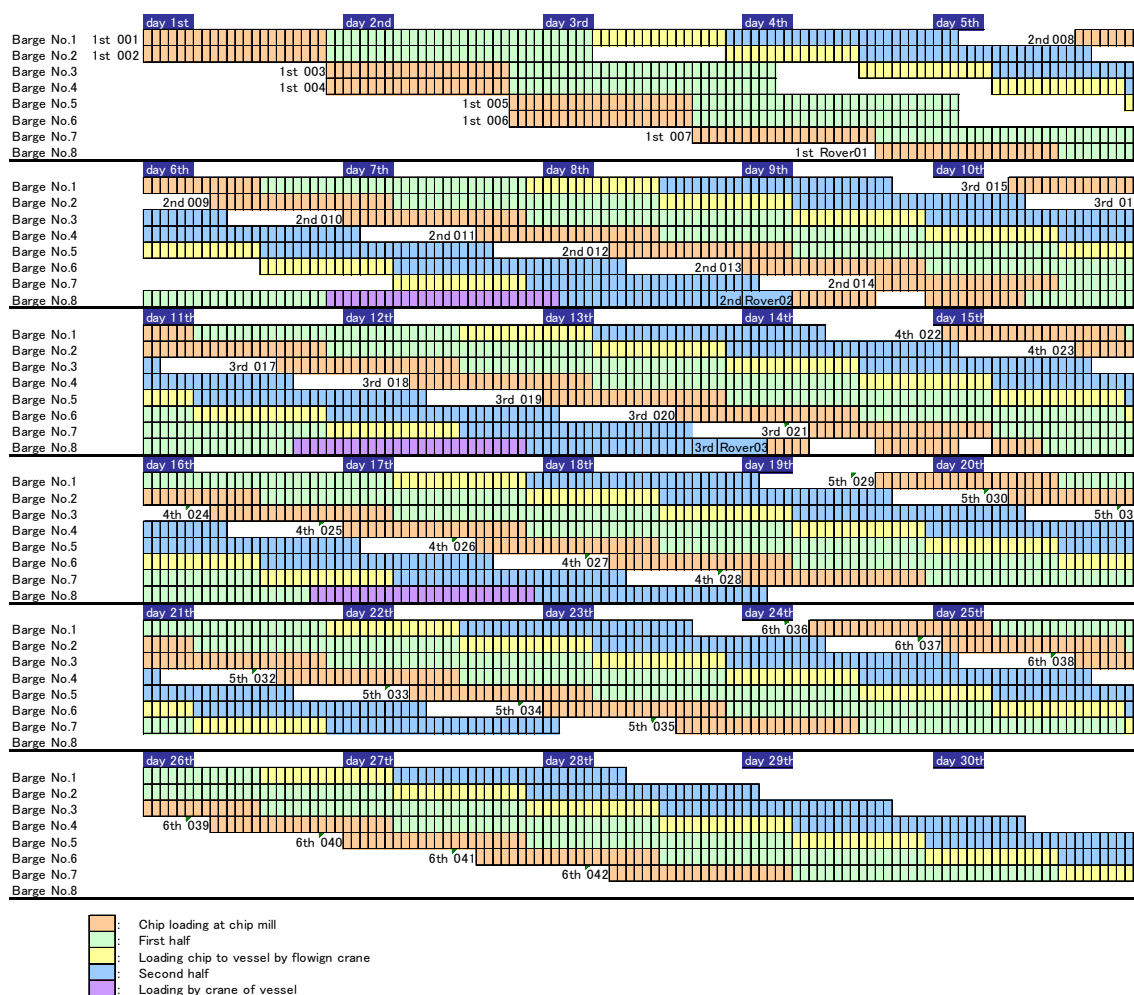
Item	(Unit)	
Distance one way		
Chip mill to the near offshore loading point	132.0	km
Chip mill to the far offshore loading point	142.0	km
Barge speed		
With chips	2.8	knot
	5.1	km
Without chips	3.0	knot
	5.6	km

Source: JICA Survey Team

Note: 1knot = 1.852 km/hr

(2) Plan of chip barge transportation operation

The plan of chip barges transportation operation (one set of 7 barges and additional one barge) is shown below.



Source: JICA Survey Team

### Chip Barges Transportation Operation Plan

#### 3.6.6 Chip Handling Plan (Vessel)

The methodology of chip handling to the vessel is planned the same as plan of Phase 1. The specification of floating crane is shown in the table below.

#### Specification of Floating Crane

Item		Unit
Number of shifts per day	3	Shift
Time for one shift	8.0	hrs
Available hours per shift	6.5	hrs
Operation hours per day	19.5	hrs
Possible chip volume to be handled per lifting	50.0	m <sup>3</sup> /time
	19.8	GMt/time
	9.3	BDt/time
Number of swings per hour	25	Times/hrs
Possible volume of handling per hour	1,250	m <sup>3</sup> /hr
	494.4	GMt/hr
	232.4	BDt/hr
Total time of loading chip to vessel (from 7 barges)	112	hrs

Source: JICA Survey Team

The vessel is assumed to be used for chip transportation from the offshore point to the purchasers.

### Assumed Vessel Specification

Item		Unit
Draft	11	m
Grain Capacity	101,941	m <sup>3</sup>
	3,600,000	CFT
Capacity of chip (A. Crassicarpa)	35,754	GMt
	18,950	BDt
Total number of 300-ft barges for one vessel	6.5	Barge
	Round up 7.0	Barge
Chip handling days including freight	9	Days

Source: JICA Survey Team

### 3.7 Chip Sales Plan

The potential purchasers for sales of Phase 1 is used and the sales plan for Phase 2 is prepared as shown below. The interview survey and confirmation of information related to the sales of chips will be conducted in the detailed FS study.

### 3.8 Action Plan Related to the Communities

#### 3.8.1 Community Training Plan

##### (1) Outline

The Social, security and fire control teams of PT. MW will be formulated as same as PT. WSL/MTI and will be implemented to develop the relations with communities to have good cooperation from them and to protect the forest and plantation areas from fire. The staff members dispatched to the site office will tackle these issues. These activities will certainly need to have the expressed effect; therefore, it is important to make plans for such achievement.

The implementation plan of community training is prepared based on i) following the previous policies and methodologies in WSL/MTI project area, and ii) the scale of the project area and number of target villages in MW area.

##### (2) Implementation plan of community training

Nine target villages for the training are listed. The detailed plan shall be confirmed for target communities and relation of location between communities and the planting/logging operations in the detailed FS study stage.

The community training will be implemented by the staff members of the Project who will visit the target communities. They will plan to frequently visit the target villages during the operation at the related area. After the operation, they will plan to visit the communities at a fixed frequency.

Outline of the activities of the community training is shown below. The social team going to the community must explain the plan of logging/planting operation and try to obtain community's understanding. At the same time, they should inform protection of plantation area and forest conservation, then inform communities with regard to prevention of forest fire. The staff members at the site office should visit the communities once a week on average and stay at the communities half a day to one day for their activity. The training is to be continued throughout a year. While, the training



activity for forest fire protection is required to be implemented with consideration of timing of using fire in the field for cultivation.

### Outline of Community Training (MW)

Item	Target community, activity, methodology	Input/ frequency
Training with regard to forest conservation and protection against forest fire	1) Target community: 9 communities 2) Time for stay in a place: half to one day 3) Contents of activity: ➤ Introducing the project and asking cooperation to the Project, ➤ Discussion, advice and talk regard to plantation area and forest conservation ➤ Instruction of putting fire operation at cultivation area (workshop style, and visit communities for direct visiting/teaching style during land preparation/putting fire on the cultivation land)	Input per one visit  1) Staff members: 3 to 4 persons 2) Boat: 1 3) Equipment for activity: simple documents of the Project, text documents/books for protection against forest fire 4) Frequency: 4 times per month (almost once a week)

Source: JICA Survey Team

### 3.8.2 Community Support Plan

#### (1) Outline

Community support of the Project aims to accelerate developing communities' understanding and cooperation to the project. PT.WSL/MTI have comprehended several needs of the communities and selected adequate supports which also matched to the Project purpose. With all these matters in mind, the following community support plan was prepared.

#### (2) Activity areas

The areas of community support in MW are categorised as 6 types below.

1. Support to "Community Activity (CA)"
2. Support to "Community Ceremony (includes wedding & funeral) (CC)"
3. Support to "Religious Ceremony (RC)"
4. Support to "Small-scale Infrastructure (SI)"
5. Support to "Public Services (PS)"
6. Support to "Government Services (GS)"

Outline of PT. MW related to community support is shown below. CA, CC and RC are major; they account for about 60% of whole number of activities. About 25% of total number of the activities are SI and PS, which public administration should basically handle. The remaining 20% is direct support to the public administration.

## 3.9 Implementation Organization and Schedule

### 3.9.1 Implementation Organization

The project SPC in Phase 2, PT. MW have already been granted the HTI forestry license, and planned to implement the activities after the joint venture will be established with Sumitomo Forestry. The implementation organization of Phase 2 is planned in this chapter based on the plan of Phase 1. The comparison between Phase 1 and 2 is shown below.

Point	Phase 1 (WSL/MTI)	Phase 2 (MW)
Project Area	113,393 ha	135,439 ha (About 1.2 times of the area of Phase 1)
Planting/logging area	68,389 ha	79,014 ha (About 1.2 times of the area of Phase1)
Project Proponent	2 SPCs	1 SPC

The operation scale is 1.2 times more than the Project of Phase 1. However, the operations for two types (wet/dry) are quite different; therefore, two management organizations are required. Also, a chip mill for MW project is planned to be constructed; therefore, a management organization for the chip mill operation is required. Thus, the following organizations for implementation of Phase 2 is planned.

1. Head office as double assignment for WSL/MTI and MW,  
in Alas Kusuma's office at Pontianak (66 staff)
2. On-site office of MW
3. On-site office of Chip mill

The outlines of each organization are planned as shown below.

(1) Head office

The president of PT. MW will be the president of two project SPCs.

(2) Site office

As described above, two onsite offices for the wet area and dry area are planned. The operation division of the head office has the duty to manage the site office. The site office will manage the actual operation including management of operation by the contractors.

(4) Chip Mill

The VP Directors of the head office also manage the whole operation of the chip mill and one estate manger is planned to be dispatched. The organization under the estate manager includes 4 divisions: 1) chip production, 2) biomass power plant, 3) administration and 4) marketing.

- 1) 5 operations (log handling, chipping, chip handling, power management, and machine maintenance) are planned to operate by 3-shift system. One manager and some staff for each shift are planned to be assigned. The heavy equipments is planned to be rented with operators.
- 2) The biomass power plant is planned to be operated by 2-shift system. There are some staff for turbine, boiler, and system. The operation will be controlled by some experts.
- 3) the administration and marketing divisions are the usual systems.

### 3.9.2 Implementation Schedule

The implementation schedule of the Project can be divided into two types: 1) infrastructure development (chip mill construction, port facility construction) and 2) operation (plantation/logging, plantation infrastructure). Type 1) is implemented within 2 to 3 years and type 2) will be implemented continuously every year. Most of the plantation infrastructure are planned to be implemented within the first plantation/logging rotation. Then, they will need to be reconstructed for maintenance which is almost same. Only base camp facility, fire tower and permanent nursery do not require reconstruction

for large-scale maintenance. Therefore, the plantation infrastructure is included in the operation schedule of plantation/logging.

The project implementation schedule is shown below.

### Project Implementation Schedule

	Year (2015–2044)																														
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	
Project period (30 years, 2015 to 2044)																															
1. Infrastructure Development																															
1.1 Chip mill construction																															
1.1.1 Detail design				■																											
1.1.2 Selection of contractors, negotiation				■																											
1.1.3 Construction of chip mill					■	■	■																								
1.2 Port facility construction																															
1.2.1 Detail design				■																											
1.2.2 Selection of contractors, negotiation				■																											
1.2.3 Construction of port facility					■	■	■																								
2. Operation																															
2.1 Plantation/logging/ plantation infrastructures																															
2.1.1 logging of existing trees/plantation	(Wet)	(First rotation: logging only)																													
	(Dry)	(First rotation: logging only)																													
2.1.1 logging planted trees/ plantation	(Wet)	(First: planting only) (2nd) (3rd) (4th) (5th) (6th)																													
	(Dry)	(First: planting only) (2nd) (3rd) (4th)																													
2.1.3 Seedling production																															
Land acquisition for plantation (MW)																															
2.2 Chip production																															

Source: JICA Survey Team



## **CHAPTER 4 FINANCIAL ANALYSIS**

Project Costs and Fund procurement plan is estimated in this chapter.



## **CHAPTER 5 RISK ANALYSIS**

Project Scope Confirmation, Third Party Risks, Corporate Summary of Sponsors, Current Situation of Project SPCs, Specific Risks for Forestry Industry and Collateral for JICA Loan are surveyed in this chapter.





## CHAPTER 6 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

### 6.1 Outline of Project Activities with Possible Environmental and Social Impacts

The Project will focus on the industrial plantation in the degraded forest area located in the lowland in West Kalimantan Province, with production of wood chip and export of the relevant products. Installation and operation of the facilities, such as infrastructure for industrial plantation, water channels to manage ground water and industrial plant for wood chip production, might give diverse impacts to the surrounding environment and social conditions in the locality. This chapter describes the results of the evaluation of the project components which might cause negative impacts, proposed mitigation measures of such impacts and environmental monitoring plan.

The above figure shows the location of the target areas of the MW Project and installation of the wood chip factory. MW Project area is located southeast of WSL and MTI Project area. Two big rivers flow in the central and southern part of the area and several settlements are located along those rivers. Other than these, settlements are scattered along with the river network outside of MW area. The protection forest, oil palm plantations and bauxite mining sites also surround the MW area. Compared WSL and MTI Project site, more development projects are going on close to the Project area.

Although they are not indicated on the map, the villages are located inside of the Project area along with the main rivers flowing inside and likewise the MTI area some villages are also located outside of the MW Project areas. Such geographical condition shall influence the characteristics of the social impacts given by the Project.

The following table outlines the Project activities which could affect environmental and social conditions in and around the target area of the Project. Most of the environmental and social impacts are expected to be caused by civil engineering works including construction of infrastructure and relevant facilities. In addition, the operation of the facilities installed by the Project and other activities such as transportation of logs and wood chips, which could cause negative impacts, were targeted by the scoping under the Survey.

**Project Activities with Possible Environmental and Social Impacts**

Type	Target activity of the scoping	Outlines of the activities
Civil engineering work	Civil engineering works for plantation infrastructure/chip production	<ul style="list-style-type: none"> <li>- Road: Transportation of logs, labor and other materials (774,000 m)</li> <li>- Canal and water level control facility: Main canal (98,000 m), branch canal (471,000 m), MC/C*<sup>1</sup> drain (849,000m<sup>2</sup>), IF*<sup>2</sup> drain (3,870,000 m<sup>2</sup>), outlet canal (9,000 m), peat dam (57 points), adjustable gate and flap gate (56 points)</li> <li>- Log pond (2 points), log yard (120,000 m<sup>2</sup>, for MTI Target area only), bark yard (15,000 m<sup>2</sup>for MTI Target area only) and chip yard (35,000 m<sup>2</sup>for MTI Target area only) : Storage of transported logs, barks left in the process of chip production, and wood chip</li> <li>- Water treatment facilities: Sedimentation pond and other facilities which treat discharges from the Project offices and accommodation (10m x 20m x 4 m, 1 point, for MTI Target area only)</li> </ul>
	Construction and operation of port facilities	<ul style="list-style-type: none"> <li>- Dolphin-type berth (for MTI Target area only)</li> <li>- Chip berth</li> <li>Steel sheet pile (1,167 pcs), Concrete placement (1,814 m<sup>3</sup>), Landfill (25,200 m<sup>3</sup>), Excavation (15,300 m<sup>3</sup>)</li> <li>- Logyard berth</li> <li>Steel pipe pile set (6 pcs), Concrete placement (19 m<sup>3</sup>)</li> </ul>

Construction works including groundwork and operation of facilities	Construction works for plantation infrastructures and their operation	Facilities for seedling production: permanent nurseries (2 points) and temporary nurseries Facilities for security: fire tower (12 points) and security post (6 points) Other facilities: Office, accommodation, workshop for machines, facilities for logistic arrangement and others (5 points, temporary design)
	Construction and operation of chip mill	Biomass power plant (7Mwh) : Ground works for the installation of electric power generating plant and coal feeding facility Chip facilities: Ground works for the installation of rotary debarker (25 ha, height of mounding: 3.5 m)
Others	Transportation of log and chip	Transportation of log: Transportation of log to the chip mill Transportation of chip: Transportation of chip produced in the chip mill to vessel for export

Note\*1: MC/C: mid cross/cross. 2\* IF: infield  
Source: JICA Study Team

## 6.2 Natural Condition of the Target area

Based on the information of ANDAL (EIA report) of the target area of industrial plantation proposed by the Project, major features of the natural condition of the respective area are summarized in this section.

### (1) Climate

According to Köppen climate classification, the target area belongs to the tropical rainforest climate (Afa, Afaw) which has characteristics of continuous rain throughout a year without notable dry season. Annual rainfall in the target area is over 3,000 mm/year. Climatic data of MW target area (1997-2006) is available at Rahadi Osman climate station in Ketapan Province. The following table shows the annual rainfall and average temperature of the project area.

#### Climate Conditions of the Target area

Area	Annual rainfall (mm/year)	Max. monthly rainfall (mm/month)	Min. monthly rainfall (mm/month)	Average annual temperature (°C)	Max. annual temperature (°C)	Min. annual temperature (°C)
MW	3,416	(Dec.)	84 (Aug.)	27.6	31.7	22.4 (7~8 月)
Area	Average humidity (%)	Max. Average humidity (%)	Min. average humidity (%)	Average wind velocity (km/h)	Wind direction (%)	Wind direction (%)
MW	-	88.0	-	-	-	-

Source : ANDAL of MW target area

### (2) Topography and Soil

As for the topographic features, peat soil extends in the flat area while mineral soil in the hilly area MW target area.

### (3) Hydrology

Hydrological networks which extend in the target area provide indispensable support to distinct ecosystems and daily life of the communities in the locality. The Project also plans to utilize water transport along the rivers. The following table summarizes hydrological conditions in the target areas.

(4) Vegetation

Generally, the forest in peat land consists of three to four layers of vegetation from canopy to the ground surface. Most are secondary forest and shrubs and composed of pioneer species grown naturally in the cutover area. Some of the protected tree species also have regenerated naturally in the secondary forest and shrub area under recovering its forest cover. Hence, it is necessary to enhance regeneration of forest by designating such secondary forest and shrub area as protection area in the target area of industry plantation proposed by the Project.

(5) Terrestrial Animals

Some protected species of mammals, birds and reptiles have been found both in the swamp forest and dried forest. Although their distribution, number and type of forest vegetation as their habitat vary depending on the species, it is indispensable to give due consideration to mitigate any negative impacts especially on the distribution and habitats of the protected species through exclusion of their habitat area from the plantation area.

(6) Aquatic Animals

A survey of identification of species and population of fishes and plankton was conducted in the river of the target area. Consequently, it was revealed that the variation of species and population of such aquatic animals were not high and that no protected species of fishes was found in the area.

**6.3 Social Conditions of the Target Area**

Baseline survey of socio-economic conditions targeting the communities located in the MW project area. Based on the result, this section describes livelihood activities in the communities and social characteristics.

**6.4 Procedures of Confirmation of Environmental and Social Considerations**

**6.4.1 Legal Frameworks on Environmental and Social Considerations in Indonesia**

(1) Government Laws and Regulations on Environmental and Social Considerations

The following table summarizes environmental laws and regulations in Indonesia related to the environmental and social considerations of the Project, especially on conservation of natural environment, environmental standards, land acquisition and indigenous peoples, except AMDAL.

**Laws and Regulations related to Environmental and Social Considerations**

Environmental Management and Conservation	<ul style="list-style-type: none"> <li>- Law No. 23/1997 concerning Environmental Management</li> <li>- Law No. 32/2009 on Environmental Protection and Management</li> </ul> <p><u>Relation to the Project :</u> Above Law No. 32 stipulates the principal of development of environmental plan and affords basis for the conduct of AMDAL prior to planning of the Project and formulate a project of industrial plantation with due environmental consideration in accordance with proposal made by the conduct of AMDAL .</p>
Natural Environment	<ul style="list-style-type: none"> <li>- Law No.41/1999 concerning Forestry</li> <li>- Government Regulation No.6/1998: Forest Exploitation and Collection of Forest Products in Production Forest</li> <li>- Law No. 5/1990 concerning Conservation of Biological Resources and Their Ecosystem</li> <li>- Government Regulation No.7/1999: The Preservation of Plants and Animals</li> </ul> <p><u>Relation to the Project :</u></p>

	<p>In order to decide the area of industrial plantation, protected fauna and flora should be identified in accordance with above law No.7/1999 which includes a list of the protected species and affords basis for setting the protected area based on the ANDAL and results of HCV survey.</p>
Air quality standards	<ul style="list-style-type: none"> <li>- Government Regulation No. 41/1999; Control of Air Pollution</li> <li>- State Minister of Environment Decree No. 13/1995: Emission Standards for Stationary Sources</li> <li>- State Minister of environment Decree No. 7/2007: Emission Standards for Stationary Sources of Stream Boiler</li> <li>- State Minister of Environment Decree No.13/2009: Emission Standards for Stationary Sources of Oil and Gas Industry Activities</li> <li>- State Minister of Environment Decree No. 5/2006: Emission Standards for Old Motor Vehicles</li> </ul> <p><u>Relation to the Project</u> :</p> <p>Operation of the heavy equipment, vehicles, and machines for chip production through the Project might cause impacts by their emissions. Standards set by the above laws and regulations afford the basis to monitor the impacts of the emission gas by the Project and take effective measures.</p>
Water quality standards	<ul style="list-style-type: none"> <li>- Government Regulation No. 82/2001: Control of Water Pollution</li> <li>- State Minister of Environment Decree No. 51/2004: Sea Water Quality</li> <li>- State Minister of Environment Decree No. 51/2004: Quality Standards of Liquid Waste for Industrial Activities</li> </ul> <p><u>Relation to the Project</u> :</p> <p>Operation of heavy equipment and vehicle as well as engineering works for the construction works planned by the Project might cause water pollution in the river channels in the target area. Standards set by the above laws and regulations afford the basis to monitor the level of water contamination by the Project and take effective measures.</p>
Solid Waste Management	<ul style="list-style-type: none"> <li>- Waste Management Act No. 18/2008</li> <li>- Government Regulation No. 18/1999: Management Procedures for Hazardous and Toxic Waste, Amendment No. 85/1999</li> <li>- Government Regulation No.74/2001: Hazardous Material Management</li> </ul> <p><u>Relation to the Project</u> :</p> <p>Solid waste is expected to be generated in the construction works of relevant facilities and their operations during the Project. Principals and measures of waste management stipulated by the above-mentioned laws and regulations afford the basis for sorted waste collection, its reuse and reduction in its amount.</p>
Noise and Oscillation	<ul style="list-style-type: none"> <li>- State Minister of Environment Decree No. KEP-48/MENLH/11/1996: Environmental Noise Standards</li> <li>- State Minister of Manpower Decree No. KEP-51/MEN/1999: Physical Threshold Values at Work Sites</li> <li>- State Minister of Environment Decree No.7/2009: Noise Level Standards for New Motor Vehicles</li> </ul> <p><u>Relation to the Project</u> :</p> <p>Operation of vehicles, heavy equipments and factory machines could induce impact of noise and oscillation. The level and type of noise and oscillation stipulated by the above-mentioned law could afford a basis to monitor them and take effective measures.</p>
Land Acquisition	<ul style="list-style-type: none"> <li>- Law of No. 5 of 1960 concerning Basic Agrarian Law</li> <li>- Law of No.20/1961 concerning Revocation of Right to Land and Materials on the Land</li> <li>- Law of No.24 of 1992 concerning the Spatial Planning</li> <li>- Presidential Decree No.36/2005: Procurement of Land for Public Interest for Implementing Development and Amendment to Presidential Decree No.36/2005</li> <li>- National Land Agency Decree No.3/2007: Guidelines for Procurement of Land for Realizing the Development for Public Interest</li> </ul> <p><u>Relation to the Project</u> :</p> <p>Land acquisition shall happen in the demarcation of target area for industrial plantations and project facilities. Basic principals stipulated by the above-mentioned laws and regulations could afford a basis to carry out the procedures including compensation based on the agreement with the communities.</p>
Indigenous People	<ul style="list-style-type: none"> <li>- Second Amendment to the 1945 Indonesian Constitution, 2000</li> <li>- Presidential Decree on Social Welfare Coaching for Remote Tribe Community, No.111/1990</li> <li>- Minister of Social Welfare's Decree on Guideline for Remote Tribe Community Empowerment Implementation, No. 6/2002</li> <li>- Act No.39 of 1999 on Human Rights</li> </ul> <p><u>Relation to the Project</u> :</p> <p>Indigenous people called Dayak tribe inhabit the target area. Above-mentioned laws and regulations stipulate major principles in implementation of project activities considering their historical, cultural and traditional backgrounds.</p>

Source: JICA Study Team

## 6.4.2 Procedures of Confirmation of Environmental and Social Considerations in Indonesia

### (1) Government Legal Frameworks on Environmental and Social Considerations

The following laws stipulate environmental assessment (AMDAL) in Indonesia.

#### 1) Law No. 23/1997 concerning Environmental Management

Provision 15: It is compulsory for the project owner to prepare the environmental assessment report (AMDAL) whenever the owner intends to implement the project which possibly gives severe and irreversible impacts to the environment. AMDAL documents consist of five reports such as 1) KA-ANDAL, 2) ANDAL, 3) RKL, 4) RPL and 5) Executive Summary.

#### 2) Law No. 32/2009 on Environmental Protection and Management

**Purpose of the Law:** It aims to realize the sustainable development of the whole society coexisting with the environmental conservation. The law directs the enhancement of rational utilization, development, maintenance, restoration, monitoring and management of the environment following the relevant law and regulations.

**Key points:** The Law emphasizes the principals of transparency in the process of project implementation and full participation of the stakeholders including the community members. It also stresses accountability of the Project organization and persistent equality at all levels stages in the project implementation.

**Provision:** Following procedure is compulsory. The project which possible gives serious and irreversible impacts should be certified with full scale of Indonesian EIS system (AMDAL). The project which does not give serious and irreversible impacts should be certified with UKL and PLA.

### (2) Projects which are subject to full scale AMDAL process and the relevancy to the propose Project

The activities listed in following table are subject to determination of full scale of AMDAL. The table also shows the relevancy of the Project activities to the determination of necessity of AMDAL. The actual impacts of these activities depend on their scale, frequency, etc. in the project; thus this report only describes their qualitative nature. As the table shows the proposed Project has several features which require the full implementation of AMDAL in compliance with the provisions of Environmental Decree No. 11/2006.

#### Criteria to Determine Full Implementation of AMDAL as Designated in the Law

Activities	Relevance to the Project
<b>Government Regulation No. 27/1999: Activities and Components to give serious impacts to the environments</b>	
1. Changes of topography and natural landscape	1-1. Changes of topography (land surface) caused by canal constructions regulating the ground water levels and planting/harvesting operations. 1-2. Changes of natural landscape caused by clearing and converting the degraded natural forest into mono-cultural plantation
2. Introduction of new plant species	2-1. The main tree species for planting originates in Irian Jaya, Papua New Guinea and Australia.
<b>State Minister of Environmental Decree No. 11/2006: Types of project which needs full implementation of AMDAL</b>	
1. Activities which possible give impacts to the environments	1-1. Forestry: 1) Production of forest products a. Production of forest products harvested in the natural forest (regardless their scales, all projects of this type are subject to AMDAL): The proposed Project has a component to produce wood chip from harvested woods in the degraded natural forest. b. Production of forest products harvested in the artificial plantation (the area is more than 5,000 ha): The proposed Project intends to produce wood chip harvested from the plantation which area is more than 5,000 ha.

Source : Government Regulation No. 27/1999, State Minister of Environmental Decree No. 11/2006

(3) Approval of AMDAL to the project owner

The implementing company WSL and MTI informed to the provincial AMDAL committee their plan of implementing the plantation Project prior to Ten-Year Plan of Industrial Plantation (RKU). In response to this, the committee conducted screening of the Project in compliance with Decree No. 11/2006 and notified the implementing company of the necessity to introduce full scale of AMDAL to the proposed Project.

So far, the process of AMDAL has been completed already with issuance of the relevant document. The following table shows the date of approval of the relevant documents to AMDAL, such as KA-ANDAL, ANDAL, RKL, RPL and Summary as well as the approval documents issued by the local authorities. Such document shall require project implementation in accordance with proposals by ANDAL and HTI operational regulations without any supplementary condition.

**Approval of AMDAL by the Indonesian Government**

<b>Project</b>	<b>Area (ha)</b>	<b>Date of Approval</b>	<b>Approval Document</b>
PT. MW Project	136,710	Sept. 16, 2009	Decision, Governor of West Kalimantan Province, No. 542/Tahun 2009

Source : Approval documents issued by the local authorities

The government regulations stipulate that in case the Project is not started during four years after the issuance of approval of AMDAL by the Ministry of Forestry, the Project owner will be fined to pay penalty. However, PT. MW started plantation in 2013.

**6.4.3 Procedures Required by JICA Guidelines for Environmental and Social Considerations**

(1) Identification of Environmental Impacts in accordance with JICA Guidelines

In addition to Indonesian system of EIA (AMDAL), this preparatory survey shall apply the JICA Guidelines for Environmental and Social Considerations issued in April 01, 2010 (hereinafter referred to as “JICA Guidelines”) in carrying out environmental and social considerations for the proposed Project. The following table shows the criteria to define the environmental categories and key activities to give serious impacts to the environments and sensitive areas exposed to such impacts. The key activities of the Project are described based on work plans in RKU and the data and information collected in the field survey and from the Project staff conducted in July 2013.

### Criteria to Define the Environmental Category in JICA Guideline and Anticipated Impacts

Environmental Category	Criteria
Category A	Proposed projects are classified as category A if they are likely to have significant adverse impacts to the environment and society. The impacts affect broader than the construction sites and area. The project which have " <u>sectors to have significant impacts, key activities, areas prone to be affected by the impacts</u> " is categorized as category A.
Category B	Proposed projects are classified as category B if their adverse impacts are less adverse than those of category A. They are site specific and can be addressed by normal mitigation measures.
Category C	Proposed project are classified as category C if they are likely to have minimal or little adverse impact on the environment and society.
Category FI	Proposed projects are classified as category FI if the JICA's funding is provided to a financial intermediary or executing agency.
Sectors to have significant impacts	Sectors associated
Sector	The following are the sectors which have significant impacts and the forestry sector is not included in this category. 1) mining, 2) pipeline, 3) industrial development, 4) thermal power plant, 5) hydro power plant, dam and water reservoir, 6) power line and distribution, 7) river and erosion control, 8) road, railway, and bridge, 9) airport, 10) port, 11) waterworks and sewerage, 12) waste management, 13) agriculture

#### (2) Procedures of Environmental and Social Considerations

The JICA guidelines stipulate the procedures of environmental and social considerations for several different cooperation schemes. In this preparatory survey which aims to investigate the feasibility of plantation forestry project, environmental and social consideration shall be confirmed by the items and instructions as shown in the following table.

#### Procedures stipulated in the JICA Guideline and the Works done in This Survey

Items	Instruction	Results/outputs
<b>Determination to conduct the preparatory survey and preparation of survey TOR</b>		
Environmental categorization of the proposed Project by JICA	To categorize the Project based on the documents review and findings in the field visitation.	The Project was categorized as category B.
Preparation of TOR by JICA	To prepare TOR of the expert through field visitation and data/information collection from Project stakeholders. Category-A projects have to follow always the above instruction. Category-B projects have to follow the above instruction whenever necessary.	Following the JICA guideline, the TOR was prepared and the expert of Environmental and Social Considerations was assigned.
<b>Conduct of feasibility study</b>		
Preparation of draft scoping sheets and information dissemination	Category-A projects have to do always. Category-B projects have to do whenever necessary.	The activities for environmental and social considerations were screened out and draft scoping was prepared.
Conduct of environmental and social Consideration survey	Category-A: EIA should be conducted. Category-B: IEE should be conducted To recommend the mitigation measures, environmental monitoring plan and implementation mechanisms of environmental and social Considerations	The survey was conducted until the interim stage, assuming Category-B. Due to the finding of component which might cause due impacts, the category of the Project was changed from B to A. Basically, this report corresponds to the requirements set for Category-A, however, some components which was difficult to be covered by the survey was left. Possible

Items	Instruction	Results/outputs
		measures to deal with such components are described in the last part of this section.
Consultation with the Project stakeholders	To disseminate the data/information collected during the survey and hold consultation meeting with the stakeholders. Category-A: Necessary to conduct Category-B: To be conducted whenever necessary	Draft scoping was prepared based on the results of HCV survey of WSL and MTI conducted with their own budget. Until the middle of this study, organization of stake holder meeting was not planned due to Category-B. However, category of the project was changed from Category-B to Category-A, stakeholder meetings required for Category-A project need to be organized in the preparatory stage for project implementation based the JICA Guideline.
Preparation of the survey report and dissemination to the stakeholders	Implementation company of the industrial plantation need to open the survey report to the stakeholder to have consultation a meeting. Category-A : Necessary to conduct Category-B : To be conducted depending on the necessity Timing of conduct : <u>Preparation of draft final report</u> : A draft report needs to be prepared based on the results of a survey on environmental and social considerations. Then, a stakeholder meeting should be held to disseminate the contents of the report and reach an agreement with the stakeholders. The result of such meeting should be included in the final report.	Until the middle of this study, organization of stake holder meeting was not planned due to Category-B. However, category of the project was changed from Category-B to Category-A, stakeholder meetings required for Category-A project need to be organized in the preparatory stage for project implementation based the JICA Guidelines.

Source : JICA Guidelines' and survey results

#### 6.4.4 Comparison of Indonesian Law/Regulations/Implementing Systems of AMDAL with the Provisions of JICA Guideline

The principle of the Environmental and Social Considerations Survey for the proposed Project is to precisely comply with AMDAL and the JICA Guideline. Environmental and social considerations were confirmed in accordance with the criteria of both JICA Guideline and AMDAL

##### Comparison of Criteria to Determine Necessity of EIA and AMDAL

JICA Guideline (2010)	State Minister of Environment Decree No. 11/2006
<b>1. Sensitive Sectors</b>	<b>1. Project Activities that require AMDAL</b>
Forestry sector is not included in the category of sensitive sectors.	Forest and Forestry: Project to produce wood chip from natural and plantation wood
<b>2. Sensitive characteristics</b>	<b>2. Screening of the project activities</b>
(1) Large-scale involuntary resettlement	(1) To change the land use and landscape
(2) Large-scale groundwater pumping	(2) To use the plants
(3) Large-scale land reclamation, land development, and land clearing	(3) To use the technology which is assumed to give adverse impacts on the environments
(4) Large-scale logging	
<b>3. Sensitive areas</b>	<b>3. Screening of the location</b>
(1) National parks, nationally-designated protected areas (coastal areas, wetlands, areas for ethnic minorities or indigenous peoples and cultural heritage)	(1) To change the land use
(2) Areas that are thought to require careful consideration by the country or locality <Natural Environment> Primary forests or natural forests in tropical areas, Habitats with important ecological value, Habitats of rare protected	(2) To change the quantity, quality and sustainability of natural resources



JICA Guideline (2010)	State Minister of Environment Decree No. 11/2006
species, Areas in danger of salt accumulations and soil erosion, and areas with a remarkable tendency towards desertification. <Social Environment> Areas with unique archaeological, historical, or cultural value, Areas inhabited by ethnic minorities, indigenous peoples or nomadic peoples with traditional ways of life, and areas with special social value	

Source: JICA Guidelnes and State Minister of Environment Decree No.11/2006

As indicated in the above table, it was judged that AMDAL shall be applied based on the standards stipulated in Decree 11/2009 indicates. Consequently, documents of AMDAL were prepared in accordance with the prescriptions in Decree 27/1999 (Government Regulation on Environmental Impact Assessment).

#### 6.4.5 Determination of the Environmental Category of the Project

##### (1) Conduct of Screening in accordance with JICA Guidelines

The following table shows the results of the screening conducted based on the prescriptions in Indonesian Law/Regulations/Implementing Systems of AMDAL, JICA Guidelines and other data obtained through the assessment.

Although this study conducted confirmation of environmental and social considerations assuming the Project as Category-B up to the middle of the study, but the category was changed to Category-A as it was revealed that the target area is located adjacent to the national park. Therefore, this report was adjusted to meet the requirement for the project of Category- A although some components, such as consultation with the stakeholders could not be realized in the study due to the time constraints. It is expected to carry out some complementary arrangement during the preparatory stages to meet the requirements for the projects of category A in accordance with the JICA Guidelines.

#### 6.5 Evaluation of the Alternative Options

The Survey Team considered the alternative options of the Project to confirm the relevance of the Project and the basis of technical options. The comparative cases are (1) Without the Project (Zero-options), (2) Conventional reforestation and forest management (BAU: Business as usual), (3) the proposed Project, and (4) the Project without the chip production. These four options were examined from the view of technologies, costs and environmental and social considerations. The following table shows the examination results to compare the four options. As is indicated, the proposed Project to implement plantation and chip production together with environmental and social consideration are among all options most recommended. Part IV of this report “Contribution against the Climate Changes” describes the results of the considerations below from the view of mitigation of GHG.

### Examination Results for Alternative Options

Items	Option 1	Option 2	Option 3	Option 4
Overall framework of the options	Without Project: No plantation and chip production ⇒ Illegal cuttings and encroachment of forest land will continue.	To implement conventional plantation and forest management	To implement the forest management and wood chip production with due consideration for the environment and society	To implement the forest management with due consideration for the environment and society
Types of Project	Nil	Plantation Project	Project of plantation and wood chip production with due consideration for the environment and society	Plantation Project with due consideration for the environment and society
Technologies	Forest management: No activities Protection area: Nil Drainage and maintenance of ground water level: No drainage and maintenance	Forest management: To implement the management Protection area: To set the area according to the government regulations Drainage and maintenance of ground water level: To conduct drainage	Forest management: To implement the management Protection area: To set the area according to the recommendation of HCV assessment Drainage and maintenance of ground water level: To control the ground water level and conduct environmental and social considerations	Forest management: To implement the management Protection area: To set the area according to the recommendation of HCV assessment Drainage and maintenance of ground water level: To control the ground water level and conduct environmental and social considerations
Land use	Forest degradation proceeds owing to the illegal cutting. Mosaic-like encroachment and shifting cultivation expands.	Degraded forests are converted to the plantation except the protection areas. Degradation of protected forest and the surrounding proceeds.	Degraded forests are converted to the plantation except the protection areas. Protected forests are appropriately managed. Following the recommendations of HCV assessment, the natural forests are demarcated for the proper uses by the local communities.	Degraded forests are converted to the plantation except the protection areas. Protected forests are appropriately managed. Following the recommendations of HCV assessment, the natural forests are demarcated for the proper uses by the local communities.
Cost	No Project cost	Cost for plantation	Cost for the environmental conservation activities and development of plantation Cost for wood chip production	Cost for the environmental conservation activities and development of plantation
Environmental and social considerations	<u>Natural environment:</u> Forest degradation proceeds. Rare species will be lost. <u>Social environment:</u> It cannot reduce the negative impacts.	<u>Natural environment:</u> Forest degradation proceeds. Rare species will be lost. <u>Social environment:</u> It cannot reduce the negative impacts.	<u>Natural environment:</u> Natural forests are protected. Habitats of rare species are protected. <u>Social environment:</u> It can reduce/avoid the negative impacts.	<u>Natural environment:</u> Natural forests are protected. Habitats of rare species are protected. Environmental impacts by the chip production are reduced. <u>Social environment:</u> It can reduce/avoid the negative impacts.
Recommendable options and its bases	<u>This option is not recommended.</u> Illegal cuttings and	<u>This option is not recommended.</u> Plantation can be	<u>Among all options, this option is most recommended.</u>	<u>This option is not recommended.</u>

Items	Option 1	Option 2	Option 3	Option 4
	activities remain uncontrolled. Forest resources decrease. Sustainability of forest, natural and social environments cannot be secured.	developed and expanded however the natural forests are left unprotected thus will be further degraded. The Project environment is still unstable.	The Project costs are high but this option can establish the long-term stable environment of the Project.	The impacts to the environment is least among all options but the profit of the Project is also least because no chip production.

Source: JICA Survey Team

## 6.6 Scoping and TOR for the Environmental and Social Considerations Survey

### 6.6.1 Outline

Focusing the activities of the Project which give impacts to the environment and society and capturing the scale, degrees and frequencies of those impacts, the Survey Team has determined the methods and approaches to assess them during and after the Project phase; this is the process of scoping in environmental and social considerations. During the Project period means from 2014 up to 2020 in which the Project is implemented while after the Project completion means from 2020 and afterwards. It is assumed that the Project companies will continue their activities on their own funds and resources after the Project completion in 2020 when the loan will be terminated.

Other than the scoping, the Survey Team conducted the socioeconomic baseline survey and environmental and social consideration survey which were contracted out to independent organizations outside the Project framework. Furthermore the Survey Team reviewed the results of the HCV assessment conducted solely by the Project companies and took some recommendations into the scoping and TOR for the environmental and social consideration survey.

### 6.6.2 Items of the Environmental and Social Consideration Survey during and after the Project implementation

To assess the impacts of the activities, the following four levels are defined from A to D with “positive” and “negative” types.

A+/A-: Significant/critical impacts (A+: positive, A-: negative/adverse)
B+/B-: Impacts to some degree (B+: positive, B-: negative/adverse)
C+/C-: There is an impact but its degree is unknown. (C+: positive, C-: negative/adverse)
D: No impacts identified

- (1) Civil works in plantation development and wood chip production: roads and water canal with their relevant facilities, yard and pond for keeping the logs, water purification facilities in the wood chip factory.

The construction scale of the roads, canals and water gates are the largest in the Project’s civil works. Having several different designs, the water canals cover by their dense networks most of the plantation area. The log reserving yard/pond and the water purification facilities will be allocated at certain areas in the project sites. Civil works to construct and maintain these facilities and forestry infrastructures are anticipated to give various impacts to the natural environments such as soil compositions and

geology, hydrology and ecosystems and to the human society adjacent to the sites of the civil works as well.

(2) Construction and operation of port facilities

Port facilities are designed to enable the barge to berth at the riverbank when it unload the harvested logs in the plantation sites and uploads the wood chips to carry them to the mother ship anchoring offshore. The facilities are constructed by installing posts and sheet piles and dredging the river bottom. After the completion of the construction, tug boats and barges carrying the wood chips will come and go regularly between the port facilities and the mother ship offshore.

(3) Construction and operation of the Project's facilities: Nursery, Security facilities (Fire watch tower, Security posts), other facilities (offices, accommodation, workshop for the vehicles)

This section shows the results of the scoping of the impacts given by the Project facilities' construction and their operations. The target of scoping is that the permanent nursery, fire watch tower, Security posts, Project offices and accommodation, workshop for the Project vehicles and heavy equipment. Other than the phase of construction, these facilities will be operated for the Project activities after the construction is completed, which could bring impacts caused by activities done in those facilities.

(4) Construction of woodchip factory and its operation: Biomass power plant (including the set up of coal installation), Facilities of wood chip processing (rotary debarker)

This section presents the results of scoping of construction and operation/maintenance of wood chip factory and its operation. It is anticipated to give in general more significant impacts than other Project components to the environments and the society. Other than operations of several types of heavy equipments and vehicles, impacts of mineral soil dressing on peat soil to the environments, operation of power plants and chip processing facilities could give several different impacts.

(5) Transportation of logs and woodchip

The operation plan to transport logs and woodchips consists of technical approaches and methodologies to carry the logs harvested in the plantation sites to the chip factory, and convey the woodchips processed at the factory to the mother ship offshore.

### **6.6.3 TOR for the Outsourced Surveys relevant the Environmental and Social Consideration**

(1) TOR for the environmental and social consideration

The following table shows the TOR for environmental and social consideration which was framed in the process of scoping described in Section 6.6.2.

### TOR for the Environmental and Social Consideration

Category	Items	Survey Items	Survey Methods
General	Examination of alternatives (Environmental-conscious plantation)	<ol style="list-style-type: none"> <li>1) Location of plantation sites and project facilities</li> <li>2) Scale and profitability of plantation/chip production plan</li> <li>3) Impacts of these plans to the environments and the societies</li> </ol>	<ol style="list-style-type: none"> <li>1) Implementation of HCV Assessment, Socioeconomic baseline survey, and Environmental and Social Consideration Survey</li> <li>2) Examination of proposed plans: To verify their profitability and other activities for environmental conservation</li> </ol>
	Air pollution	<ol style="list-style-type: none"> <li>1) Environmental Standards of Indonesia, Japan, WHO, etc.</li> <li>2) Emission of exhausts from heavy facilities and vehicles</li> <li>3) Location and arrangements of the operation sites, accommodations and other social facilities.</li> <li>4) Anticipated impacts</li> </ol>	<ol style="list-style-type: none"> <li>1) Review of the existing materials and documents</li> <li>2) Field reconnaissance survey and interview to the personnel</li> <li>3) Review of SPEC of the civil works and activities, period, location and scale, SPEC of vehicles and heavy facilities, their number (Q'ty) and expected distances of their trips</li> <li>4) Estimation of the impacts based on the above review</li> </ol>
Pollution Control	Water pollution	<ol style="list-style-type: none"> <li>1) Environmental Standards of Indonesia, Japan, WHO, etc.</li> <li>2) Decree and scale of soil erosion and water pollution caused by gasoline, oils and solid wastes</li> <li>3) Survey of water uses by the local people and anticipated impacts</li> </ol>	<ol style="list-style-type: none"> <li>1) Review of the existing materials and documents</li> <li>2) Field reconnaissance survey and interview to the personnel</li> <li>3) Review of SPEC of the civil works and activities, period, location and scale, SPEC of vehicles and heavy facilities, their number (Q'ty) and expected distances of their trips</li> <li>4) Estimation of the impacts based on the above review</li> </ol>
	Solid wastes	<ol style="list-style-type: none"> <li>1) Environmental Standards of Indonesia, Japan, WHO, etc.</li> <li>2) Methods and technologies to discard the solid wastes generated at the civil work sites and accommodations in the camp site</li> </ol>	<ol style="list-style-type: none"> <li>1) Review of the existing materials and documents</li> <li>2) Field reconnaissance survey and interview to the personnel</li> <li>3) Review of SPEC of the civil works and method to store the gasoline and oils for vehicle and facilities, and method to discard the solid wastes</li> <li>4) Estimation of the impacts based on the above review</li> </ol>
	Soil contamination	<ol style="list-style-type: none"> <li>1) Methods to gasoline and oil for the Project vehicles and heavy equipments and to prevent oil leakages</li> </ol>	<ol style="list-style-type: none"> <li>1) Field reconnaissance survey and interview to the personnel</li> <li>2) Review of SPEC of the civil works and method to store the gasoline and oils for vehicle and heavy equipments</li> <li>3) Estimation of the impacts based on the above review</li> </ol>
	Noise and vibration	<ol style="list-style-type: none"> <li>1) Environmental Standards of Indonesia, Japan, WHO, etc.</li> <li>2) Scale and degree of noises and vibrations generated by the Project vehicles and heavy equipments</li> <li>3) Impacts anticipated in the surrounding areas</li> </ol>	<ol style="list-style-type: none"> <li>1) Review of the existing materials and documents</li> <li>2) Field reconnaissance survey and interview to the personnel</li> <li>3) Review of duration, frequency and period of using the Project vehicles and heavy equipments</li> <li>4) Estimation of the impacts based on the above review</li> </ol>
	Land subsidence	<ol style="list-style-type: none"> <li>1) Environmental Standards of Indonesia, Japan, WHO, etc.</li> <li>2) Ground levels in/around the site of chip factory</li> <li>3) Scale and degree of land subsidence</li> </ol>	<ol style="list-style-type: none"> <li>1) Review of the existing materials and documents</li> <li>2) Field reconnaissance survey and interview to the personnel</li> <li>3) Measurement of land subsidence</li> </ol>
	Stench	<ol style="list-style-type: none"> <li>1) Scale, degree and frequency of stench generated by the Project vehicles, heavy equipments and</li> </ol>	<ol style="list-style-type: none"> <li>1) Field reconnaissance survey and interview to the personnel</li> <li>2) Inventory and confirmation of operation</li> </ol>

Category	Items	Survey Items	Survey Methods
		solid wastes 2) Impacts anticipated in/around the operation sites	of the Project vehicles and heavy equipments 3) Inventory and confirmation of design to discard the solid wastes in the Project sites 4) Estimation of the impacts based on the above survey
	Bottom sediment	1) Environmental Standards of Indonesia, Japan, WHO, etc. 2) Changes of conditions of bottom sediments anticipated by the several civil work 3) Impacts predicted in/around the operation sites	1) Review of the existing materials and documents 2) Field reconnaissance survey and interview to the personnel 3) Measurement of land subsidence
Natural environment	Protected areas	1) Government Decrees of Indonesia 2) Locations of the protected areas and the types and scales of the Project activities 3) Methodologies to minimize the adverse impacts of the protected areas	1) Review of the existing materials and documents 2) Field reconnaissance survey and interview to the personnel 3) Review of RKU and Results of HCV assessment and its recommendation 4) Estimation of the impacts based on the above survey
	Ecosystems	1) Decrees and guidelines of Indonesia and international organizations, etc. 2) Location and distribution of vulnerable ecosystems and endangered species of fauna and flora 3) Measurements to minimize the negative impacts on those ecosystems	1) Review of the existing materials and documents 2) Field reconnaissance survey and interview to the personnel 3) Review of RKU and Results of HCV assessment and its recommendation 4) Estimation of the impacts based on the above survey
	Hydrology	1) Decrees and guidelines of Indonesia and international organizations, etc. 2) Quantity and flow of river water in/around the Project area	1) Review of the existing materials and documents 2) Field reconnaissance survey and interview to the personnel 3) Measurement of the water level and its seasonal flow in the river
	Topography and geology	1) Changed of topography and geology caused by various civil works 2) Impacts anticipated to appear with the changes above	1) Review of the plans of civil works in the Project 2) Field reconnaissance survey and interview to the personnel 3) Estimation of the impacts
Social Environment	Resettlement (Land acquisition)	1) Guidelines of land acquisition and resettlement in Indonesia, international organization and donors 2) Achievements and actual cases of land acquisitions in the Project	1) Review of the decrees and the guidelines relevant to the land acquisition and resettlement 2) Review of the achievements and actual cases of land acquisitions and resettlement 3) Examine the validity of acquisitions and compensation procedures of the actual cases by referring the existing decrees and guidelines
	Poverty	1) Definitions of the poor in the government decrees and regulations 2) Distribution of poor households who are subject to land acquisitions 3) Impacts of the land acquisitions and plantation to poor households	1) Review of the decrees and the regulations of the government 2) Identifications of poor households in the socioeconomic baseline survey 3) Estimation of the impacts on land acquisitions, employment and other Project activities to poor households.
	Minority/indigenous people	1) Laws and regulations on the ethnic minority and indigenous people 2) Distribution of ethnic minorities and indigenous people 3) Issues and problems in their rural lives which the ethnic minorities	1) Review of the decrees and the regulations of the government 2) Identifications of the households of ethnic minorities and indigenous people by the socioeconomic baseline survey 3) Identifications of the issues and problems

Category	Items	Survey Items	Survey Methods
		and indigenous people are facing with 4) Impacts given by the Project activities	in their rural lives which they are facing with 4) Estimation of the Project impacts
	Local economy (employment /livelihood means)	1) Conditions of livelihoods of the households in the Project target areas 2) Types of livelihood activities and their cash income 3) Employment performance by the Project	1) Understanding the livelihood activities and their cash income through socioeconomic baseline survey 2) Understanding of employment performances through socioeconomic baseline survey
	Land use and local resource use	1) Ongoing practices of forest and land uses by the community members 2) Changes brought about by the Project activities	1) Understanding of the existing practices on the community resource uses through socioeconomic baseline survey 2) Verification of the plantation design and the existing practices of forest and land uses by the community members 3) Estimation of the Project impacts
	Water utilization	1) Ongoing practices of water uses in the community 2) Anticipated impacts given by the constructions of several infra and Project facilities	1) Understanding of the ongoing practices of water uses in the community through socioeconomic baseline survey 2) Understanding of the impacts given by the construction of forestry infra and Project facilities to the existing practices of water uses
	Social capital and social organizations to determine collective actions	1) List of households and their members and leadership to manage the community group 2) Community groups and mechanisms to determine their collective actions	1) Interview to the community leaders in the socioeconomic baseline survey to ask their views and opinions on the Project 2) Understanding on the structures and functions of the community groups
	Uneven distributions of negative impacts and project benefit	1) Locations of the activity sites of the Project and the target communities 2) Annual target area of the Project and the plan of employment of the community people 3) Performance and achievements to employ the community people	1) Review of the achievements of employment and confirmation of the annual plan of reforestation and employment 2) Verification of the procedures to employ the community members 3) Confirmation of the employment performances of the community members (their home village and accumulated number of the employed members)
	Conflict of interests among the community	1) Cooperation of the Project and the target community 2) Cooperation between the target communities 3) Conflicts of interest and problems among the target communities	1) Interview to the Project staffs on the cooperation and conflict/problems between the Project and the communities and among the communities 2) Survey on the achievements of the Project activities targeting to support the community members
	Landscape	1) Scale of the Project facilities such as infra/port and surrounding environments 2) Continuity and harmony of the landscape which are formed by the plantation sites/project facilities and surrounding natural vegetation	1) Verification of the construction plans for several Project facilities from the view of harmony and continuity of the landscape 2) Interview to the Project staff and field reconnaissance survey
	Gender	1) Negative impacts to the gender and gender balance (Newly emerged imbalances such as differences of cash income)	1) Interview to the Project staffs and other personnel on the past performances and achievement by the Project 2) Verifications of procedures of employment and personnel affairs
	Children's human rights	1) Impact of the Project activities to the lives and security of the community members	1) Interviews to the Project personnel on the existing issues and problems on the children's human rights. 2) Verification of the policy on education and social welfares.

Category	Items	Survey Items	Survey Methods
	Infectious diseases e.g. HIV/AIDS	<ol style="list-style-type: none"> <li>1) Scale of migrant staffs and their families who will reside in the Project site and their surrounding environs</li> <li>2) Prevention measures against infectious diseases such as HIV/AIDS</li> </ol>	<ol style="list-style-type: none"> <li>1) Verification of the accommodation plan (construction plan of chip factory) which intends to welcome the new company</li> <li>2) Verification of the prevention measures against the infectious diseases such as HIV/AIDS and promotion activities for hygiene and health among the Project staffs</li> </ol>
	Work environment (Including the safety)	<ol style="list-style-type: none"> <li>1) Environment of construction sites and several civil works,</li> <li>2) Project policies to ensure security during the operations of the Project</li> <li>3) Performance and achievements up to the present</li> </ol>	<ol style="list-style-type: none"> <li>1) Verification of the implementation plan of each Project component</li> <li>2) Confirmation of the performance/achievements and their policies to secure their safety of the workers</li> </ol>
Others	Accident	<ol style="list-style-type: none"> <li>1) Environments for the employers of civil works and constructions</li> <li>2) Project policies to ensure the security during the operation</li> <li>3) Performance and achievements up to the present</li> </ol>	<ol style="list-style-type: none"> <li>1) Verification of the implementation plan of each Project component</li> <li>2) Confirmation of the performance / achievements and their policies to secure their safety of the workers</li> <li>3) Field reconnaissance survey of the accident sites and interviews to the personnel on them.</li> </ol>
	Stakeholder Meeting (SHM)	<ol style="list-style-type: none"> <li>1) Outline of the SHM to open and share the contents of DfR</li> <li>2) Responses and countermeasures to the comments of the participants in SHM</li> </ol>	<ol style="list-style-type: none"> <li>1) Summary and review by the Survey Team</li> </ol>

Source: JICA Survey Team

(2) HCV Assessment (this was carried out by the Project companies by themselves)

The Project is designed based on the results and recommendations of the Environmental Impact Assessment (AMDAL) designated by the Government of Indonesia. It recommends the formulation of environmental-conscious implementation plan of reforestation. According to AMDAL reports approved by the local government, the Ministry of Forestry issued the concession of industrial plantation (HTI) to the Project companies. They consequently formulated a Ten-Year reforestation plan (RKU) to target WSL and MTI project areas which have been also concurred by the Ministry for their implementation. The procedures done during the preparation stage fully cover the requirements on environmental and social consideration stipulated by the Government of Indonesia. In addition to above, the Project companies (PT. WSL and PT. MTI) have determined to implement HCV assessments. The assessment employs more strict and critical criteria to identify the high conservation value area (HCV area) which are consistent with the international value and standards to protect the critical/endangered ecosystems and fauna/flora. Applying HCV assessment to the existing implementation plan, the Project is able to demarcate its plantation area and the important areas for conservation. The TOR of the HCV assessment is presented below.

HCV assessment employs the following six criteria to identify the high conservation value area and recommend the implementation plan to enhance sustainable management.

- HCV 1: Areas with Important Levels of Biodiversity
- HCV 2: Natural Landscape & Dynamics
- HCV 3: Rare or Endangered Ecosystems
- HCV 4: Environmental Services
- HCV 5: Natural Areas Critical for Meeting the Basic Needs of Local People
- HCV 6: Areas Critical for Maintaining the Cultural Identity of Local Communities



The steps of assessment are listed below. Owing to the time limitation, the Survey Team contracted out from step 1 to step 5 to a subcontractor. Step 6 and Step 7 shall be conducted by using the budget of the Project companies. Thus this report describes the results up to step 5.

Step 1: Preparation of the assessment

Step 2: Review of materials and documents

Step 3: Analysis of satellite images (procurement of the satellite image and analysis of land cover)

Step 4: Field verification survey (Field verification survey and collection of primary data)

Step 5: Preliminary analysis (Analysis of primary data and demarcations of

Step 6: Stakeholder meeting (Preparation and implementation of the meeting)

Step 7: Preparation of HCV recommendation and assessment reports of HCV (Making of draft final report, Peer review, Making of final report)

(Source: "Guidelines for the Identification of High Conservation Values in Indonesia- HCV Toolkit – Indonesia, by the Consortium for Revision of the HCV Toolkit for Indonesia, 2009)

### (3) Socio-economic baseline survey

The JICA Survey Team carried out the socio-economic baseline survey in the target communities in the MW Project area to grasp their overall conditions of livelihoods and involvement into the Project. The survey consists of village profile survey and individual household survey. The overall TOR comprises the following two parts.

#### **Village profile survey:**

- 1) Location of community, history of immigration and settlement
- 2) Population and number of households
- 3) Existing infrastructures in the target villages  
Livelihood activities (Agriculture, livestock keeping, fishery, Retailing and small shops, employment by the project, others)
- 4) Community activities (Cooperatives, village ceremony)
- 5) Issues and problems in the daily life (livelihood, health and safety, government services)

#### **Household survey:**

- 1) Family structures  
Assets owned by the household (Condition of houses, farm tools and other equipments/assess to make livelihoods)
- 2) Conditions of livelihoods (Agriculture, livestock keeping, fishery, Retailing and small shops, employment by the project, others)
- 3) Conditions of forest utilization (Forest products, uses, frequency, quantity, others)
- 4) Gender issue (Work sharing and cooperation between men and women in making livelihood)
- 5) Annual household income
- 6) Annual household expenses: Balance between income and outgoing
- 7) Access to the social services and economic opportunities (education, market, loan)
- 8) Hopes and Demands for improving the livelihood

Among the items in the TOR above, those related to livelihoods, household income and gender are associated with the environmental and social consideration hence their survey results shall be reviewed to come up with the measures to address the impacts brought about by the Project.

### (4) Environmental and social consideration (ESC) survey

Focusing on each component, the Survey Team carried out the environmental and social consideration survey in accordance with the guidelines of JICA and international organizations such as World Bank. The following items of the TOR of the survey were outsourced to the agency competent to fulfil its requirements. The final report submitted by the agency was reviewed and utilized to formulate the recommendation of ESC for environmental conscious implementation of the Project.

#### **TOR for the Environmental and Social Consideration**

- 1) **Review of related documents and materials:** To review the AMDAL-related documents, JICA guideline, ten years' reforestation plan (RKU) and annual plan of operation. In particular five documents of AMDAL such as KA-ANDAL, ANDAL, RKL, RPL and Summary) and RKU are reviewed in detail and carefully.
- 2) **Finalization of scoping:** To identify the environmental items to be affected in the Project activities and

- assess the impacts based on the review findings of relevant documents.
- 3) Assessment of the environmental impacts by the Project activities: To assess the impact more exactly (negative and positive, its degree) of the Project activities through field verification and additional collection of information
  - 4) Recommendation of the measures to avoid/mitigate the impacts: To recommend the measures to avoid/mitigate the impact identified in the survey

## 6.7 Results of the Environmental and Social Consideration Survey (including some predictions)

This section describes the results and findings of the environmental and social consideration survey which was carried out based on the framework of the scoping.

## 6.8 Evaluation of the Project Impacts

The items of environmental impacts were evaluated according to the framework of scoping. The following sections show the results of evaluation of the Project impacts. The same as with scoping, the following four levels from A to D with “positive” and “negative” implications are defined.

- A+/A-: Significant/critical impacts (A+: positive, A-: negative/adverse)  
B+/B-: Impacts to some degree (B+: positive, B-: negative/adverse)  
C+/C-: There is an impact but its degree is unknown. (C+: positive, C-: negative/adverse)  
D: No impacts identified

### 6.8.1 Civil Works in Plantation Development and Wood Chip Production

The following table shows the results of the impact assessment in the civil works of plantation development and wood chip production (e.g. road and canal construction, yard and pond of log and wood chip, water purification facilities).

### 6.8.2 Construction of Port Facilities and its Operation

The following table shows the results of evaluation of environmental impacts for the port facility construction and its operation. The port facilities will be constructed to facilitate the barges and the tug boats to berth which upload the wood chips and transport them to the mother ship offshore. The facility is a dolphin-type berth. It has three breasting dolphins with their platforms and two mooring dolphins. In total five dolphins are planned with distances of 40 meters each.

### 6.8.3 Construction and Maintenance of the Project Facilities

The following table shows the results of the impact assessment in construction and maintenance of the Project facilities such as nursery, fire watch tower, security posts, offices, accommodation and workshops for the vehicles. In particular, around 200 to 300 people are supposed to reside in the accommodation facilities, thus impacts caused by their daily lives should be carefully assessed.

### 6.8.4 Construction and Operation of the Chip Factory

The following table shows the results of the impact assessment on the construction and operation of the chip factory where the biomass power plant and the chip processing facilities are installed and operated.

### 6.8.5 Transportation of the Logs and Chip

The following table shows the results of the impact assessment in log and chip transportation. The transportation does not include any civil works or constructions; however the heavy equipments, vehicles and tug boats/barges operate locally, which cause some impact to the environment. The target of assessment is the process from unloading of the logs collected at the plantation sites to the uploading of the wood chip processed at the factory to the mother ship offshore for exporting.

### 6.8.6 Results of HCV Assessment and Finalization of Target of Plantation

#### (1) Results of HCV assessment

The Survey Team conducted the HCV assessment of MW area by subcontracting it to a competent agency in the country. Owing to the limitation of time, the assessment only covered from step 1 to step 5 of HCV values. Step 6 and step 7 were conducted by the Project companies by subcontracting using their own funds. Thus the assessment arranged by the Survey Team carried out document review, field survey and preparation of HCV mapping. Currently the assessment is continuing at the final stage to open the consultation meeting and complete the final report. Hence this report describes the interim results of the assessment.

The field survey in HCV assessment in the MW area identified 23 HCV indexes (areas) which are composed of several HCV values defined from HCV 1 to HCV 6 (see Chapter 6.6.3).

#### (2) Finalization of the plantation target in view of the HCV index

By overlaying the distributions of HCV Index identified in the assessment with the original land use plan in RKU, the plantation targets were revised in order to secure the protection area indicated by HCV indexes in the assessment.

#### Revised Plantation Target of the MW Area

	Plan <sup>(Note 1)</sup>	TP	TU	TK	KL	SP	Total
MW	RKU	82,425	18,182	6,781	27,814	239	<b>135,439</b>
(ha)	JICA Survey	79,014	18,533	7,227	30,509	156	<b>135,439</b>

Source: JICA Survey Team

Note: RKU: "Ten-Year Plan for industrial plantation","JICA Survey": It indicates the figures finalized by the JIC Survey Team

TP (Tanama Popok): Plantation area, TU (Tanaman Unggulan): Indigenous tree monitoring area

TK (Tanaman Kehidupan): Social Forestry area, KL (Kawasan Lindung): Protected area

SP (Sarana dan Prasarana): Infrastructure area

## 6.9 Mitigation Measures and Environmental Monitoring Plan

### 6.9.1 Mitigation Measures for the Environmental Impacts

The following table shows the mitigation measures and other related countermeasures against the environmental impacts assessed as A, B or C during the Project period in Section 6.8. The table does not show the items which were assessed as "No impact" during the Project period such as land subsidence, conflicts of interest among the communities, cultural heritage sites, children's' human rights and cross-border impacts and impacts to climate change. The entity to implement the measures is the Project company (PT. MW). The supervising organizations are the Ministry of Forestry which

provided the concession of HTI and provincial government of West Kalimantan which gave approval on AMDAL for the Project.

### Measures to Mitigate Environmental Impacts during the Project Period

	Items	Mitigation Measures	Cost
Pollution control	Air Pollution	<p>Minimization of negative impacts:  <u>Exhaust from heavy equipments and vehicles:</u>                      To suppress exhausts emission by prohibiting idling engine, setting the speed limitation                      To prepare manuals for operating the vehicles and heavy equipments following the Government Regulation No.41/1999 on environmental standards on air  <u>Exhaust from the power plant operating at the Chip factory:</u>                      To measure and monitor the exhaust from the power plant and to install desulfurization equipment if the necessity is confirmed.                      To fulfil the emission standards on PM, SO<sub>x</sub> and NO<sub>x</sub> as designated in the State Minister of Environment Decree No/7/2007).</p>	<p>Project management cost                       Construction cost of chip factory</p>
	Water pollution	<p>Minimization of the impacts:                      Sewage treatment: To ensure the primary treatment of sewage (used water to wash logs and human swage) drained from the chip factory and the accommodation in the Project site. To drain the sewage after precipitating the solids sufficiently at the sedimentation basin in the factory.                      To monitor the quality of drained water and install the facilities of secondary treatments (bio-remediation) if it is necessary then to fulfil the State Minister of Environment Decree No.51/1995 of drainage standards of Indonesia.</p>	Cost to construct and maintain the chip factory
	Solid wastes	<p>Minimization of the negative impacts  <u>General solid wastes</u> generated in construction, chip production, wastes from staffs daily lives:                      To implement 3R policy that is separate collection and re-use of the wastes (composting of organic wastes, collection of recyclable and hazardous waste by the collection traders, reduce the waste)  <u>Hazardous waste</u> generated used oils of the vehicles, equipments and machines:                      To store the used oils at the Project facilities and request the collection traders specialized for hazardous waste to collect them regularly.</p>	Cost for treating the solid wastes at the chip factory
	Soil contamination	<p>Minimization of the negative impacts  <u>Storage of used oil:</u>                      To do maintenance and inspection of the vehicles and equipments to check regularly and avoid the oil/gasoline leaks.                      In order to avoid the diffusion and penetration of the used oil;                      To install the concrete on the ground at the workshop to park the vehicles and equipments and to set the impervious wall around the workshop and associated facilities  <u>Treatment of residual soils generated in dredging:</u>                      The residual soils will be discarded at the landfill site allocated at the chip factory in MTI area and around the berths at each Project site (close to the permanent nursery). The residual soils should be treated in the same way as solid wastes.</p>	Cost to construct forestry infra and chip factory
	Noise and vibrations	<p>Minimization of the negative impacts  <u>Noise and vibrations caused by the vehicles and equipments:</u>                      To prohibit idling of engines and set the speed limitation                      To prepare manuals for operating vehicles and equipments  <u>Noise and vibrations</u> in the process of producing the wood chips in particular those generated by the operation of debarker and chipper.                      To set the deadening equipments, sound barrier and anti-vibration equipments.</p>	<p>Cost of the Project management                       Cost of the chip factory</p>
	Land subsidence	<p>Minimizing the negative impacts  <u>Land subsidence along the water canals in the plantation sites:</u>                      To avoid as much as possible the area where the ground water level is high</p>	Cost to construct and maintain the forestry infra
	Stench	Minimization of negative impacts	

	Items	Mitigation Measures	Cost
		<p><u>In general:</u> To implement fully the treatment of residual soils of dredging which causes stench. To minimize the exhaust of vehicles and equipments and the leakage of their oils and gasoline as mentioned earlier. <u>Exhaust, gasoline and oils of vehicles and equipments:</u> To prohibit the idling of engine, To remove the surface soils contaminated by gasoline and oils and store them in packed bags Solid wastes: To do composting of organic wastes, carry-out of the wastes for recycling and hazardous wastes by the collection traders to the outsides of the Project area <u>Treatment of residual soils of dredging:</u> The residual soils will be discarded at the landfill site allocated at the chip factory in MTI area and around the berths at each Project site (close to the permanent nursery). The residual soils should be treated in the same way as solid wastes.</p>	<p>Cost to remove the contaminated soils as a part of the Project management cost Cost to treat the solid waste Cost to conduct dredging</p>
	Bottom sediment	<p>Minimization of negative impacts: To fully implement the treatment of solid wastes and sewage at the chip factory sites <u>Treatment of solid wastes:</u> To implement the separate collection of the solid wastes following the 3R policy and requests the collection traders to collect recyclable and hazardous wastes regularly. <u>Sewage treatment:</u> As a primary treatment, to implement fully the precipitation treatment to separate and remove the solid wastes at the sedimentation basin.</p>	<p>Cost to treat solid waste and sewage in the chip factory</p>
Natural environment	Protection area	<p>Avoidance of negative impacts To set the buffer zone with one kilometre width in the area sharing the boundaries with the protected forests thus to avoid the expansion and invasion of the seeds of planted species in the protected forest land.</p>	<p>Cost of plantation and harvesting</p>
	Ecosystem	<p>Minimization of negative impacts The Project companies shall strictly maintain the protection area through regular monitoring in the Project sites. The indigenous rare species shall be protected in patchy together with other trees surrounding it.</p>	<p>Cost of community-related activities</p>
	Hydrology	<p>Verification and minimization of the negative impacts To monitor the water levels of the well, basin and the ground water simultaneously with the expansion of water canal construction. To take measurements in case unfavourable impacts are identified.</p>	<p>It hasn't been cleared yet because the impacts are not well identified.</p>
	Topography	<p>Verification and minimization of the negative impacts To monitor the changes and fluctuations of topography and geology at the same time with construction of the chip factory and forestry infra. To take measurements in case unfavourable impacts are identified.</p>	<p>It hasn't been cleared yet because the impacts are not well identified.</p>
Social environment	Resettlement (Land acquisition)	<p>Minimization of the negative impacts. To provide the target households the alternate plots of good conditions</p>	<p>Cost included in land acquisition plan</p>
	Poor households	<p>Positive impacts: To improve the livelihoods by creating employments To continue to employ the poor households in the Project Negative impacts: To minimize the impacts through providing the target household of land acquisitions the alternate sites of good conditions.</p>	<p>Cost included in land acquisition plan</p>
	Minority ethnic groups and indigenous people	<p>Positive impact To improve the livelihoods and living conditions as whole by conducting community support activities Other impacts: verification and minimization of the negative impacts To identify the overlapping of the plantation targets and the traditional land uses of the Dayak people then to revise and finalize the operation plan of plantation from the view of protecting their traditional communal land uses. To identify the positive and negative impacts of the newly formed community in the factory to the traditional Dayak society To take measures in case some negative impacts are identified.</p>	<p>Cost included in the community-related activities  Cost of plantation and chip production</p>

	Items	Mitigation Measures	Cost
	Local economy e.g. livelihoods and employment	Positive impacts To improve the livelihood levels to employ the community people in the Project To secure the opportunities of employment constantly and monitor the changes/improvement of livelihood conditions	Cost included in the community support activities
	Land and local resource uses	Avoidance of the negative impact To understand the traditional land and resource uses among the community members before starting the construction of the forestry infra and developing the plantation sites. To revise and finalize the operation plan to avoid maximum the negative impacts of the constructions to the traditional uses.	Cost included in the community socialization activities before the Project activities are started
	Water utilization	Negative impacts To design the log pond, birth and chip yard to avoid the competition of river/water uses with the community people. To elaborate the route of transportation in order to minimize the daily traffic of boat and ship.	Cost included in the transportation of logs and wood chips
	Existing social infra and services	Positive impact To formulate and implements construction of the forestry infra and social welfare facilities in association with enhancing the positive impacts of those activities	Cost included in the forestry infra and community supports
	Social capitals and organizations to determine collective actions	To understand the traditional land and resource uses among the community members before starting the construction of the forestry infra and developing the plantation sites. To revise and finalize the operation plan to avoid at maximum level the damages/adverse impacts of the activities to such a community tradition	Cost included in the community socialization activities before the Project activities are started
	Uneven distribution of benefit and damages of the Project	To minimize the uneven distributions of the Project impact and To extend and concentrate the support activities in the communities facing with several damages and adverse impacts	Cost included in the community-related activities
	Landscape	To sustain the harmony of the project site and surrounding environment, especially natural forests and shrubs in terms of continuity of landscape. To minimize the area of bare land in the forestry infra, chip factory, and transportation facilities of logs and wood chips, To plant trees as many as possible.	Cost included in the plantation development
	Gender	Positive impacts To improve the understanding and knowledge of gender among the community members To support and continue the improvement of understanding on gender through continuing the community support activities	Cost included in the community-related activities
	Sexual transmitted diseases (STD) such as HIV/AIDS	Avoidance of the negative impacts (expansion of the diseases) 1) To control the emergence some businesses inducing the prostitution, such as bar, night club and karaoke shop. 2) To conduct campaign for the workers and staffs at the chip factory for avoidance of STD.	Cost included in the community-related activities
	Work environment	Minimization of the negative impacts To prepare the “Health and Safety Regulations” in order to protect the workers from harsh and severe environments and implement fully the health and safety policy for them.	Cost included in the Project management
Other	Accident	Minimization of the negative impacts Same as the above item, “work environment”, to prepare the “Health and Safety Regulation” and “Health and Safety Manual”	Cost included as a part of Project management

Source: JICA Survey Team

Similar to the above table, the following table indicate the mitigation measures and other countermeasures to address the Project impacts anticipated after the Project completion. The “after the Project completion” means the situation in which the overseas assistance (loan) terminates to support

the Project and funding is handled by the Project companies themselves without any supports from outside. It is assumed to be after 2021. The table, however, does not indicate the environmental items assessed as “No impacts”.

### Measures to Mitigate Environmental Impacts after the Project Completion

	Items	Mitigation measures	Cost
Pollution control	Air pollution	<p>Minimization of negative impacts:</p> <p><u>Exhaust from heavy equipments and vehicles:</u> To suppress exhausts emission by prohibiting idling engine, setting the speed limitation To prepare manuals for operating the vehicles and heavy equipments following the Government Regulation No.41/1999 on environmental standards on air</p> <p><u>Exhaust from the power plant operating at the Chip factory:</u> To measure and monitor the exhaust from the power plant and to install desulfization equipments if the necessity is confirmed. To fulfil the emission standards on PM, SOx and NOx as designated in the State Minister of Environment Decree No/7/2007).</p>	<p>Cost included in the Project management</p> <p>Cost of chip factory construction</p>
	Water pollution	<p>Minimization of the impacts:</p> <p><u>Sewage treatment:</u> To ensure the primary treatment of sewage (used water to wash logs and human swage) drained from the chip factory and the accommodation in the Project site. To drain the sewage after precipitating the solids sufficiently at the sedimentation basin in the factory. To monitor the quality of drained water and install the facilities of secondary treatments (bio-remediation) if it is necessary then to fulfil the State Minister of Environment Decree No.51/1995 of drainage standards of Indonesia.</p>	Cost of maintaining the chip factory
	Solid wastes	<p>Minimization of the negative impacts</p> <p><u>General solid wastes</u> generated in construction, chip production, wastes from staffs daily lives: To implement 3R policy that is separate collection and re-use of the wastes (composting of organic wastes, collection of recyclable and hazardous waste by the collection traders, reduce the waste)</p> <p><u>Hazardous waste</u> generated used oils of the vehicles, equipments and machines: To store the used oils at the Project facilities and request the collection traders specialized for hazardous waste to collect them regularly.</p>	Cost of maintaining the forestry infra and chip factory
	Soil contamination	<p>Minimization of the negative impacts</p> <p><u>Storage of used oil:</u> To do maintenance and inspection of the vehicles and equipments to check regularly and avoid the oil/gasoline leaks. In order to avoid the diffusion and penetration of the used oil; To install the concrete on the ground at the workshop to park the vehicles and equipments and to set the impervious wall around the workshop and associated facilities</p> <p><u>Treatment of residual soils generated in dredging:</u> The residual soils will be discarded at the landfill site allocated at the chip factory in MTI area and around the berths at each Project site (close to the permanent nursery). The residual soils shold be treated in the same way as solid wastes.</p>	<p>Cost of removing the contaminated soils</p> <p>Cost of solid waste treatment and dredging</p>
	Stench	<p>Minimization of negative impacts</p> <p><u>In general:</u> To implement fully the treatment of residual soils of dredging which causes stench. To minimize the exhaust of vehicles and equipments and the leakage of their oils and gasoline as mentioned earlier.</p> <p><u>Exhaust, gasoline and oils of vehicles and equipments:</u> To prohibit the idling of engine, To remove the surface soils contaminated by gasoline and oils and store them in packed bags</p> <p><u>Solid wastes:</u> To do composting of organic wastes, carry-out of the wastes for recycling and hazardous wastes by the collection traders to the outsides of the Project area</p>	Cost of treatments of solid wastes and sewage

	Items	Mitigation measures	Cost
		<p><u>Treatment of residual soils of dredging:</u> The residual soils will be discarded at the landfill site allocated at the chip factory in MTI area and around the berths at each Project site (close to the permanent nursery). The residual soils should be treated in the same way as solid wastes.</p>	
Natural environment	Protection area	<p>Avoidance of negative impacts To set the buffer zone with one kilometre width in the area sharing the boundaries with the protected forests thus to avoid the expansion and invasion of the seeds of planted species in the protected forest land.</p>	Const included in the plantation development
	Ecosystem	<p>Minimization of negative impacts The Project companies shall strictly maintain the protection area through regular monitoring in the Project sites. The indigenous rare species shall be protected in patchy together with other trees surrounding it.</p>	Costs included in the plantation development.
	Hydrology	<p>Verification and minimization of the negative impacts To monitor the water levels of the well, basin and the ground water simultaneously with the expansion of water canal construction. To take measurements in case some unfavourable impacts are identified.</p>	The cost has not been framed yet because its impacts are not known.
	Topography	<p>Verification and minimization of the negative impacts To monitor the changes and fluctuations of topography and geology at the same time with construction of the chip factory and forestry infra. To take measurements in case some unfavourable impacts are identified.</p>	The cost has not been framed yet because its impacts are not known.
Social environment	Resettlement (Land acquisition)	<p>Minimization of the negative impacts. To provide the target households the alternate plots of good conditions To set the social forestry plot for the people to plant trees around the residential areas.</p>	Cost included in the implementation of land acquisition.
	Poor households	<p>Positive impacts: To improve the livelihoods by creating employments To continue to employ the poor households in the Project Negative impacts: To minimize the impacts through providing the target household of land acquisitions the alternate sites of good conditions.</p>	Cost included in the implementation of land acquisition.
	Minority ethnic groups and indigenous people	<p>Positive impact To improve the livelihoods and living conditions as whole by conducting community support activities Other impacts: verification and minimization of the negative impacts To identify the overlapping of the plantation targets and the traditional land uses of the Dayak people then to revise and finalize the operation plan of plantation from the view of protecting their traditional communal land uses. To identify the positive and negative impacts of the newly formed community in the factory to the traditional Dayak society To take measures in case some negative impacts are identified.</p>	Cost included in the community support activities and in the plantation development and chip production.
	Land and local resource uses	<p>Avoidance of the negative impact To understand the traditional land and resource uses among the community members before starting the construction of the forestry infra and developing the plantation sites. To revise and finalize the operation plan to avoid maximum the negative impacts of the constructions to the traditional uses. To allocate the social forestry plots for the people to plant trees around the residential areas.</p>	Cost included in the Project socialization activities in the target community.
	Local economy e.g. livelihoods and employment	<p>Positive impacts To improve the livelihood levels to employ the community people in the Project To secure the opportunities of employment constantly and monitor the changes/improvement of livelihood conditions</p>	Cost included in the plantation/forestry infra development and community support.
	Uneven distribution of benefit and damages of	<p>To minimize the uneven distributions of the Project impact and To extend and concentrate the support activities in the communities facing with several damages and adverse impacts</p>	Cost included in the community support



	Items	Mitigation measures	Cost
	the Project		
	Landscape	To sustain the harmony of the project site and surrounding environment, especially natural forests and shrubs in terms of continuity of landscape. To minimize the area of bare land in the forestry infra, chip factory, and transportation facilities of logs and wood chips, To plant trees as many as possible.	Cost included in seeding production and tree community support activities.
	Sexual transmitted diseases (STD) such as HIV/AIDS	Avoidance of the negative impacts (expansion of the diseases) 1) To control the emergence some businesses inducing the prostitution, such as bar, night club and karaoke shop. 2) To conduct eh campaign fort the workers and staffs at the chip factory for avoidance of STD.	Cost included in the community support activities

Source: JICA Survey Team

The following table show the standards and guidelines for the mitigation measures and other related countermeasures against the Project impacts. The items and impacts which are not covered by the Indonesian standards refer to the guidelines of Japanese government. The decrees and the guidelines indicated in the table give the directions of monitoring and the standards for measurements in the environmental monitoring plan.

### Standards and Guidelines for the Mitigation Measures and Counter Measures

Items	Standards and Guidelines	Items focused and remarks
<b>Pollution control</b>		
Air pollution	<p>&lt;To apply the Indonesian standards&gt; Environmental standards of air: Exhausts of construction equipments and vehicles Government Regulation No.41 /1999: Control of Air Pollution Emission standards of exhausts: old types vehicles State Minister of Environment Decree No.5/2006: Emission Standards for Old Motor Vehicles</p>	SOx, NOx, CO, PM <sub>10</sub> , PM <sub>2.5</sub> CO, HC (Hydrocarbon)
Water pollution	<p>&lt;To apply the Indonesian standards&gt; Surface water and ground water: Standards of water quality: Water quality of river, ponds and wells in the Project target areas. To maintain the quality as class I and class II as designated in the standards (Level I and II is as existing quality. It is usable for drinking water after purification) Government Regulation No.82/2001: Control of Water Pollution Standards for drainage: Drainage from the Project facilities (accommodation) to the rivers. To maintain the quality as class I and class II as designated in the standards. State Minister of Environment Decree No.51/1995: Quality Standards of Liquid Waste for Industrial Activities.</p>	<p>pH, BOD, COD, SS (Suspended solids), Dissolved oxygen, Phosphate, Nitrate, Ammoniac nitrogen., Escherichia coli</p> <p>Temperature, Dissolved solids (DS), Suspended Solids (SS) pH, Dissolved iron, Copper, Other materials</p>
Solid waste	<p>&lt;Indonesian law and regulations&gt; Encouragement of 3R according to the Waste Management Act No.18/2008 Treatment of solid waste: Government Decree No.18/1999, No.85/1999</p>	<p>Implementation of 3R by collecting separately and conduct the followings</p> <ol style="list-style-type: none"> <li>1) Composting of the organic wastes,</li> <li>2) Recycling and reusing of the wastes by the collection traders</li> <li>3) Reducing the amount of the solid waste</li> </ol>
Soil contamination	<p>&lt;Indonesian law and regulations&gt; The following is only for reference. State Minister of Environment Decree No.128/2003: Guideline for Hydrocarbon waste and contaminated soil treatment using biological method &lt;Japanese guidelines&gt; Guidelines to be referred is "Guidelines of oil pollution control in prepared in March 2006 by the council of the government on environment, sub-committee on soil and pesticide"</p>	<p>Bio-remediation to remove the soil contamination by used oils. It is supposed not to applicable in the Project. Oil film and Oil odour caused by the soils contaminated by the oils of vehicles and heavy equipments. They are perceived visual and olfactory attention.</p>
Noise/vibration	<p>&lt;Indonesian law and regulations&gt; Standards of noise according to the land use components State Minister of Environmental Decree No.48/1996: Standards of noise for the new type vehicles State Minister of Environmental Decree No.7/2009:</p>	<p>Acceptable noise level: dB (A) Industrial area (construction sites): 70 Office compounds (close to the Project facilities): 65 Trucks to operate in the Project Acceptable noise level: 83=86 (L Max dB (A))</p>
Stench	<p>&lt;Japanese law, regulation and standards&gt; Odour Control Act: to target specific malodorous substance to cause stench and give damages on living environments, 22 types of substances</p>	<p>Substances to cause specific malodour: exhausts, oil and gasoline, solid wastes, human wastes (feces and urine excretion), etc.</p>
Bottom sediments	<p>Followings are the standards on bottom sediment &lt;Japanese standards&gt; Provisional standards for removing bottom sediments ( (1975): It regulates the removal of mercury and PCB included in the bottom sediments Special instruction for the countermeasures of dioxins: It shows the direction to treat the dioxins included in the bottom sediments</p>	<p>The bottom sediments are affected by the inflow of drainage, wastes, gasoline and oils from the Project sites. However direct monitoring of the bottom sediments needs huge budget and high level technologies thus it is not applicable in the Project. Instead, the Project shall monitor the substances as mentioned above to cause the changes of bottom environments in the river</p>

Source: JICA Survey Team

## **6.9.2 Environmental Monitoring Plan**

This section describe the environmental monitoring plan to verify the implementation of the mitigation measures and their effects to the environment and the society. The targets of monitoring are those indicated as a component of “mitigation measures and other relevant countermeasures” during and after the Project in the former section.

The entity to implement the monitoring and recoding their results and taking countermeasures is the Project company (PT. MW). The company has been conducting the monitoring for a half year on water quality and habitats distribution of fauna and flora in the Project area. Based on the performances, achievements and capacity of the company in monitoring, the Survey Team recommends the environmental monitoring plan consistent with all the findings on the environmental assessments as described in the former sections.

## **6.10 Stakeholder Meetings**

The JICA’s guideline states that the stakeholder meeting was supposed to be held twice to fully incorporate the ideas and opinions from the relevant stakeholders into the proposed plan. The first meeting aims to share scoping drafts and reflect comments from the stakeholders in the environmental and social considerations, while the main objective of the second meeting is to finalize the project plans described in the draft final report considering the opinions and comments given by the stakeholders about the proposed plans.

As described in Section 6.4.3, the stakeholder meetings were not originally planned in this Survey as the Project was originally classified as Category B by JICA. Since it was judged that the Project might have a possibility to cause adverse environmental impact in the course of the Survey, the Project was re-classified as Category A by JICA just before the submission of this draft final report. Hence, there was no time for stakeholder meeting during the Survey. In this connection, the project proponents should convene the meetings prior to the implementation of the project according to the JICA’s guidelines and revise the project plan based on comments and opinions obtained in the meetings.

## **6.11 Draft Land Acquisition Plan**

In the course of the Project, the project companies need to acquire the lands currently used for farms and other purposes for plantation of industrial trees. In fact, land acquisition has already taken place in the WSL and MTL areas. The following sections introduce the draft land acquisition plan which contains the legal basis and necessary procedures as well as arrangements including compensation for losses caused by land acquisition.

### **6.11.1 Necessity of Land Acquisition and Involuntary Resettlement**

#### **(1) Project Components which needs Land Acquisition and Possible Affected Areas**

The project area belongs to the state and categorized as production forest. The project proponents have been granted the concession (HTI) from the Ministry of Forestry to operate and manage the project area. Although the area acquired is expected to be rather small, the proper process should be taken in

land acquisition so that the Project could smoothly achieve its goal as planned. In particular, it is quite important to minimize the negative potential impacts on rural people's life in the course of the Project since key principles of the Project are to coexist with local communities as well as to harmonize with the nature in the project area. Hence, the process of land acquisition should be fully in line with the laws and regulations of the Indonesian government and the JICA's guidelines. The following are the project components that would cause land acquisition.

- 1) Plantation and Harvesting Plan: Areas for plantation
- 2) Plantation Infrastructure Plan: Areas for infrastructure necessary for plantation
- 3) Chip Mill Construction/Chip Production Plan: Areas for a chip mill factory and its associated facilities (The areas have been already acquired by the companies.)
- 4) Log and Chip Transportation Plan: Areas for facilities to anchor barges and chip yards
- 5) Port Facility Construction Plan: Areas for facilities to anchor tug boats and barges

(2) Alternative Designs to avoid/minimize Land Acquisition

The original 10-year plantation plan (RKU) classified the project area into several land uses to avoid overlap with the residential areas according to the recommendations from AMDAL. As the plantation plan was not detailed enough to clearly identify areas/plots to be acquired on the ground, the project proponents have identified the plantation areas after assessing the status of areas planned for plantation to minimize the scale of land acquisition when preparing an annual plantation plan.

(3) Measures to be taken to minimize Land Acquisition during the Implementation of the Project

The Project will not acquire lands without the consent of affected people unlike public-works projects; therefore the individual negotiations with the affected people should be the principle process to take for land acquisition. In case mutual consensus is not obtained, such areas should be excluded from the target areas for plantation, so that the scale and cases of land acquisition would be minimized.

### 6.11.2 Legal Framework for Land Acquisition

(1) Outline of Laws and Regulations on Land Acquisition

The state has overall administrative control over the lands in the country under the existing laws and regulations of the Indonesian government. The existing laws and regulations governing land acquisition are listed and summarised in the following table. The project proponents should follow them when acquiring lands for the Project as they are in line with the World Bank's Operational Manuals (OMs) concerned with land acquisition.

#### Laws and Regulations governing Land Questions

Item	Summary
1. Land law and Its associated regulations	<p><b>1-1. Law No.5/1960 concerning Basic Agrarian Law</b></p> <p>The law defines that the land ownership can belong to individuals and corporations. In particular, the law stipulates that the legitimacy of the following rights should be recognized.</p> <p>i) Land ownership right (<i>Hak milik</i>), which should be granted only to the Indonesian citizen</p> <p>ii) Costmary land use right (<i>Hak ulayat</i>)</p> <p>iii) Other rights relevant to lands and resource uses, such as right of land clearance, right of lease, right of building a house, and right of collection of forestry products</p> <p>These rights should be fully considered when the amount of compensation for land acquisition is estimated.</p>

Item	Summary
	<p><b><u>1-2. State Minister of Agrarian Affairs Decree No.5/1999: Guideline for the Settlement of Problems related to the Communal Reserved Land of the Customary-law-abiding Community (Adat land)</u></b></p> <p>People living in rural parts of Indonesia still observe the customary law (<i>Adat</i>) in their daily life. The decree (Decree No. 5/1999) recognizes the legitimacy of the customary land use right over the lands where they have inherited over generations (<i>Adat land</i>). It further defines the scope of the rights, such as rights of occupation and use of <i>adat land</i> and those of hunting and collection of forestry products in <i>adat land</i>.</p> <p>The status of the customary land use rights over <i>Adat</i> land including its scope should be clarified with the assistance from NGOs, rural people, and external experts, prior to the implementation of the Project.</p>
2. Laws and regulations concerned with land acquisition	<p><b><u>2.1 Presidential Decree No.36/2005: Procurement of Land for Realizing the Development for Public Interest</u></b></p> <p><b><u>2-2. Presidential Decree No. 65/2006: Amendment to Presidential Decree No. 36/2005: Procurement of Land for Realizing Development for Public Interest</u></b></p> <p>Decree No. 36/2005 defines the procedures for land acquisition for public-works. Decree No. 66/2006 specifies the types of infrastructure construction project which may require land acquisition. Moreover, the same Decree defines i) the typical organizational structure of land acquisition committee with its obligations, ii) contribution of costs/expenses for operations of the committee, and iii) procedures for estimation of the compensation cost and its possible payment (in cash or in kind).</p>

Source: The JICA Survey Team (The Study Team prepared based on the relevant laws and regulations mentioned in the table above and the World Bank technical papers.)

## (2) Principles of JICA Policies on Land Acquisition

The key principles of JICA policies on involuntary resettlement suggested in JICA's policies on land acquisition are as follows:

### **Principles of JICA Policies**

1. Loss of means of livelihood caused by land acquisition is to be avoided when feasible by exploring all viable alternatives.
2. When land acquisition is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.
3. Compensation must be based on the full replacement cost as much as possible.
4. Compensation and other kinds of assistance must be provided prior to displacement.
5. Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.
6. Appropriate and accessible grievance mechanism must be established for affect people and their communities.

The above-mentioned JICA's principles should be complemented by the World Bank's safeguard policies as summarized below.

### **Abstract of the World Bank's Safeguard Polices**

1. Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others which to take advance of such benefits.
2. Eligibility for compensation and assistance should be given to potential affected people (PAP) who: i) have formal legal rights to land (inducing customary and traditional land right recognized under law); ii) do not have formal legal rights to land at the time of census but have a claim to such land or assets; and iii) have no recognizable legal right to the land they are occupying.
3. Support should be provided even for the transition period (between displacement and livelihood restoration).
4. For projects that entail land acquisition that would affect fewer than 200 people, only an abbreviated resettlement plan is to be prepared.

## (3) Comparison between JICA Guidelines and Indonesian Laws / Regulations

The following table shows the differences between the JICA Guidelines and Indonesian laws/regulations concerned with land acquisition and approaches to be taken for land acquisition in the Project.

### Differences between JICA Guidelines and Indonesian Laws/Regulations and Approaches to Fulfilment of the Gaps

No.	Approaches based on the WB Safe Guard Policies and JICA Guidelines	Indonesian Laws and Regulations
1	Loss of means of livelihood caused by land acquisition is to be avoided when feasible by exploring all viable alternatives. When land acquisition is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.	Basic Agrarian Law (No.5/1960) and State Minister of Agrarian Affairs Decree (No.5/1999) recognize citizen's rights to lands. Presidential Decrees No. 36/2005 and No.65/2006 define the procedures for land acquisition for public purposes by public institutions. Although there is no clear article specifying land acquisition by the public sector, the same procedures are deemed to be applied for the private sector's project.
2	Compensation must be based on the full cost for replacement of loses of lands and other assets.	Presidential Decree No.65/2006 specifies the method of estimating the compensation cost based on the official prices (NJOP) or the selling prices higher than NJOP.
3	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. Appropriate and accessible grievance mechanism must be established for affect people and their communities.	Presidential Decree No.36/2005 stipulates that information disclosure to and negotiations with affected people are requisite processes to reach an agreement on land acquisition. Article 18A in Presidential Decree No.65/2006 further stipulates that affected people can file a complaint to provincial courts in case they disagree with the amount of compensation.
4	The Indonesian laws and regulations concerned stipulate the citizen's rights to land and the legitimacy of land acquisition. However, there is no specific article indicating that land acquisition is an issue to be avoided or minimized by all means. Although land acquisition for public purposes by public institutions is stipulated by the laws/regulations, there is no law/regulation stipulating land acquisition by the private sector.	Land acquisition should be considered as negative impact on people in affected communities. Compensation should be done based on the mutual agreement with affect people through individual negotiations. The project proponents should complete the process of land acquisition by providing careful and prompt support to affected people.
5	The Indonesian laws and regulations stipulate that the public prices (NJOP) should be used for estimation of the compensation cost in addition to the actual market prices. NJOP is usually lower than the market prices.	As the Project has been implemented by the private companies, the market prices shall be applied for estimation of compensation costs. Use of the prevailing market prices in negotiations with affected people could facilitate the progress of land acquisition since such prices would be easily accepted by affected people.
6	There is no stipulation on the participation of affected people in monitoring and the grievance mechanism in the Indonesian laws and regulations.	In this project, the project proponents, i.e., PT. WSL and PT. MTI shall take all the procedures for land acquisition. The project implementation bodies shall be responsible for monitoring and acceptance of grievance in the course of continuous discussions/negotiations with affected people.

Source : The JICA Survey Team

### (3) Policies on Land Acquisition in the Project

The following table shows the policies on land acquisition based on the gaps between the JICA guidelines and Indonesian laws and regulations on the same.

#### Approaches to Land Acquisition in the Project

Item	Approaches
The project proponents, PT. WSL and PT. MTI, shall adopt the following policies on land acquisition in the Project considering the gaps between the current Indonesian legislative systems and the guidelines set by the international organizations. The main aim of the policies introduced here is to gap between the JICA principles and Indonesian laws and regulations.	
1. Overall Policy	1-1. Try to avoid land acquisition 1-2. Provide sufficient compensation and assistance so that affected families can restore their livelihood at least by the level before the Project in case that land acquisition cannot be avoided. 1-3. Not to conduct land acquisition without the full consent of affected people as the Project is implemented by private companies.

Item	Approaches
	1-4. Formulate the land acquisition plan and implement the acquisition accordingly
2. Objects and coverage of compensation	2-1. Compensation and assistance shall be provided to all the people who get adverse impact on their livelihoods or those who waive the rights to i) use their lands, ii) access to their own farms or forests, and/or iii) collect/harvest annual/perennial or tree crops. In case that the Project adversely affects the social and cultural activities, certain assistance should be arranged to restore the affected activities. 2-2. The Project will not acquire lands where any semi-permanent buildings, such as houses, are constructed; therefore, only crops (annual and perennial crops) and trees are the subjects for compensation. 2-3. Any people who might be affected by land acquisition, regardless history of living or social status, will have a right to get compensation. 2-4. Any people who are confirmed that their residence, land, and any other assets are located in the acquired areas at the first consultation meeting will be regarded as the subjects for compensation.
3. Estimation of the amount of compensation	The amount of compensation shall be estimated based on the full replacement cost in principle.
4. Provision of alternative sites	For affected people who significantly rely on their lands for their livelihoods, the Project should secure and provide alternative lands for them, which should be equivalent to or higher than the lands acquired in terms of the locations and land productivity.
5. Community Participation	The procedures/process, principle rules, and schedule of land acquisition should be presented to communities prior to land acquisition. The procedures for land acquisition should be finalized based on the comments given by communities.
6. Budget	All the costs necessary for land acquisition and its associated supporting activities should be included in the project cost. As delay of payment would cause delay in the commencement of afforestation, and eventually affect the financial viability of the Project, the process of land acquisition should be executed as smooth as possible.
7. Schedule	Land acquisition should not be conducted before provision of agreed compensation and assistance. The following steps will be taken for land acquisition: 1) consultation with communities ⇒ 2) estimation of the amount of compensation or security of alternative sites ⇒ 3) payment of compensation ⇒ 4) acquisition of land ⇒ 5) land preparation for plantation. Schedule of land acquisition should be clearly indicated and it should be implemented according to the plan.
8. Organizational structure for implementation	Social Security Teams (SSTs) established by PT. WSL and PT. MTI are responsible for all the procedures for land acquisition including preparation and payment of compensation. SSTs should also be responsible for other supporting activities, such as training and other support services for local communities, so as to obtain consent and cooperation from the communities.
9. Cut-off date	The date when the project proponents have the first consultation meeting at the respective target villages to explain the annual plantation plan should be considered as the cut-off date. As the project area is too large to develop in a year, the Project plans to gradually enlarge its plantations. Hence, the disclosure of the project plan and the process of land acquisition in the target villages will be made in the beginning of years whenever afforestation is planned. The cut-off date will be separately set for the respective villages every year.

Source : The JICA Survey Team

### 6.11.3 Scale and Scope of Land Acquisition

#### (1) Population Census

The villages located in and around the project area are listed in the Ten-Year plantation plan (RKU). However, there is no information about households residing in the project area or population who would be affected by land acquisition in the plan, since no population census survey has been carried out by local government units. Hence, there is a need to conduct a census survey to identify: i) hamlets and households located within the project area and ii) affected people by land acquisition so as to prepare a land acquisition plan for the Project.

Nevertheless, it is difficult to conduct a census survey to precisely identify the number of affected people in this Survey because of the following reasons:

- 1) Large project area: The total plantation area in WSL and MTI comes to 68,384 ha (WSL: 25,046 ha and MTI: 43,338 ha) including those for plantation infrastructure. As hamlets and houses of local communities are widely distributed over the area, it would be impossible to conduct a census survey to cover all the plantation area within a few months of the study period.
- 2) Phase information disclosure: There have been cases where local people who happened to know the Project occupied lands in the project area wanted to claim compensation. If a census survey is conducted before the commencement of the Project, people even living outside the project area can be aware of the Project and illegal occupation aiming at compensation by those who originally reside outside the area might increase. Therefore, the Project proponents plan to conduct a census survey and information disclosure only at the target villages just before the start of afforestation in the same villages. As the scale of land acquisition and the number of affected people will be determined annually as the Project is implemented, it is impossible to identify the number of affected people in all the project area in this Survey.

Although it is difficult to determine the number of affected people based on a census survey, the past record could suggest the possible scale of land acquisition.

#### (2) Setup of Cut-off Date and Measures to Prevent the Inflow of Communities

As described above, the project information will be disclosed to local communities in a phased manner. The cutoff date is to be set when the project proponents commence the meeting with communities in the project area. Affected people will be determined in the target villages based on the census data collected at the respective cutoff dates. After determination of the scale of land acquisition, the agreement on land acquisition for plantation shall be exchanged between the project proponents and local communities of the target villages. Since the payment of compensation needs to be completed prior to the commencement of afforestation, the procedures shall be executed as smoothly and rapidly as possible. It would take about two to three months at the longest from the identification of affected people to the completion of payment of land acquisition. Therefore, the project proponents will not necessarily need to update the list of affected people.

There is also a need to prevent the influx of communities into the project area after the cutoff dates since it would take a few months from the negotiations with affected people to the payment of compensation.

Consequently, SSTs of the PT. WSL and PT MTI should seek assistance from the leaders of the target villages (e.g., chief of village, religious leaders, and traditional leaders) and other villagers not to allow immigrants to reside in the villages and occupy any part of the project area in parallel with frequent patrols in the target villages. Frequent visits to and patrols in the target villages could make outsiders aware that the villages are kept under strict surveillance, so as to prevent the inflow of communities from outside.

#### (3) Assets and Lands to be Acquired

It is also impossible to determine the scale and size of assets and lands to be acquired by the Project in this Survey for the same reasons as specified in the section on population census. The following



table shows the assets and lands that the Project has already acquired from 2009 to 2013. The same data indicate that lands with permanent assets (e.g., houses) have not been acquired by the Project, but those which could be rather easily replaced, such as farmlands, forests, crops, and trees, have been the subjects for land acquisition. The following table shows the assets and lands acquired in the WSL and MTI Project areas. Cases of MTI area could be better example to predict scale of land acquisition in MW area because both areas are similar in terms of mode of distribution of the villages.

#### (4) Living and Livelihood Conditions of Local Communities

Please refer to Section 6.3 “Social Environment in the Project Area” for more details.

#### (5) Socially Vulnerable Groups: Indigenous People and Minority Groups

There is no common definition about indigenous people in the Indonesian laws/regulations and the documents used for environmental and social consideration by the international organizations and other donor agencies. In the ADB’s policies<sup>1</sup>, the following are the important characteristics to be considered for provisional definition.

- i) Descendants of people who have lived in the area concerned even before the foundation of modern nations which set up the borders of the countries; and
- ii) Groups of people who have inherited a specific socio cultural system over generations.

Based on the definitions described above, the Dayak people are regarded as indigenous people living in the MTA area. It is, therefore, necessary to appreciate the values of their culture and tradition and pay due attention to, so that their value will not be damaged by the Project.

This Survey mainly aimed to grasp the distribution of the households of the Dayak people in the project area along with their basic living and livelihood conditions through the environmental and social considerations. It is still necessary to conduct an in-depth survey in the course of the project to identify the countermeasures taken for the prevention of any damage or alteration of their society and living environment.

The Indigenous People’s Plan (IPP) is supposed to be formulated and implemented as one of the principle measures to be taken for indigenous people; however, the approach to the considerations of the Dayak people might be more flexible than other indigenous people as their life style is not as same as others. For instance, an ADB project for renewable energy development in Indonesia<sup>2</sup> recommended taking flexible measures under the principles of ADB as indigenous people in Indonesia have been already fully integrated into the Indonesian society. (“Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance Grant for the Renewable Energy Development Sector Project to the Republic of Indonesia”, November 2002).

Since the Dayak people in the Maradap region in West Kalimantan Province have been already integrated into the administrative system of the Indonesian government, the same ADB project did not

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1 The Bank’s Policy on Indigenous People, ADB, April 1998

2 Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance Grant for the Renewable Energy Development Sector Project to the Republic of Indonesia”, ADB, November 2002

formulate the Indigenous People's Development Plan (IPDP) for the Dayak people, but handled them as one of the affected groups in the Land Acquisition, Resettlement and Assistance Plan (LARAP). The specific approaches to be taken were described in the LARP so as to give due considerations to the Dayak people.

Hence, the project proponents need to consider the way of properly considering the Dayak people in the project area including the necessity of the IPP prior to the implementation of the Project.

#### 6.11.4 Measures for Compensation and Assistance

##### (1) Compensation for Losses

The following table shows the methods to compensate for losses with the guidelines to follow.

**Compensation for Losses caused by Land Acquisition**

Items	Descriptions
Farmlands	There is no land officially categorized as farmland in the project area, as all the lands belong to the state. The price of the land for compensation shall be estimated in negotiations with affected people based on the labour input made for clearing/cultivation of the land. Furthermore the Project companies provide the alternative land which has the same conditions as those of original land. Such alternative land is allocated in the residential area and the surrounding social forestry area where it is suitable to plant perennial crops and trees as well. The village leader has to approve to offer such a land to the affected people as an alternative to compensate for the loss of land.
Paddy fields	Rice plants growing in the paddy fields shall be the subject for compensation. The amount of compensation shall be determined in negotiations with affected people based on the pre-set prices indicated in the provincial ordinance governing the amount of compensation "Regulation of Ketapang Regency No.6/2006 on Basic Price Setting Compensation for Planting Growing in the District Ketapang" and actual market prices.
Vegetables, Ornamental plants, and Trees	The amount of compensation shall be determined in negotiations with affected people based on the pre-set prices indicated in the provincial ordinance governing the amount of compensation "Regulation of Ketapang Regency No.6/2006 on Basic Price Setting Compensation for Planting Growing in the District Ketapang" and actual market prices.

Source : The JICA Survey Team

The date when the project entities have the first consultation meeting with communities in the target villages is to be set as the cutoff date. As the information disclosure will be done in a phased manner in the Project, the consultation meeting will be hold only in the year when the project starts the afforestation. Hence, it is difficult to set a specific date as the cutoff date commonly applicable to all the project components like other infrastructure projects. Affected people in the target villages are to be identified when the first consultation meeting is held; therefore, anyone who moves into the project area after the cut-off date will not be treated as eligible for compensation.

##### (2) Livelihood Restoration Plan

People who lose a part of their livelihoods by land acquisition shall be given necessary assistance in securing alternative lands. The Minister's Decisions No. 70/Kpts-II/95 and No. 246/Kpts-II/1996, and Ministerial Decree No. P.21/Menhut-II/2006 define that 5% of the total project area shall be used as "Infrastructure Area" which include the residential area and another 5% of the same shall be designated as "Community Reforestation Area (*Areal Tanaman Kehidupan*: TK)". These ideas were incorporated in the zoning map of the Ten-Year plantation plan (RKU) and also the revised plantation plan finalized in the Survey.

As a means to restore the livelihoods of affected people, the Project will secure alternative lands in the Infrastructure Area or Community Reforestation Area and provide them to affected people so that they could plant trees and produce crops. Furthermore, the Project will hire affected people for the project activities especially until they could restore their livelihoods at the level before the Project.

### Restoration of Livelihoods

Necessity of livelihood restoration	Summary of Assistance
1. Replacement of lands (paddy fields and upland farms)	To secure alternative lands in the Infrastructure Area or Community Reforestation Area designated in the Plantation Plan based on the above-mentioned Minister's Decisions or Ministerial Decree.
2. Replanting of annual/perennial crops and tree crops	To secure alternative lands for planting useful/valuable trees and growing crops in the Community Reforestation Area designated in the Plantation Plan based on the above-mentioned Minister's Decisions or Ministerial Decree.
3. Assistance in securing cash income until affected people can obtain income by above-mentioned support	To facilitate access to employment opportunity in the Project to assist affected people in recovering their income until they can obtain sufficient income by the above-mentioned activities.

Source : The JICA Survey Team

### (3) Entitlement Matrix

The following table shows the types of loss caused by land acquisition, beneficiaries, contents of compensation, and responsible bodies for compensation. The procedures for compensation under the private sector project are rather simple as compared to those under the public sector projects.

#### 6.11.5 Accessible Grievance Mechanism

It is important to develop a collaborative relationship with local communities to avoid a significant risk of affecting the feasibility of the Project. In case local communities take stand against the Project, the project companies might find it difficult to be able to continue implementing the Project.

It is, therefore, essential to develop a mechanism where local communities can file their grievances. In fact, the project proponents, PT. WSL and PT. MTW, have organized the Social & Security Teams (SSTs) which can function as the grievance mechanism accessible to local communities. The SSTs have also carried out several activities, such as explanation of the Project, awareness campaign about fire prevention, and assistance in prevention of inflow of outsiders, to enhance their understanding of the Project. Moreover, the SSTs have handled issues on land acquisition individually to build consensus paying due consideration to the individual situations of affected people and settled any problems occurring in the process of land acquisition with the assistance from leaders of the target villages, namely administrative leaders (Chief of village) and traditional leaders. In this way, the project proponents have already established a mechanism to solve/settle issues by its own effort.

If the objection or appeal raised by the people is quite difficult to be addressed solely by SST or the conflict of interest between the Project company and the affected people is serious, the local government will intervene between the two parties to solve the issue. The experiences of the Project indicate that the local government witnessed some cases of negotiation of two sides and helped them reach agreement smoothly. No critical objection and appeal have been presented by the people, which might need the intervention of the local government.

In short there are currently two mechanisms to address the objections and appeals from the affected people. The first one is “two party mechanism between the people and the Project company” while the second one is “three party mechanism between the people, the Project company and the local government”. The latter mechanism will be employed in case the two party mechanism cannot solve the conflict.

#### **6.11.6 Implementation Structure for Land Acquisition (Responsible Organization for Land Acquisition and its Responsibilities)**

As described above, complaints about land acquisition have been handled and settled by the SSTs in the Project. The SSTs have gone around to the target villages to listen complaints and requests from communities and have taken necessary actions to satisfy the needs of communities.

When the SSTs take the procedures for land acquisition, the leaders of the local government units (district governments, sub-district governments, and villages), traditional leaders, and police officers concerned are to be involved in the process. They can help the SSTs settle issues/problems occurring in the process and validate the procedures for land acquisition.

#### **6.11.7 Implementation Schedule (Commencement of Land Acquisition from the Completion of Payment of Compensation)**

The procedures for land acquisition will start when the project proponents cut/clear the remaining trees in the area. The following table shows the typical schedule of land acquisition based on past experiences.

**Typical Schedule for Land Acquisition**

Activities	Timing	Summary
Visit to the target villages by SST	All year round	The SST staff shall visit the target villages through a whole year to provide the support services.
Explanation of the annual plantation plan to communities in the target villages	December	The explanation of the annual plantation plan shall be made in December at the target villages, as afforestation in new areas will start in January.
Negotiations and agreement with affected people on land acquisition	All year round	The negotiations will be held throughout a year since the status of the target areas can not be identified prior to the commencement of afforestation.
Commencement of afforestation	All year round	Planting of trees can be carried out throughout a year since there is no clear dry season in the project areas.

Source: Prepared by the JICA Survey Team based on the information obtained from PT. WSL and PT. MTI.

The project proponents shall identify the target areas and target villages when they prepare the annual plantation plan one year before planting trees in such areas. The SSTs together with the officials from the local government units concerned shall hold a meeting to explain the annual plantation plan in the target villages. In the meetings, the SST staff shall clearly indicate the target areas to be used for plantations and explain to communities who have used the target areas that the Project intends to compensate for their losses caused by land acquisition. The SST staff shall often visit the target villages and provide sufficient explanation to affected people so as to obtain full consent from them. At the same time, the staff shall identify the lands to be acquired as well as persons who use and/or

own such lands. As specified in the previous section, the date of the first meeting with the target village is to be set as the cut off date.

### 6.11.8 Expected Cost and Possible Sources of Budget

The cost needed for land acquisition is categorized as “compensation cost: compensation payment for losses or temporary relocation of lands and assets.” The necessary budget for the compensation cost shall be allocated from the project budget by the project components. As it is impossible to clarify the whole picture of land acquisition as well as affected people in this study, the total compensation cost for the Project is estimated based on the actual expenses used for land acquisition in 2013. Assuming the same amount of cost will be needed for land acquisition in the remaining target villages, the annual compensation costs from 2014 to 2017, when afforestation in the newly opened areas end, are estimated in proportion to the number of villages to be targeted in the respective years.

### 6.11.9 Monitoring by the Project Proponents

In the Project, the project proponents can start afforestation in the newly opened areas only after completing the payment of compensation in accordance with agreements reached with affected people. To achieve the plantation targets allocated to the respective years, the project proponents need to reach agreements with affected people on land acquisition and complete all the compensation payments in a given period. It is, therefore, important for the SSTs with the village leaders to monitor the progress of the process of land acquisition at least every two weeks or one month: namely, i) progress of compensation payments, ii) provision of assistance, and iii) completion of demarcation of the plantation areas.

A form which can be used for monitoring the progress of land acquisition is drafted as shown below. The monitoring form shall be prepared for the respective cases as the progress of negotiations may vary with the situations of affected people. The key information to be recorded/monitored periodically includes name of affected person, status of negotiations, and progress of payment.

#### Draft Monitoring Form

Name of village : _____ Name of sub-village : _____ Date of recording : xx/xx/2014 Name of Recorder : _____				
No.	Name of affected person	Assets to be acquired	Status of Negotiations	Payment of compensation
1	Pak. AAA aaa	Farmland: 0.02 ha Rubber tree: 15 trees Banana: 3 trees	<input checked="" type="checkbox"/> Pre-negotiation <input checked="" type="checkbox"/> Under discussion <input type="checkbox"/> Completion of the deal (Determination of compensation)	<input type="checkbox"/> Not ready for payment of compensation <input type="checkbox"/> In the preparation of compensation <input type="checkbox"/> Completion of payment of compensation <input type="checkbox"/> Completion of an arrangement of alternative

Name of village : _____ Name of sub-village : _____				
Date of recording : xx/xx/2014 Name of Recorder : _____				
				land <input type="checkbox"/> Completion of all the processes
(ditto)				
2				
3				
4				
5				

Source : The JICA Study Team

#### 6.11.10 Consultation with Local Stakeholders

As described in Section 6.10.1, no consultation with local stakeholders has been convened during the Survey.

#### 6.12 Actions to be Taken in the Following Stages

Since the Project was only recently classified as Category A in terms of its potential environmental impacts by JICA HQ, this Survey was not at this time able to fully comply with the requirements given to the Category A project in the JICA Guidelines. Hence, the project proponents need to take necessary actions to fulfil the requirements including the survey topics untouched by this Survey in the course of preparation for the implementation of the Project after this study. Major topics to be dealt with by the project proponents are described below.

##### (1) Convening of Stakeholder Meetings

The stakeholder meetings shall be convened in accordance with the JICA Guidelines. The project proponents shall disclose / share the scoping drafts with local stakeholders and obtain comments and suggestions from them in the first stakeholder meeting. In the second meeting, the project proponents shall consult with them about the draft project plan, which includes the results of further considerations/assessments on the topics described in the following items (items (2) and (3)).

##### (2) Identification of Affected People

In the process of preparation for the implementation of the Project, the number of affected households/people needs to be identified. It is, however, unrealistic that the project proponents can conduct a full-scale census survey to cover all the households distributed over the project area. Hence, they should take a feasible approach to determining affected people in the project area with tolerable accuracy. The approaches and the methodologies to grasp the total households and the population and to set the cutoff date as described above are required to be further examined in the process of the Project preparation stage before its official commencement.

(3) Development of Concrete Measures to be taken for the Dayak People

The project proponents shall develop concrete approaches and measures to be taken for the Dayak people and their society through a detailed village survey, stakeholder meetings, and reviews of any existing development projects in and around the project area. In the preparation of concrete approaches and measures, attention shall be paid to inherent problems and/or features specifically applicable to the Dayak people as well as its society, which the Survey was not able to clearly identify through the socio-economic baseline survey, although some information, such as the decision making and consensus building processes, local tradition of compliance with village rules, and traditional activities founded on their unique religion, can be referenced. It is essential that the measures should be developed based on their traditions and structure of the society to ensure their understanding and cooperation.

It is also advisable to develop an operational guideline for proceeding with land acquisition and developing community support activities with the understanding, consent and support of the Dayak people in the course of the preparation for the implementation of the Project.

(4) Review of the Final Report of HCV Assessment in the MW Project Area and Reflection of its Recommendation to the Implementation Plan

The HCV assessment in the MW area is at the final stage at the time of the Survey completion. In the interim findings of the assessment, it recommended the revision of the plantation target by allocating more area to the conservation, social forestry, etc.

After the Survey completion, the Project companies are recommended to review the final report of HCV assessment which indicate the HCV areas and their directions and methods of management and comments/discussions of the consultation meetings for the stakeholders. Through the review the companies shall finalize the plantation of MW area.





# **Part IV**

## **Contribution to Climate Change**



## **CHAPTER 1 REVIEW ON THE CONTRIBUTION OF CLIMATE CHANGE STRATEGY**

### **1.1 Preface**

The total forest area on earth is approximately 4 billion ha. This accounts for 30% of the earth's total land area, and serves as an important CO<sub>2</sub> sink. The carbon stock of forests (including the forest soil) is estimated as approximately 1.15 trillion tons, which accounts for half of earth's total carbon pool (approximately 2.5 trillion tons). Despite its important function as a huge carbon pool, in recent years especially in developing countries, forests continue to disappear and degrade due to conversion to agricultural land, extensive harvesting of wood for fuel, increase in forest fires, illegal logging, and slash-and burn cultivation. As a result, the Green House Gas (GHG) from deforestation and forest degradation has added 20% to total emissions. Due to the urgency of the issue, prevention of deforestation and forest degradation as well as promotion of sustainable forest management as part of the climate change strategy are being spotlighted by the international community.

In line with the United Nations Framework Convention on Climate Change (UNFCCC), approaches including REDD (Reducing Emissions from Deforestation and Forest Degradation), improvement of carbon stock, forest conservation and sustainable forest management (hereafter referred to as REDD+) were emphasized at the 13th Conference of the Parties (COP13) in 2007. In the Copenhagen Accord which was held at the COP15 in 2009, developed countries including Japan expressed their support for REDD+ and at the same time, forest conservation and sustainable forest management were recognized as efforts to mitigate climate change.

In the context of REDD+, intergovernmental negotiations, which significantly contribute to UNFCCC's effort to achieve a comprehensive agreement, have been showing extensive progress. Despite the discussions held with regard to the institutional arrangements, the international agreement concerning how the agreement's management should be performed is yet to be reached. Nevertheless, expertise and experience on forest conservation and sustainable forest management are still deemed necessary in the course of discussion on climate change and GHG reduction target in each country.

Emission reduction and evaluation based on scientific knowledge are particularly important in Indonesia where the amount of GHG emissions is the third largest in the world and deforestation and forest degradation account for 47% of major causes of GHG emissions. The Indonesian government has been implementing five priority measures which include the elimination of illegal logging, prevention of forest fires, restructuring of forestry sector through capacity building and efficiency of forest resources management, conservation of forest resources and decentralization of authority in the forestry sector. In addition, conservation efforts of peat land in the forestry sector is also an important factor in mitigating climate change.

Among the stakeholders in the forestry sector, the role of private companies in forest development is extremely important as they have a great influence on the situation and condition of forests. Forest management by private companies has been held responsible for the continuous reduction of the amount of carbon and current condition of forests, especially in Indonesia where there have been cases of illegal forest development and unplanned large-scale industrial plantations that have stirred social and environmental criticism. Hence, the implementation of environmental friendly forest management

system, as one of the important element of REDD+ to promote sustainable forest management, is expected to be able to maintain and preserve forests that are known to have high public value as one of the most important social infrastructures, while at the same time creating economic value for the society.

This review aims to quantify the role of sustainable forest management to reduce the GHG emission including the peat land management by using the framework of REDD+ as much as possible as reference, and to review and assess its impact to the overall climate change strategy. The review particularly will assess the contribution of National Action Plan on Climate Change (Rencana Nasional Penurunan Emisi Gas Rumah Kaca : RAN-GRK) established under the 2011 Presidential Decree and West Kalimantan Climat Change Strategy to the “Forest and Peat” measures which include forest management.

## CHAPTER 2 REVIEW ON INDONESIAN INTERNAL LEGAL SYSTEM AND PLAN

### 2.1 Status of Climate Change Strategy in Indonesia

RAN-GRK was established in Indonesia under a Presidential Decree in 2011, and since then has been the regulating target of GHG emission reduction in each development sector. Target of emission reduction of each sector is shown in the table below along with its priorities and principles. Additionally, RAN-GRK is widely used as a reference in planning, developing, monitoring and evaluating the implementation of mitigation actions conducted by local government, related agencies and other economic actors. The content is updated on regular basis depending on the needs, scientific knowledge and status of policy development. The target of the GHG emission reduction in the area of carbon sink for the forest sector for 2020 in comparison with 2005 is 672 million t-CO<sub>2</sub> (equivalent to 26% reduction); an additional 367 million t-CO<sub>2</sub> (equivalent to 15% reduction) can be targeted when it receives the support from developed countries. The rate of emission reduction in the sector of forest and peat is extremely high (approximately 87%) , hence, the sector is very important to achieve the Indonesian country's target.

**Target Of Emission Reduction In Each Sector Until 2020**

Sector	Emission reduction (mil t-CO <sub>2</sub> )		Action Plan	Owner of Authority
	26%	+15%		
Forest and peat	672	367	Forest fire control, peat land water resource control, forest and soil regeneration, forests, illegal logging control, deforestation prevention, community development	Ministry of forestry, ministry of environment, ministry of public works, ministry of agriculture
Waste product	48	30	Garbage management development, City 3R and sewage system	Ministry of public works, ministry of environment
Agriculture	8	3	Introduction to low-carbon variety of rice, irrigation optimization, application of organic farming method	Ministry of agriculture, ministry of environment
Industry	1	4	Energy efficiency, renewable energy development	Ministry of industry
Energy and transportation	38	18	Bio fuel development and utilization, improvement of fuel consumption efficiency , public transportation, energy demand control, renewable energy and energy efficiency	Ministry of transport, ministry of energy and mining, ministry of public works

Source: Website of New Mechanisms Information Platform, Japan

The following are principles and priorities in above-mentioned action plans (RAN-GRK):

#### <Principles>

- The mitigation action must not hamper economic growth and must prioritize public welfare (especially energy resilience and food security).
- The actions must support the protection of poor and vulnerable communities as well as environment in the context of sustainable development.

#### <Priorities>

- The action plans should be directly related to emission reduction that can be measured, reported, and verified.
- The action plans should be consistent with the development priorities and conducted at low cost.

Under the Presidential Decree as RAN-GRK, all 33 provinces in Indonesia were required to formulate a GHG Emission Reduction Action Plan (RAD-GRK: Rencana Aksi Daerah Penurunan Emisi Gas Rumah Kaca) at provincial level within one year from the effective date of the decree. Each province is further required to develop mitigation plans based on the actual condition on the ground, in which common methods and processes are set to meet national target through close coordination with others at national and provincial level.

## **2.2 Status of REDD+ in Indonesia**

While forests serve as an important GHG sink, deforestation and forest degradation continue to occur and serve as a huge source of emissions. Especially in Indonesia, where 120 million ha (approx. 63%) are forests out of the total land area of 192 million ha, and where Indonesian forests make up approximately 10% of the world's rainforest (source: FOE Japan 2010). These forests are not only important element of ecosystem, but also play significant roles in climate change.

Currently, REDD+ is one of the climate change mitigation measures at the UNFCCC. Indonesia as the owner of vast forest areas has shown keen interest in the REDD+ as a low cost potential measure in GHG reduction. The government of Indonesia continues to develop relevant pilot projects, improve its governance and policies, while receiving support from the international community.

### **(1) Implementation structure and progress of REDD+ in Indonesia**

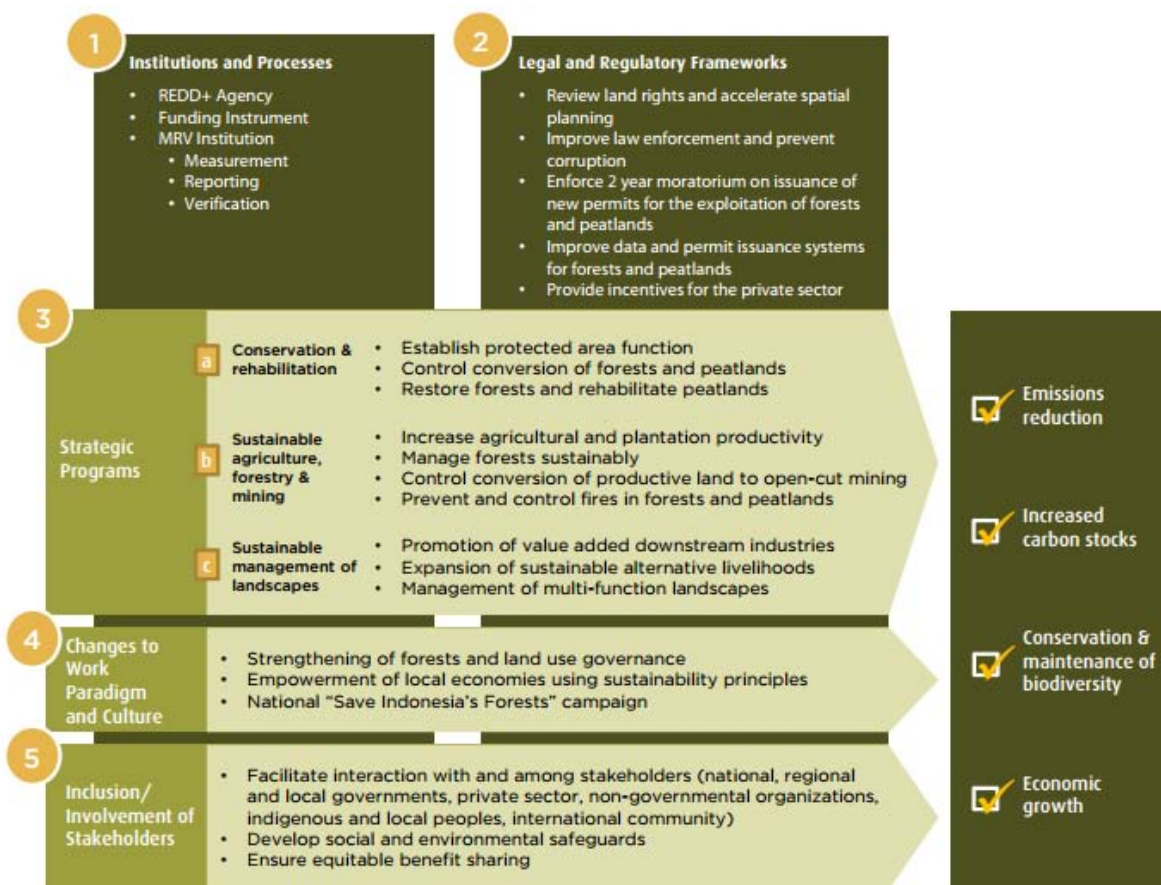
As shown in table below, REDD+ task force was established in September 2011. An implementation structure was set up with the specific focus on the Presidential Work Unit for Development Monitoring and Control (UKP4). Further REDD+ Agency was established in August 2013 and in December 2013, and Mr. Heru Prasetyo was appointed by the President as the head of the Agency. Functioning as an institution under direct supervision of the President, the REDD+ agency has mandates of: 1) overseeing the REDD+ policies at national level, 2) coordinating the work of relevant ministries and local government agencies, and 3) conducting overall coordination of related agencies, establishment of MRV agency and funding mechanisms. It is often found that the coordination process lacks clarity and raises issues on setting future action plans. However, the REDD+ Agency, as one of the government agencies in charge of climate change issues including forest resources, will be able to initiate the promotion of coordination.

### Structure and Function of REDD+ Implementation in Indonesia

Organization	Roles and Responsibilities in REDD+
Presidential Work Unit for Development Monitoring and Control (UKP4)	<ul style="list-style-type: none"> <li>Under direct supervision of the President, Mr. Kuntoro Mangkusubroto was assigned to be the head of UKP4.</li> <li>Its main task is to evaluate the work of ministers and report back to the President. It also collects information from relevant organizations and coordinate the organizational structure of REDD+ activities.</li> </ul>
National Council on Climate Change (DNPI)	<ul style="list-style-type: none"> <li>Established in July 2008. From October 2009 served as administering authority of CDM and DNA.</li> <li>Conduct workshops on technical matters of REDD+ such as MRV system and reference scenarios and support the work of UKP4 and BAPPENAS.</li> </ul>
National Development Planning Agency (BAPPENAS)	<ul style="list-style-type: none"> <li>Formulate National REDD+ Strategy</li> </ul>
Ministry of Forestry	<ul style="list-style-type: none"> <li>Regulate forest industry and national parks in Indonesia</li> </ul>
Special REDD+ Agency	<ul style="list-style-type: none"> <li>Under direct supervision of the President.</li> <li>Coordinate relevant ministries and local government agencies, Formulate REDD+ policies</li> <li>Conduct overall coordination of MRV agencies and financial mechanisms</li> </ul>

Source : Indonesia REDD+ National Strategy, WEB site of REDD Research and Development Center, Forestry and Forest Products Research Institute

Indonesia National REDD+ Strategy was formulated in June 2012. The strategy set targets on the emission reduction, carbon stocks increase, conservation & maintenance of biodiversity and improvement of economic growth based on five basic points shown in Figure below: (1) organization and procedure, (2) legal and regulatory framework, (3) strategic programs, (4) work paradigm and transformation of work culture, and (5) inclusion/involvement of stakeholders.



Source : Indonesia REDD+ National Strategy

### Frame Work And 5 Main Components in REDD+

(2) REDD+ activities in Indonesia

Indonesian government places great importance on REDD+, and has actively demonstrated its best efforts in developing REDD+ system and policies while at the same time receiving global-wide support on its Forest Carbon Partnership Facility (FCPF) and UN-REDD. Various donor countries have showed their interest in supporting Indonesia, especially Norway which since 2010 has committed to support Indonesia by providing up to 1 billion USD depending on the project outcome in relation to the GHG emission reduction caused by deforestation, forest degradation and peat land in Indonesia. Besides adopting policy of suspending the issuance of new logging rights (moratorium) for natural forest and peat land since 2011, signature features for REDD+ activities in Indonesia include: national strategy to promote REDD+, administrative policy, Measurement Reporting Verification (MRV), support for pilot province, and support for establishment of funding method.

While various donors have shown keen interest in supporting Indonesia through implementation of specific activities, Establishment MRV is important in the future. Although there has not been a clear and final decision, there have been discussions on establishing MRV Agency as a way of keeping updated on future needs and progress.

**The History of Progress of REDD+ in Indonesia**

2007	Bali action plan was adopted at COP13 which was held in Bali, Indonesia. The Bali Action plan was directed toward forest conservation, sustainable forest management and the enhancement of carbon stocks. The plan states that signatory countries are obliged to promote climate change activities at national and international level based on: “1) provision of Policy approaches and positive incentives on issues concerning REDD, 2) forest conservation efforts in developing countries, and 3) forest sustainable management and enhancement of forest carbon stocks . Further, the concept of REDD+ that incorporates forest conservation, forest sustainable management is also emphasized.
July 2008	Establishment of National Council of Climate Change (DNPI) as per Presidential Decree No. 46
September 2010	Establishment of President Work Unit for Development Monitoring and Control (UKP4) and REDD+ taskforce based on Presidential Decree No. 19. The task force is responsible for the following undertakings: <ul style="list-style-type: none"> <li>• Preparation for the establishment of REDD+ agency (officialiated in Sept 2013)</li> <li>• REDD+ national strategy coordination</li> <li>• Preparation for the establishment of REDD+ funding system and mechanism. Preparation for the establishment of REDD+ agency. (In this case, REDD+ MRV agency is considered as a standalone independent organization)</li> <li>• Implementation of REDD+ activity in the first pilot province as well as formulation of the selection standards of the second pilot province</li> <li>• Implementation and monitoring of natural forest and peat land related measures in accordance with Presidential Decree No. 10, 2011)</li> </ul>
September 2011	Establishment of REDD+ taskforce based on Indonesia Presidential Decree No. 25 The task force is responsible for the following undertakings: <ul style="list-style-type: none"> <li>• Preparation of the establishment of National REDD+ Agency</li> <li>• Development of National REDD+ strategy and national GHG emission mitigation action plan</li> <li>• Securing financing instruments</li> <li>• Installation of independent MRV system</li> <li>• Formulation of selection standards and strategy for project implementation in pilot provinces</li> <li>• Other preparation and implementation of activities based on letter of intent (LOI)</li> </ul>
June 2012	Indonesia National REDD+ strategy was formulated.
June 2013	Indonesia REDD+ agency was established. Detailed tasks are to be determined later; however, responsibilities could have the following functions: <ul style="list-style-type: none"> <li>• Establish ministerial-level agency under direct supervision of President based on law</li> <li>• Oversee REDD+ policy at national level and coordinate agencies and local government’s related agencies</li> <li>• Overall coordination of MRV agency and funding mechanism</li> </ul> (December 2013: Mr. Heru Prasetyo was appointed as the head of REDD+ Agency)

JICA Survey Team



(3) The situation of REDD+ in West Kalimantan

RAD-GRK of West Kalimantan has received approval by the Provincial Governor and set the target for the amount of emission reduction of each sector (see Table below). The amount of emission reduction target of Land sector (agriculture, forestry, peat land) and Plantation including oil palm is large enough so that it is clear that emission reduction from land use change is important for the province. This suggests that the role of environmentally well-considered industrial development and forest management is significant.

**Emission Reduction Target of each Sector in Comparison with BAU by 2020**

No	Sector	Emission reduction target (million t-CO <sub>2</sub> ) ※in comparison with BAU	Rate of Emission reduction target (%)
1	Land sector (agriculture, forestry, peat land)	266.111	50.9
2	Plantation	313.465	60.0
3	Energy	0.024	0.7
4	Transportation	2.168	87.2
	Total	581.768	

Source : Based on interview with relevant government in West Kalimantan, JICA Survey Team prepared.

REDD+ strategy in the forestry sector has set a target to reduce emissions by 26% (or 32 million t-CO<sub>2</sub>) compared to the BAU (business as usual) scenario by 2020. Moreover, REDD+ activities will be implemented based on the following strategies (see Table below). Despite the fact that activities in West Kalimantan have been carried out and referenced based on the REDD+ Strategy, no clear technical guidelines and methodologies are widely known by the public. According to the interviews conducted with relevant stakeholders, the details of some of the data are unknown: namely, (1) reference scenarios have been set by extracting points from various sources in 10 years time from 2000 until now, and (2) distribution process of peat is in reference to the available data.

**Outline of REDD+ Strategy in West Kalimantan**

Item	Contents
Empowerment of system and policies of local government	<ul style="list-style-type: none"> <li>• Establishment of REDD+ Taskforce at Province level.</li> <li>• Implementation of Action plans and sectoral budgeting set for West Kalimantan Province.</li> <li>• Measures for private companies that support conservation of forest resources and prevention of deforestation</li> <li>• Sustainable Forest management incentive</li> <li>• Green Investment Award and certification letter for private companies in Forest industry, Plantation, Farming and Mining who implemented Zero Burning, and Reduced Impact Logging.</li> <li>• Formulation of Local law and Governors Policies to support environmental issues in West Kalimantan</li> </ul>
Policy formulation and management building for Technical Implementation Unit at Provincial level	Restructuring of national parks and technical institutions for resource conservation management, establishment of forest inventory system, forest fire control.
Regulate REDD+ Payment/incentive system with political accountability	Create a system with the participation of local communities and stakeholders, including indigenous people

Source: WEST KALIMANTAN REDD+ TASK FORCE

Meanwhile, Japan International Cooperation Agency (JICA) and the Ministry of Forestry (MoF) of the Republic of Indonesia have agreed to implement Indonesia-Japan Project for Development of REDD-Plus Implementation Mechanism (IJ-REDD), which will conduct the establishment for REDD+ implementation structure in West Kalimantan, the pilot project in the Gunung Palung national park, and capacity building for the carbon monitoring in Central Kalimantan. IJ-REDD shall implement activities to set reference scenarios based on the climate change progress shown at the provincial level and serve as a strategy that puts together national and provincial climate change countermeasures through additional independent research. Further IJ-REDD is expected to contribute to Indonesia REDD+ policy and methodology, while at the same time technical support for West Kalimantan continues to flow from international NGOs, international financial institutions and monetary funds.

## CHAPTER 3 REVIEW OF EXISTING METHODOLOGIES AND THE METHODOLOGY OF ESTIMATION FOR GHG REDUCTION

### 3.1 Review of Existing Methodologies

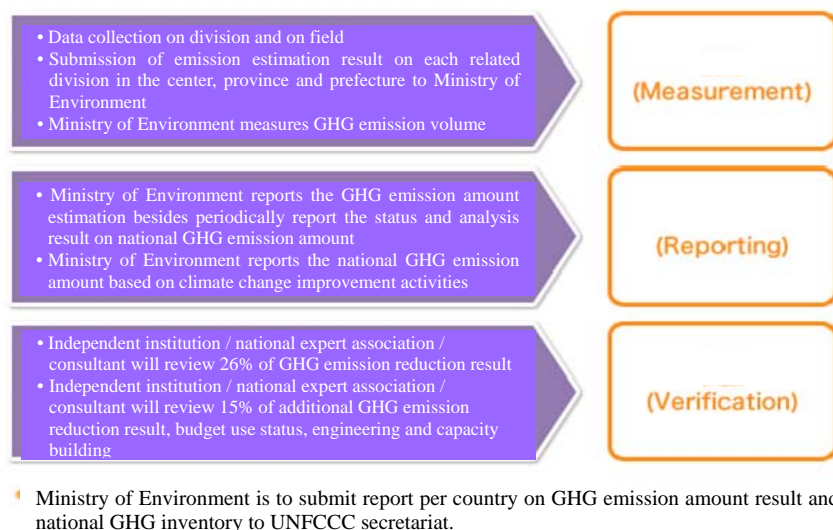
The information of the Indonesian government's GHG inventory and proposed REDD+-plus methodologies are collected and reviewed in order to evaluate the project's contribution as the climate change countermeasures. In this study, all this information is utilised to quantify the effect of running the project on greenhouse gas (GHG) emission reduction and evaluate the contribution level of mitigation to climate change. The table below shows the list of collected information and proposed methodologies to evaluate the project's impact as climate change countermeasures. The detailed information of the result of the review is described in Section 3.2.

**The Main Existing Methodologies Studied in this Study**

Category	Methodologies	Research method
Indonesian government's method	Indonesian government's GHG inventory calculation method and RAN-GRK's method	Literature review and interview
	Methods under consideration as REDD-plus in West Kalimantan	Interview
	Methods under consideration as REDD-plus in Central Kalimantan	Interview
Existing methodology	IPCC Good Practice Guidance of LULUCF	Literature review
	A/R-CDM's methodologies	Literature review
	Verified Carbon Standard (VCS) methodologies (Methodology ID: VM004, VM006, VM0007 etc.)	Literature review
The Joint crediting mechanism (JCM)	JCM feasibility study conducted by the Ministry of Economy, Trade and Industry, Japan	Literature review
	"New mechanism feasibility study" or "JCM feasibility study" conducted by the Ministry of Environment, Japan (MOEJ) and Global Environment Centre Foundation (GEC)	Literature review
Others	REDD-plus Cook Book published by REDD Research and Development Center (REDD R&D Center) launched within the Forestry and Forest Products Research Institute (FFPRI)	Literature review
	Result of JST-JICA Project on Wild Fire and Carbon Management in Peat-Forest in Indonesia	Literature review and interview
	Advice from experts	Interview

Source: JICA Survey Team

The figure below is an overview of the Measurement, Reporting, Verification (MRV) process in GHG emission volume reduction through implementation of RAN-GRK by each division and local authority. In addition, Indonesia Ministry of Environment, conforming to Environmental Management Act (No. 32), and with current support from Japan International Cooperation Agency (JICA), GHG inventory system "SIGN (Sistem Informasi Gas Rumah Kaca National or National GHG Inventory System) is being developed. The expected outputs of SIGN include: statistic data of GHG emission volume from all divisions based on IPCC's guideline(historical emission volume) and, information submission with regard to GHG emission volume (emission standard in specific year), as well as GHG inventory report planning implementation to be submitted to UNFCCC. Moreover, CO<sub>2</sub> is the target gas for the evaluation in this report just like the GHG emission of forest sector in RAN-GRK.



Source: REDD research centre Forestry and Forest Products Research Institute

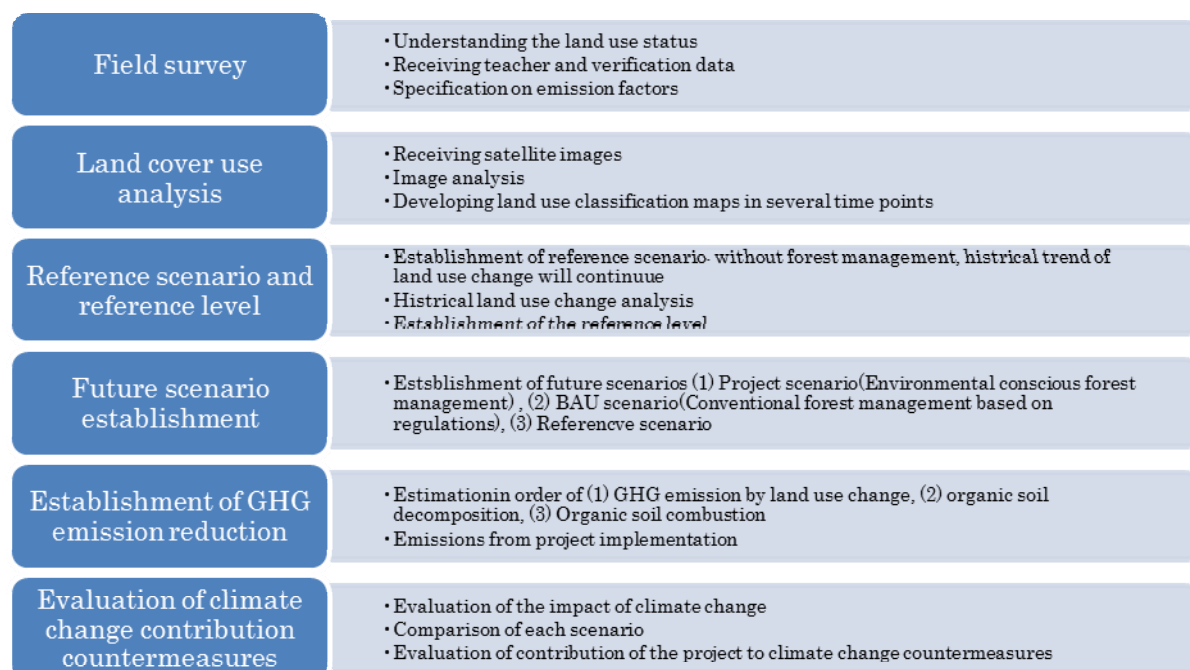
### Overview of Measurement, Report, Verification Process on GHG Emission Volume

#### 3.2 The Method of the Estimation of GHG Emission Reduction

Together with Mega Rice Project which started widely around 1995 and oil palm plantation development as of recent years, peat land development has been continuing on Kalimantan island and Sumatra island, and it is recognized as a large-scale source of CO<sub>2</sub> emission. Peat land conservation to control GHG emission which is the result of peat fire and natural decomposition, for the Indonesian central and local governments, has become one of the most important policy issues for climate change mitigation. Also, the decomposition mechanism of organic matter of peat land and quantification methods of CO<sub>2</sub> emission from peat land ecosystems currently have on-going research, and results are not yet totally confirmed. However, the results of reviewing existing methodologies and interviews with experts clearly show that although some methods have been proposed, measuring GHG emission from peat land accurately is extremely complicated and it is difficult to reach a consensus from the experts concerning the quantification method which has been established and verified. Furthermore, the data for the calculation of, distribution of peat land in the project site, peat depth, amount of forest carbon stock accumulated in the area and emission factors have not yet been sufficiently obtained.

For these reasons, in this study, according to the information of existing methodologies reviewed in section 3.1, evaluation of the impact of the project implementation on GHG sequestration, emission and contribution as climate change countermeasures is conducted as shown below.

- (1) While referring to existing research results, official methods and default values utilized by the national and provincial government are preferentially applied.
- (2) Evaluation of target research project (written as “project scenario” in later parts) is conservatively considered.
- (3) Results of JST-JICA project “ Project on Wild Fire and Carbon Management in Peat-Forest in Indonesia” are to be actively utilised.



Sauce : JICA survey team

### Outline of Investigation and Evaluation Flow

Investigation and evaluation flow in this study is shown in the figure above. According to result of reviewing the existing methodologies, regarding the evaluation method of GHG emission reduction, a methodology (later called basic methodology (draft) ) reported in “Feasibility Study for the Project to Reduce GHG Emissions through the Introduction of Large-scale Countermeasures against Peat land Fires in Central Kalimantan, Indonesia” which was conducted as one of the study projects of Joint crediting mechanism (JCM) feasibility study organised by the Ministry of Economy, Trading and Industry, Japan (METI) in 2012, is to be referred to. It has the following three components of GHG emissions which are to be applied in conducting an evaluation: (1) land use change, (2) natural decomposition of organic soil (peat), and (3) organic soil combustion. The advantage of the methodology is that it can comprehensively evaluate the activities which cause a large effect on GHG emission from the managed forest area. In addition, the results of Japanese research project “JST-JICA project on Wild Fire and Carbon Management in Peat-Forest in Indonesia” can be applied. Also, utilization of the same methodology is also under consideration in the Central Kalimantan province which has wide peat forest area, similar to the West Kalimantan province. Procedures of the evaluation and emission factors to calculate amount of GHG emissions are determined in reference to methodologies of Verified Carbon Standard (VCS) (principally VM0004) and Indonesian GHG inventory’s factors. GHG emissions from fossil fuel consumption of the project implementation are also estimated. The estimation term is from 2014 to 2034.

#### (1) Method of evaluation of GHG emissions by land use change

The assumption of the amount of GHG emissions by land use change refers to the basic methodology (draft), calculating by multiplying activity data and emission factors. The data of the area of land cover classification, which was obtained from satellite image analysis in the past as well as in present, are applied as activity data. The land cover classification areas in the future is determined by the

information of the management plan of the project according to scenarios which will be described later in the report. Furthermore, regarding emission factors in every land cover classification, carbon volume accumulated above the ground is applied. Emission Factors (EFs, CO<sub>2</sub>/ha) were defined based on the reviewed methodologies and previous studies, information from the Indonesian government and records of operation from WSL/MTI/MW.

In this report, EFs were evaluated on the values which are used for estimation of Indonesian forest carbon stock from the government (hereinafter “official data”), (see Table below). AGC (Carbon stock Above Ground) in the table shows the equivalent amount of CO<sub>2</sub> in biomass above ground.

**Carbon stock Above Ground of Each Land Use (Unit: t-CO<sub>2</sub>/ha)**

No	Code	Land Use/Land Cover	AGC (time averaged)	Source
1	2001	Natural forest	195.4	Perhitungan awal tahun 2009*
2	2002	Degraded Natural forest	169.7	Perhitungan awal tahun 2009*
3	2004	Mangrove	170.0	Bappenas 2010
4	2005	Swamp forest	196.0	Bappenas 2010
5	2006	Forestry Plantation	64.0	Balitbang Kehutanan, 2010
6	2007	Bush/Shrub	30.0	Expert Judgment
7	2010	Cultivation	63.0	Bappenas 2010
8	2012	Settlement	5.0	Bappenas 2010
9	2014	Bare land	2.5	Bappenas 2010
10	3000	Grassland	4.5	Expert Judgment
11	5001	Water body	0.0	Bappenas 2010
12	20041	Degraded mangrove forest	120.0	Bappenas 2010
13	20051	Degraded swamp forest	155.0	Bappenas 2010
14	20071	Swamp shrub forest	30.0	Bappenas 2010
15	20091	Upland cultivation	10.0	Bappenas 2010
16	20092	Mixed upland cultivation	30.0	Bappenas 2010
17	20093	Paddy field	2.0	Bappenas 2010
18	20094	Embankment	0.0	Bappenas 2010
19	20121	Airport/port	0.0	Expert Judgment
20	20122	Land for transmigration	10.0	Expert Judgment
21	20141	Mining	0.0	Bappenas 2010
22	50011	Swamp	0.0	Expert Judgment

\*Source: Meeting on December 11th, 2012, National Working group, Ministry of Forestry

## (2) Method of estimation of GHG emissions from organic soil (peat) natural decomposition

The results of Global Change Biology (2012) 18, 3410-3422, report the following: effects of disturbances on the carbon balance of tropical peat swamp forests as result of “JST-JICA project on Wild Fire and Carbon Management in Peat-Forest in Indonesia” (JST-JICA project), and the difference in greenhouse gas emission from ecosystem among land use and vegetation condition as well as the situation of drainage. Although the characteristics and the generating process of peat land in Central Kalimantan is not completely the same as in West Kalimantan, the emission factors of natural decomposition of peat in this study refer to the data of the report and are shown in the table below. The emission factor of Undrained plantation (UP), which was not available in this study, was calculated using the method mentioned in the basic methodology (draft). Based on the past climate date within eight years (2002-2009), five years were at the high water level (the emission factor is assumed equal to Undrained Forest (UF)). Likewise, the emission factor of Undrained non-forest (UN) was calculated by adding the GHG emission of Undrained Forest (UF) to the difference between Drained Burnt forest (DB) and Drained Forest (DF).

According to the differences on drainage and land use of future scenarios, the emission factors for evaluation of GHG emissions from the natural decomposition of organic soil (peat) are determined.

The emission factors for evaluation of GHG emissions from the natural decomposition of organic soil (peat) of below scenario are surveyed.

- (a) Reference scenario: historical land use change continues without implementing forest management. No drainage.
- (b) BAU scenario: Conventional forest management based on laws and regulations. Water level is lowered by drainage.
- (c) Project scenario : Forest management considered in the environment. Water level is controlled (high).

The characteristics of peat land in West Kalimantan are different regarding the surrounding natural conditions, mechanisms of its creation and circumstances of the industrial development from Central Kalimantan which is where the study of JST-JICA project was implemented. There is a limitation to apply methodologies which are developed in different peat land areas, so that setting emission factors for the target area and improvement of accuracy should be future issues.

### (3) GHG emissions from organic soil combustion

In Central Kalimantan which the basic methodology (draft) is targeted, organic soil combustion is considered the most important source of GHG emissions as well as the basic methodology (draft). The circumstances of peat fire in Central Kalimantan is different from West Kalimantan, where, the large scale land exploitation by drainage was not conducted; thus the impact of peat fire towards the entire greenhouse gas emissions is relatively low in West Kalimantan.

Moreover, enough precise information for estimation of future incidents of comparatively small fires for mosaic farm cultivation by local people, as well as the number of accidental fires in the BAU and project scenarios were not found in our study. Therefore, in this research as comparison of the impact of the climate change of each scenario, the evaluation on the contribution to climate change mitigation was conducted under the assumption there will be no difference of GHG emissions between each scenario. This is considered as the most conservative approach for the project scenario. Fire use for shifting cultivation under the reference scenario will continue in the area. Draining water off from peat land in the BAU scenario increases fire risk because of the drying of peat soil. Project scenario does not use burning technique for land preparation before planting and controls water at high level, and gives most attention to the forest fire prevention. For these reasons, the risk of fire of the project scenario is considered to be adequately low, and the evaluation under the condition that there is no difference between scenarios in GHG emissions by organic soil combustion is considered as a conservative evaluation method.

### (4) Others

This study does not aim for implementing REDD+ project, but is considered as contribution of countermeasures against climate change by forest management which will be carried out as an economic activity, with reference to the concept of REDD+. In other words, it does not aim to be

issued emission credit. Hence, general issues which are deemed necessary for evaluation of REDD+ project, leakage, uncertainties, non-permanence and management of the risks are not part of this study.



## CHAPTER 4 ESTIMATION OF GHG EMISSION REDUCTION

### 4.1 Identification of Drivers of Deforestation and Forest Degradation and Changes of Forest Area

The forests surrounding the project area have been decreasing severely since the 1990s because of the development of the large-scale oil palm plantation. Especially the large land area of the south and the northeast of the project area were changed to plantations. However, the developments were carried out only in the concession areas where it was permitted to plant palm trees and it rarely entered into the concession areas for forest plantation. Mosaic land use changes from forests to other land use were widely observed in the area near rivers and streams. They are mainly caused by slash-and-burn cultivation by the local people. The result of the field observation clearly corroborated this.

Inside of the project area, large-scale land conversion did not occur because it was set as a forestation concession. However, light and thin lines growing from water streams into forest areas were observed in satellite images after the 1990s. They seem to be paths for illegal logging operations. Logs were processed roughly by chain saw in the forest, or only round logs were transported through the streams and canals to the outside of the forest area. Actually, we observed a large number of illegal logging operations in the project area through our field survey which was held around 2010. Also mosaic land use changes from forests to other land use were widely observed in the area near the rivers and streams of the project area. They are mainly caused by slash-and-burn cultivation by the local people as well as bauxite mining. This information should be applied in the consideration of future scenarios, especially for the ones without the project implementation.

### 4.2 Trends of Land Use Change

Land use classification in the most recent years as well as approximately the past 15 years for the surrounding area and the project area (Reference Area: RA) was conducted with supervised classification of LANDSAT images with training data from field survey and high-resolution satellite images (Quikbird-2/Worldview-2).

The project area (PA) is 250,751 ha of the concession area of WSL/MTI and MP located in West Kalimantan, which is the target area of this Feasibility Study.

The reference area (hereinafter “RA”) has been set according to the approved VCS Module VMD0007 version 1.0 and the minimum reference area (MREF hereinafter) has been calculated by the following procedures:

$$\text{MREF} = \text{RAF} * \text{PA} \quad (\text{equation 1})$$

$$\text{RAF} = 7500 * \text{PA}^{(-0.7)} \quad (\text{equation 2})$$

MREF: Minimum area of the reference area (ha)

RAF: Coefficient of Reference area 1.25 (derived from eq. 2)

PA: Project target area (ha)

PA is 250,751 ha and MREF is 312.489 ha which was calculated by equation 1. 312,489 ha of RA were located to include PA. Bands 3, 4 and 5 were used for the analysis.

The land use in 2013 included compartments of Acacia plantation of WSL/MTI and the satellite image of 2013 had a high percentage of cloud cover. In order to prevent these effects from influencing the reference scenario (the scenario without project of WSL/MTI/MW), parts of the compartments and cloud cover were replaced with the images of land use (moderately/severely degraded swamp forest) in 2009.

The main change of land use from 1997 to 2013 are conversion of moderately degraded swamp forest to severely degraded swamp forest / bush / shrub (forest degradation) and moderately/severely degraded swamp forest to other land use (deforestation) in PA, and to mining area and/or oil palm plantation(deforestation) in RA. In the concession area of WSL, the forest degradation from illegal logging was detected. The deforestation from illegal logging and slash-and-burn cultivations were detected in MW.

#### **4.2 Changes of forest carbon stocks**

Carbon stocks of RA were calculated by multiplication of EF and the area of the land use. The results show the reduction of the total carbon stock in the past 15 years and the reduction might be mainly from decreasing of carbon stock of Moderately degraded swamp forest, which is a relatively high carbon stock in RA. Degradation and deforestation of moderately degraded swamp forest might be caused by illegal logging and slash and burn cultivation, development of mining and oil palm plantation.

#### **4.3 Reference Area and Reference Level Setting**

Preconditions shown from current status of land use and tendency of past land use change from image analysis as well as result of this observation and past current site observation, are provided in the review of reference area. When there is no reference area, it is considered as the most possible future scenario. Main information given in this observation is shown by table below. As for project subject area, in order that Industrial Plantation Forest (HTI) development license can be issued, oil palm plantation development in project subject area and industrial forestation industrial large-scale land use change by other business entities is not expected to happen. Meanwhile, illegal cultivation by illegal logging and fire agriculture, and comparatively small scope of land use change by illegal local residents, where there is no businessman takes control of local area, it is then considered to still continue and expand. In this research, for reference scenario, without managing forest as a project, land use change prior to project execution is continuing; in other words, deforestation by illegal logging and field cultivation by fire agriculture will continue and expand as well in the future. In West Kalimantan REDD+, information about policy (which puts past deforestation and degradation trend as reference level) was obtained, and confirmed if it complies with this policy.

**Main Precondition for Considering Reference Scenario and Reference Level**

Item	Information scheme
Forest logging	Until right before starting the project, illegal logging is vibrantly going on.
Use change to farmland	Until before starting the project, land use change of mosaic condition by fire agriculture was spreading.
Agricultural land use	In surrounding of the area, oil palm and industrial reforestation are the main industrial land use change, and both are involving feat drainage. However, it is not executed within industrial reforestation concession
Social economic condition	With the tendency of population increase, while demand for business expansion becomes high, pressure onto the forest is considered to become high.
Thinking way of reference scenario in West Kalimantan province	Is the policy that puts land use change historical trend as of recent years as reference level. It is basically the same as the way it is utilised in this study.

Source: JICA Survey Team

The past change in forest carbon cumulative amount is surveyed.

**4.4 Future scenario setting**

## (1) Future scenario setting

Other than forest management scenario (project scenario) with method that considers environment assumed in this project area, land use change so far is set as continuous scenario in forest management scenario without consideration towards environment, and without doing forest management. Assumption of each scenario is shown in the table below. The difference which assumes large effect in climate change is the requirement in availability of forest management, protected forest establishment, drainage, and water level maintenance. While assuming fire ignition and fire prevention countermeasure, it is assumed large effect is spreading with GHG generation by peat combustion. As given in Section 4.2, where GHG emission reduction result evaluation method is used in this observation, conservative assumption was made in this research, and there is no difference in peat combustion among the scenarios.

**Future Scenario Overview**

No.	1	2	3
Scenario	【Reference scenario】	【BAU scenario】	【Project scenario】
Summary	Illegal logging and illegal farming keep going on.	The existing form (minimum environment consideration, drainage is operated) of forest management is exercised	Forest management with environment consideration is exercised.
Availability of forest control	N/A	Available	Available
Protected forest setting	N/A	Lowest limit that still complies to regulation (conservation district 10%, native tree species area 20%)	Vigorously protected forest HCVF setting
Drainage and water level maintenance	No drainage	With drainage Fire by soil drying is not uncommon	Water level control is executed. Soil moisture is high, fire is rare
Fire ignition	Small fire ignition keeps going by fire agriculture	Ground clearance by fire is carried out	No fire ignition.
Fire prevention countermeasure	N/A	Available	Thorough / consistent
Land use change	Natural forest degradation by illegal logging continues. Fire agriculture farm in mosaic condition is expanding, deforestation continues.	Excluding protected area, degraded natural forest is shifted to artificial forest. Protected forest degradation continues.	Excluding protected area, degraded natural forest is shifted to artificial forest. Protected forest degradation continues.

Source: JICA Survey Team

(2) Land use cover area setting in every scenario

Based on reference scenario and future scenario, land use cover area in 2020 and 2030 is estimated. For land use cover area, the effect is imparted onto GHG emission amount by natural decomposition of organic soil; this area setting makes project scenario to be conservative. Land use cover area in 2013, 2020 and 2030 are shown in the next tables. Regarding GHG emission amount by natural decomposition of organic soil, the area value in 2013 for 2014-2019, 2020 for 2020-2029, and 2030 for 2030-2034 are used in the calculation.

#### 4.5 Project Emission Amount and Leakage Estimation

(1) GHG emissions from implementation of the forest management

In project scenario and BAU development scenario, forest management is conducted in the project area. In this observation, as an important activity to consume fossil fuel in forest management (based on 1) sapling growing, 2) sapling transport, 3) logging and exporting, and 4) dredging) project's GHG emission amount is estimated from predicted amount of fuel consumption in accordance to utilization of heavy equipment and vehicles. Type of fuel is diesel oil, emission factor of 0.0692 kg-CO<sub>2</sub> / MJ, 38.2 MJ/L is used. Project scenario and BAU development scenario are of the same amount, GHG emission amount due to forest logging and fuel consumption local resident in reference area is zero. In fact, deforestation area in BAU development scenario is to be larger than project scenario, so project scenario's project emission amount for BAU becomes small. Further, also in reference scenario, fossil fuel decreases due to shift to wood logging, wood and agriculture products by local residents. Because of this, in comparison within scenario, this evaluation method is considered conservative.

GHG emission estimated amount in accordance with logging process is surveyed.

(2) GHG emissions from the chipping process

The main sources of GHG emissions from the chipping process are log transportation (river), conveying timber materials in plant, handling wood chips, transporting wood chip products (river) and electricity generation. The consumption of diesel fuel for heavy machines and transporters and coal for the energy plant were estimated and GHG emissions were calculated with emission factors: diesel fuel 0.0692 kg-CO<sub>2</sub>/MJ or 38.2 MJ/L, and coal 0.09kg-CO<sub>2</sub>/MJ or 26.2 MJ/kg.

Estimated GHG emissions of the chipping process are surveyed. The GHG emissions of this process in the reference and BAU scenarios are determined to be zero in this study.

#### 4.6 Greenhouse Gas Emission Effect

The future scenario is based on the three decided scenarios: ① continuation of existing land use change without forest management scenario (reference scenario), ② forest management by method that not sufficiently takes environment into consideration scenario (BAU development scenario), and ③ forest management by method that takes environment into consideration scenario (project scenario), absorption and emission amount estimation of GHG by land use change, GHG emission amount by organic soil natural decomposition. GHG emission by organic soil combustion is estimated, and

moreover, project emission is estimated from diesel oil consumption amount per forest management project activity; in other words, effect towards climate change is taken into consideration.

(1) Effect by land use change

Forest carbon cumulative amount of each scenario is estimated. Forest carbon cumulative amount within evaluation period of 2034 is estimated from reference scenario of 17.0 million t-CO<sub>2</sub>, BAU development scenario of 23.7 million t-CO<sub>2</sub>, and project scenario of 25.8 million t-CO<sub>2</sub>, and by forest management, by controlling random forest logging and land use change, forest carbon cumulative amount is suggested to have continuous protective effect. Also, based on HCVF research, protected forest area is set higher than usual; thus it is more possible that forest carbon is fixed. To evaluate it conservatively, forest recovery by protected forest control is not included in estimation. By appropriately control protected forest, so that remaining natural forest recovery can be foreseen, the effect to climate change related to forest carbon cumulative in project scenario is considered higher than this result.

(2) Effect of GHG emission by organic soil decomposition

With regard to organic soil, or in other words GHG emission by peat natural decomposition, estimated result in each scenario is given in the table below. It is known that peat natural decomposition is closely related to water level. GHG emission amount in reference scenario where drainage channel installation and large-scale land use change are not conducted is the least, and emission in BAU development scenario where drainage is operated is the highest.

(3) Effect of GHG emission from organic combustion by fire

As described in project emission amount section in Section 4.4.6, in GHG emission amount per peat combustion by fire it is evaluated with no difference in the scenario. Project scenario maintains water level without operating drainage, and conducting fire proof control. Also, ground clearing by fire is not done in normal industrial plantation. Because of this, fire incident risk is considered small, and is evaluated with no difference between scenario and is called conservative method.

(4) GHG emission amount per forest management industrial activity

GHG emission amount per heavy equipment and vehicle used in sapling planting, sapling transport, logging and exporting, and dredging until 2034 is the same in BAU development scenario and project scenario. Since protected forest setting area is many in project scenario, and compared to BAU development scenario the plantation area is fewer, GHG emission amount in actual BAU development scenario is less compared to project scenario. Also, in reference area, diesel oil is consumed for wood logging by local residents as well as wood and agriculture shift, so this is considered as zero. The annual total GHG emission of the chipping process is estimated. The GHG emissions of this process in the reference and BAU scenarios are determined to be zero in this study.

## (5) Conclusion

Compilation of GHG absorption and emission by land use change, GHG emission by organic soil decomposition, and GHG emission per diesel oil consumption per GHG emission and forest management project activity by organic soil combustion, contribution level is considered for the climate change countermeasure of this project.

From above result, the hypothesized forest management scenario (forest management with environment consideration, in protected forest setting, based on chemical observation, HCVF is vigorously set up, water level is controlled without operating drainage, forest management that thoroughly executes fire prevention countermeasure without ground clearance by fire is considered effective as climate change countermeasure. Area where random deforestation and land use change take place, and in areas where non-environmental protection project is carried out or under planning to promote forest management project with environment protection like this project, future GHG emission from subject area is controlled, and this is considered as one of effective methods as climate change countermeasure.

Regarding effect for climate change on forest management as researched in this study, the possibility as climate change countermeasure is to be evaluated as quantitatively as possible, not aimed to generate emission right. Also, for evaluation method and utilized data, the parameter does not comply to the formula, so we incorporated other information during the research. The next phase of research development progress and international rule establishment related to climate change is in progress, and is predicted to be more precise and transparent so that higher calculation method can be developed.

### **4.7 Evaluation with Regard to Environmental Integrity and Sustainable Development**

When evaluating effect on climate change extended by forest management of this research and possibility as climate change contribution, regarding other side of greenhouse gas absorption and emission control, there are also some points to keep in mind. In Conference of the Parties COP16 within climate change framework (2010, Mexico, Cancun), the signatory nations united, and aimed to reduce, stop, and turnover the loss from forest degradation and carbon. Hence, consideration towards the consistency of environmental integrity and the multifunction of forest ecosystem, sustainable forest management promotion is pursued. Also, in the same treaty in Conference of the Parties COP16 (2010, Mexico, Cancun), regarding REDD+ safeguard, the following matters were agreed:

- ① National forest program and related national treaty and agreement is to be supplemented
- ② transparent and effective forest governance
- ③ respect to knowledge and rights of indigenous people
- ④ participation of local people and stakeholder
- ⑤ natural forest and biodiversity protection conservation
- ⑥ activity to deal with risk turn around
- ⑦ emission shift reduction activity

This project is not to be implemented as REDD+ project, from consideration of biodiversity and indigenous people, and contribution side to sustainable development, so endeavours of this project are to be verified.

(1) Biodiversity consideration

In this project, study related to High conservation value forest (HCVF) is to be conducted, content of proposal from research institution is to be reflected in the action plan. On the conservation value that should be reserved, biodiversity, landscape value, environmental service from the forest, basic requirement from local community, traditional cultural identity of local community are to be given, but in this project especially consideration towards biodiversity, protected forest is set high from legal requirement aspects, and to demonstrate effort to preserve natural forest.

(2) Consideration towards local people

In this project, through process of obtaining agreement from local people in regards to the action plan, especially the content of HCVF research proposal, and specifically agreement making on conservation value are to be put on best effort basis. The characteristic of agreement form on the executed projects, explanation in advance and agreement making execution about annual plan are given, and decided in every following year, every level, every subject area and every particular requirement, and detail agreement making is carried out. In this project, it is the plan to carry out the next agreement binding the process basically on the achievement so far.

(3) Contribution towards sustainable development

In this project, during the employment in project execution, also contributing to local economic development, and to make it sustainable profitable, the plan will introduce seedling planting from local people, and sell the seedlings. Also, based on community support plan, inflation improvement support (harbour, road, school, auditorium) is to be executed, thus contributing to local social life environment. Further, employee’s medical clinic is to open to the local people, and by being responsible for the core of medical care, it is expected to contribute to local people’s well-being.

As above, this research project can be considered as giving considerable support towards consideration on the implementation of climate change countermeasures.

**4.8 Comments from Stakeholders**

Interview was conducted for experts from Japan and government related parties from Indonesia, to get opinions about evaluation methods for this research and contribution possibility for climate change countermeasures. Main comments are as follows.

Research subject	Main content of the opinion
Expert in forest field related to climate change (Japan)	Peat parameter has yet been decided. Literature related to peat (Nature publication) should be collected with effort. Peat depth and sedimentation speed received the effect of micro-topography, and difficult to standardize. Research method of this study (past trend evaluation method, reference level setting method, future scenario (without project, insufficient environment consideration scenario (BAU development scenario), environment consideration scenario (project scenario))) can be outlined. How to evaluate the analysis on peat when water passage is established and water level is given should be solved. Future collaboration with IJ-REDD+ should also be further studied. This forest management project’s water level development know-how can be considered as REDD+. For example, planting canal in industrial plantation area which lower the water level can increase the water level, and stopping oil palm plantation development which lower the water level, it becomes plantation area which can maintain water level can be considered.

Research subject	Main content of the opinion
Researcher in conservation technology and tropical peat monitoring technique (Japan)	<p>The role of the forest sector in the private sector is very important as climate change measures in the peat area of Indonesia. Progressive approach that is environmentally friendly forest business sector plays an important role.</p> <p>Lowering the water level will cause peat decomposition operation to process which will become problem. For industries that adopt the management methods, including carbon value, which does not maintain the water level, it is necessary to consider that external non-economic cost will harm the business operation.</p> <p>Large-scale forest management with the environment consideration for climate change mitigation and environmental protection is considered significant, but it is necessary to perform well and verification monitoring, it should be able to prove scientifically the effect . It is necessary to measure the water level and flux to a minimum implementation.</p> <p>Model showing relationship between water level and peat analysis to some extent has been completed. It is recommended to use the comparison parameters (non-forest land forest without a drain, drain of forest have, drained) developed in Hokkaido University.</p> <p>Emissions vary greatly due to season change and level of dryness. Emission amount is less for forests in the following order: arid land with drain &gt; forest with drain &gt; forest without drain. When the water level such as El Nino is significantly lower, emissions from forest without drain rises temporarily. It can explain why organic particle is easy to decompose and accumulated in the forest floor.</p>
Expert in forest policy and climate change (Japan)	<p>Accurate map for peat distribution does not exist, but there are peat distribution maps developed by Wetland International and map owned by Ministry of Forest and Ministry of Agriculture, although it does not accurately reflect the actual situation in the field. It is difficult for public to access a map owned by government institution.</p> <p>With support from West Kalimantan government on JICA's climate change countermeasure project, provincial climate change countermeasure RAD-GRK was developed. Despite bell-shaped distributed, DNPI has held a symposium on peatland management, positioning of peatland has become important in the climate change countermeasure. Performing accurate assessment on peatlands to reduce CO<sub>2</sub> emissions has drawn interest from government.</p> <p>Because accurate data on peat distribution does not exist, evaluation of emission reduction may be difficult, but quantitative evaluation is important to reflect the study result.</p> <p>If using CO<sub>2</sub> emission reduction method by raising underground water level is possible for planting, although it does not necessarily have to fit into REDD+, could it not be claimed as contribution from plantation industry to emission reduction for climate change countermeasure? Furthermore, it would be nice if the result of JICA's forest fire prevention project which is currently being carried out in West Kalimantan province (fire prevention by local system) can be used in plantation project.</p>

Sauce : JICA survey team

#### 4.9 Cooperation and Collaboration with Other Projects/Programs in The Associated Fields

##### (1) IJ REDD+ Project conducted by JICA

Targeting West and Central Kalimantan provinces, JICA has started the project titled "Indonesia-Japan Project for Development of REDD+ Implementation Mechanism" (Technical cooperation) in June 2013 and projected to continue for three years. The following is the outline of the project

#### Outline of the IJ REDD+ Project

Item	Outline
Scheme	Technical cooperation
Title of the Project	Indonesia-Japan Project for Development of REDD+ Implementation Mechanism
Project Period	From June 2013 to June (for three years)
Overall goal	Implementation mechanism for REDD+ developed in the titled project is integrated into the national level mechanism of REDD+ implementation.
Project purposes	The REDD+ implementation mechanisms is developed in West and Central Kalimantan provinces.
Outputs	<p><u>Outline 1</u>: Frame of REDD+ implementation at sub-national level is developed.</p> <p><u>Outline 2</u>: A model to implement REDD+ in Gunung Palung National Park</p> <p><u>Outline 3</u>: A model to implement REDD+ in three types of forests such as production forest, protection and other forests located outside of national forest land (<i>kawasan hutan</i>).</p> <p><u>Outline 4</u>: Capacity of carbon monitoring is enhanced.</p> <p><u>Outline 5</u>: Project experiences are referred and in the process to develop the national-level implementation mechanism for REDD+</p> <p>➤ Output 1, 2 and 3 are supposed to be the products of the activities in West Kalimantan province.</p>



Item	Outline
	Output 4 is the products of the activities in Central Kalimantan province and output 5 is the one at the national level.

Source: Brochure of the Project

Activities related to output 1 to 3 are projected to be implemented in West Kalimantan province. In particular, output 3 aims to develop the REDD+ implementation mechanism to target the production forest (*kawasan hutan produksi*). In this regard, because the proposed Project is industrial plantation project, it has not been clearly determined whether the Project is appropriate to be a pilot case of REDD+. However the proposed Project could provide its field-based experiences on the practices of safeguards required by the framework of REDD+. They relate to collaborations with the local communities in establishing plantation and practicing the forest conservation and management.

Therefore as one of the entities that is engaging in the development and conservation of the forest resources, the proposed Project is requested to build and continue the cooperation and collaboration with the IJ REDD+ project in developing the implementation model of REDD+ particularly when the REDD+ project needs to consult on project in related fields.

A JST-JICA research project “Wild Fire and Carbon Management in Peat-forest in Indonesia” was implemented from 2010 to 2014 in Central Kalimantan. The study targeted peat land and its surrounding forest. Hokkaido University which has excellent research experience on peat land initiatively managed the project and developed a methodology to evaluate carbon stocks and dynamics and developed a carbon circulation model in peat land. It is expected that the outputs will be improved and utilised to evaluate the carbon emissions from peat land area as a part of the REDD+ scheme.

The project is outlined in Table below.

**Wild Fire and Carbon Management in Peat-forest in Indonesia**

Item	Project descriptions
Scheme	Technical cooperation
Title of the Project	Wild Fire and Carbon Management in Peat-forest in Indonesia
Project period	From February 2010 to March 2014
Overall goal	Not set
Project purposes	Model of wild fire and carbon management in peat-forests developed
General Description of the Research Project	<p>The peat accumulated beneath a tropical peat swamp forest could be ignited and burn down the forest</p> <p>Enormous quantities of carbon are stored in peatlands in the low marsh areas of Indonesia. If drainage channels are dug in the peat and the deposits of vegetation dry out, both hot combustion (peat fires) and cold combustion (microbial decomposition) occur, releasing large quantities of carbon into the atmosphere and resulting in a loss of the biodiversity. Moreover, the carbon monoxide and fine particles released would threaten the health of residents. This project aims to develop water management appropriate for the region, restore the forests, create an early fire detection system using satellites, and establish measures for rapidly extinguishing fires — all measures that are needed to restore these peat marshes. The data will be integrated with satellite GIS data to build carbon flux models that will contribute to creating REDD-plus* and MRV** standards.</p> <p>* REDD-plus: Reducing Emissions from Deforestation and forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries ** MRV: Measurement, Reporting, and Verification</p> <p>Building a system for comprehensive management of peatland, inhibition of carbon release and carbon management</p> <p>The world’s only MRV system capable of accurately determining carbon emissions from peatland was created by integrating ground and satellite data. This system will be used with REDD-plus to restore and maintain the tropical peat swamp forests that are the earth's most important carbon sinks and treasure troves of biodiversity.</p>

Resource: <http://www.jica.go.jp/oda/project/0802751/index.html>

The Project members are proposing that the knowledge and methodologies developed in Central Kalimantan through the research project should be applied to the whole Kalimantan area including West Kalimantan. Regarding the process of developing comprehensive methodologies of REDD+ in the region and coordination among provinces which the Indonesian government has been facing, the outputs of the project make a potentially important contribution. The implementation of the sustainable forest management, like the project that was evaluated in this study, will have a great impact to reduce GHG emissions at the provincial level. When IJ-REDD+ project promotes REDD+ activities, including developing REDD+ implementing systems at the field level, entities of forest management should share skills and knowledge on forest management with IJ-REDD. Additionally, the continuous cooperative relationship between IJ-REDD+ project and forest industry will be invaluable.

(2) Program of Community Development of Fires Control in Peat Land Area

Since June 2010, JICA has been implementing the project titled above in enhancing the capacity of the communities in fire control in the peat and forest areas. Outline of the project is as follows.

**Outline of the Project**

Item	Outline
Scheme	Technical cooperation
Title of the Project	Program of Community Development of Fires Control in Peat Land Area
Project Period	From July 2010 to July (for five years)
Overall goal	Frequencies of wild fires in peat and their total areas decrease in the target province.
Project purposes	The target communities in the project area are well organized to implement fire control and their capacities are improved.
Outputs	<u>Output 1:</u> Methodologies of fire control are developed by collaboration between the communities and the local governments in and around the protection forests ( <i>kawasan hutan lindung</i> ). <u>Output 2:</u> Approaches of fire control by participation of the target communities are developed outside of the protection forests. <u>Output 3:</u> Policies, directions and plans of fire prevention e.g. including the development plans of forest fire prevention offices (DAPOS) are improved with emphasis on the fire control through collaboration with the communities.
Inputs by Japanese side	Long-term experts: Organization development/Chief adviser, Fire control by communities, Training for fire control, support to local governments, coordinator Short-term expert: Extension of forest fire control technologies, Extension of peat fire control technologies, others

Source: Project information <http://gwweb.jica.go.jp/km/ProjectView.nsf/>

To produce outputs 1 and 2, the project prepared a guidebook of forest and land fire prevention for the villages in the peat land area in June 2013.

**Contents of the Guidebook**

<p>Guidebook (Original version in Indonesian)</p> <p><u>Part 1: Activities to target various stakeholders and the relevant agencies</u>                      Guidebook on the forest fire control in the villages located in peat areas</p> <p><u>Part 2: Activities in the target communities</u>                      Series A: Village-based fire control program                      Series B: Prior explanation on the village-based fire control and program for the preparation                      Series C: Fire control plan through land management and its implementation                      Series D: Fire control through practicing land management                      Series E: Fire control plan through activating the community groups                      Series F: Practices of fire control through activating the community group</p>
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Series G: Plan and implementation of the advanced stage of fire prevention

Source: Guidebook prepared by the Project

Project activities are mainly implemented in the protection forests (*kawasan hutan lindung*). Meanwhile the SST (Social & Security Team) of the proposed Project has been implementing village-based fire control in the WSL and MTI area since its commencement in 2010. Their daily activities are not fully disciplined nor structured as described in the guideline, but well achieved in a practical sense in promoting mutual understanding between the Project and the community, and developing the understanding of the Project. They also grasp the practices of slash-and-burn by the people in farmland preparation which consequently could cause forest fires in a wider area, and it gives them technical instructions on how to use fire to control spread of fire in the surrounding forest and plantation.

The Project will have to strengthen its organizational setup to respond to the expansion of the plantation area in the years to come; thus more staff need to be assigned to do regular visitation and patrol to the target area and the communities. However only increasing the number of staff will not be able to cover all the requirements in the expanded target; thus it is essentially important to provide more support directly to the communities in developing their capacity further to practice firm forest fire control by themselves.

In this sense, the guidelines and other materials on fire control are essential and useful for the proposed Project. In the period to come, the Project should fully utilize such materials to develop the understanding and positive attitude of community members toward fire control using a more disciplined and structured approach.

(3) Cooperation with other projects/programs

Adding to the technical cooperation by JICA, some NGOs are implementing forest conservation and plantations in West Kalimantan Province. The following table shows the list of such project including those terminated. “Eco Future Fund” (EFF) carried out up to 2010 was a plantation to establish 40 ha of “green corridor” for the purpose to enhance the biodiversity conservation. From 2011 they have been developing a plantation using the indigenous tree species in the wetlands. The findings and field-based experiences of those projects are therefore good references for the proposed Project to refine the plans of community support in planting trees in social forestry area and conserving the protection areas. The project of International Charcoal Society has been terminated already; however the experiences of plantation in the communal lands in the project could provide good insights of developing such activities in the target communities in the proposed Project area.

**NGO Projects Which Are Under Implementation or Were Already Completed In West Kalimantan Province**

Name of NGOs	Project Title	Target and Period	Activity
Eco Future Fund (EFF)	Forest Rehabilitation Project in Ramando Nature Conservation Area	Central Kalimantan Province, from 2011 to present	Plantation to develop “green corridor” of 40 ha
	Rehabilitation of Swamp Forests in Peatland (Completed)	Central Kalimantan province, 2008~2010	Plantation of 8,000 seedlings of indigenous species in swamp forests
International	Rehabilitation of Degraded	West Kalimantan province	Development of plantation in

Name of NGOs	Project Title	Target and Period	Activity
Charcoal Society	Forests in West Kalimantan Province (Completed)	1995 - 2008	communal lands and school compounds. Their scales are from two to ten ha. Local NGOs and communities were mainly engaged in the activities.

Source: JICA Survey Team

Other than these projects/programs, feasibility studies of REDD+ were implemented during 2011 and 2012 funded by the Ministry of Economy, Trade and Industry and the Ministry of Environment (Global Environmental Centre) of the Government of Japan. Findings and outputs of the studies such as methodologies and implementation plan could be a source of reference in considering the application of framework of REDD+ to the proposed Project in the future.

#### 4.10 Future Problems and Proposals

Forest management of this study has been made to pay attention and various kinds of environmentally friendly forest management. Considerations that would bring big effect to climate change are:

- ① protected forests to be established in legal area will be well managed
- ② water level should be controlled without involving drainage in peatland,
- ③ no ground clearance by slash-and-burn
- ④ fire prevention should be thorough.

These kinds of forest management know-how are widely recognized as examples of best practice that take environment into consideration, and is expected to spread in other regions. Also, agriculture products coming from such forest management with environmental consideration are valuable, and are expected to be value-added.

In West and Central Kalimantan of Indonesia, areas where random forest logging and land use change are still on-going and areas where non-environmental conservation projects are executed or planned, are not few, which is in line with the background of this study. In case quasi-national level REDD+ or climate change solution is promoted, the forest center will have an important role, since running environment-conserving forest management as in this project would help control future GHG emission from such areas, and is considered as one of effective methods for climate change countermeasure. By continuously putting forest management into practice, strictly monitoring the condition and protecting forests that need conservation, it would be possible to bring positive impact to the economic condition of the areas. With quasi-national level climate change countermeasures, it is deemed necessary to create a mechanism and system to properly monitor the implementation and its progress, which is also one of the very important measures to promote forest management that continuously takes care of the environment.