

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 I & II)  
(JR)

April 2014

Japan International Cooperation Agency

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

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## Currency Exchange Rate

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>This report</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>Separate</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
HP-HTI	( <i>Hak Pengusahaan –Hutan Tanaman Industri</i> ) / Concession in the industrial forest area

## ABBREVIATION

Abbreviation	Bahasa Indonesia/Full word in English
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 countries/ plus

## ABBREVIATION

Abbreviation	Bahasa Indonesia/Full word in English
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
SOx	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 I Study Report**

## **CHAPTER 1 INTRODUCTION**

### **1.1 Background and Purpose of the Survey**

#### **1.1.1 Background of the Survey**

Indonesian forest land is one of the largest forest areas in Asian region and the third largest in the world. It covers 94.4 million ha, which is equal to 52% of the country's land area or 10% of world forest land (FAO 2010). It is a very valuable asset for Indonesia. However, from 2000 to 2005 an annual average of 1.09 million ha of forest land in Indonesia experienced degradation. This forest degradation causes negative impacts to local communities such as the increasing natural disasters, deterioration of local biodiversity and emission of Green House effect Gas (GHG).

Most of the local residents in rural areas of Indonesia, especially in West Kalimantan province, make their living from agriculture and fishery although natural resources for such activities are not always abundant. Furthermore, the peat soil prevailing in Kalimantan is in general not suitable for producing agricultural crops, which makes it difficult for the local residents to make their living only by agriculture. Hence, they sometimes rely on the illegal logging and slash-and-burn cultivation in natural forest areas. This results in further degradation of local environment and reduction of public benefits provided by the natural forests.

In these circumstances, it is recommended to introduce sustainable forest management which will enable creation of job opportunities for the local community. This approach will contribute to rehabilitation of degraded natural forests and help the local economy recover to some extent in the short term. Of critical importance is the creation of a sustainable forestry business. However, due to technical and financial problems, it is difficult for the Indonesian government to introduce the approach now using its own resources.

There are private forestry companies that possess the necessary techniques for conducting sustainable forest management. The drawback is that massive additional investment is required for social and environmental infrastructures for maintaining the peat soil conditions, environmental friendly operations, etc. This additional investment is for public benefit, but private companies have been shouldering those costs so far.

The Indonesian government stated in its "Master Plan for the Acceleration and Expansion of Indonesia's Economic Development" (MP3EI) that they would raise the nominal GDP six times by 2025 compared to that in 2010; this would make Indonesia one of the world's top 10 countries in terms of GDP. The Master Plan states that utilizing natural forests should be limited only to the production of non-logs products, and log production should be undertaken as a sustainable plantation business and/or social forestry. An internationally competitive log production and wood processing industry could be achieved by promoting sustainable industrial forestation.

The Ministry of Forestry established a Road Map as the Master Plan agenda for the forest sector. The objectives of this Road Map are: i) to achieve 10 million ha of industrial forestation by 2025, and ii) to increase the annual log production volumes to 363 million m<sup>3</sup>/year. However in 2010, only 430,000 ha of plantation and 14 million m<sup>3</sup>/year of annual log production had been achieved.

A total 1,590 trillion Rupees (Rp.) of investment is estimated necessary to complete the objectives of Road Map and 98.2% of this investment is expected to come from private companies. The invitation of private companies has not been successful because of the huge long term investment required and the difficulty to obtain financial support from banks or other financial institutions.

The Indonesian government stated in COP15 (Dec. 2009) that they would reduce 26% volume of CO<sub>2</sub> emission by 2020 compared to 2005. To accomplish this target, the Indonesian government also set up the Indonesia Climate Change Sectoral Road map (ICCSR). According to it, the Indonesian government will promote the introduction of Sustainable Forest Management (SFM) and REDD scheme, and achieve further expansion of industrial forestation.

In the assistance policy of Japan Ministry of Foreign Affairs for Indonesia, one of the most important points is assistance corresponding to the climate change problem. In November 2011, Japan and Indonesian concluded an agreement of “Bilateral Cooperation on Climate Change between the Government of Japan and the Government of Indonesia”. In the third clause of this agreement, it is stated that there will be further forest-related cooperation in promoting sustainable forest management.

Furthermore, JICA and Ministry of Forestry of Indonesia concluded Minutes of Meeting (MM) and issued a joint statement that JICA will continue to strengthen support for climate change measures such as REDD in cooperation with the Indonesian government and the Ministry of Forestry.

Consequently, one of the major Japanese forestry companies, Sumitomo Forestry Co., Ltd. has stated its intention to develop an industrial plantation and wood chip production in western Kalimantan by applying the technologies of sustainable forest management. Because they aim to build a kind of social infrastructure by protecting the surrounding natural forests and using environmental conscious technologies in maintaining the plantation site, it could qualify to receive financial support such as overseas investment of ODA in a form of Public-Private Partnership (PPP) between Indonesia and Japan.

### **1.1.2 Objectives of the Survey**

The objective of the survey is to clarify the necessity, viability and sustainability of the project in view of technical, financial, and environmental aspects, and to propose an optimum implementation plan basis (PPP/BOT etc. or as a private project) and O&M schemes utilizing private funds, international funds, and public funds.

## **1.2 Survey TOR**

This survey will be implemented based on the TOR which was agreed between JICA and JICA Survey Team. The TOR and outputs of the survey are shown in table below.

### Survey TOR and Major Outputs

Survey TOR		Major outputs
1. Confirming the background and necessity of the proposed project	1-1. Review of industrial forestation sector in Indonesia 1-2. Review of natural and social economic conditions in the project area 1-3. Necessity of the proposed project	(Phase -1 & -2) ➤ Confirming: i) matching between upper plans and policies of Government of Indonesia and project, ii) implication of the project in the industrial forestation sector ➤ Data book of natural and social economic conditions of the project area ➤ Explanation of the necessity of the project
2. Consideration and planning of project implementation	2-1. Development of project objective and scope 1) Industrial forestation: review of existing plantation project and confirmation of the project target area 2) Wood chip production: review of existing wood chip projects in Indonesia, confirmation of place and location of planned area of wood chip factory 2-2. Setting of design conditions and outline design 1) Industrial forestation: seedling production, planting operation, nursing and maintenance of planted trees, harvesting and re-plantation, marketing, infrastructure development, plan of trainings for the employed workers, consideration of supports to the local communities 2) Wood chip production: Construction of the wood chip factory, estimation of amount of logs supply and wood chip production & selling, development of infrastructure, biomass utilization, transportation and export of wood chips 2-3. Development of construction plan and implementation system/schedule, project cost estimation	(Phase-1) ➤ Reforestation plan (based on reviewed existing plan) composed with plantation area, plantation area/ methodology/ amount, plantation/ logging / log transportation plan ➤ Wood chip production plan composed with chip factory construction plan, plans of wood chip production scale/ methodology/ amount, and plans of wood chip transportation and marketing ➤ Construction plan, project implementation system and schedule ➤ Breakdown of project cost estimation ➤ Outline design maps of plantation area, which will show working blocks.
		(Phase-2) ➤ Reforestation plan (based on the reforestation plan of Phase-1) composed with plantation area, plantation area/ methodology/ amount, plantation/ logging / log transportation plan ➤ Wood chip production plan (based on the plan of Phase-1) composed with chip factory construction plan, plans of wood chip production scale/ methodology/ amount, and plans of wood chip transportation and marketing ➤ Construction plan, project implementation system and schedule ➤ Breakdown of project cost estimation ➤ Outline design maps of plantation area, which will show operation blocks.
		(Phase-1 & -2) ➤ Plan of trainings for the employed workers, ➤ Consideration of supports to the local communities
3. Environmental considerations	3-1. Environmental consideration study 1) Screening, preparation of check list & monitoring form following JICA guideline, consideration of monitoring system 2) Consideration of the impacts on the natural environment, and mitigation measures for the impacts 3) Consideration of impacts on the social environment, and mitigation measure for the impacts 4) Consideration for gender and social vulnerable group	(Phase-1 & -2) ➤ Environment screening table ➤ Check list and monitoring table ➤ Report at Initial Environmental Examination (IEE) study level including environmental monitoring plan
4. Consideration of contribution to measures for climate change	4-1. Review of legislations and policies related to climate change measures 4-2. Review of plans and projects related to climate change measures surrounding project area 4-3. Consideration of contribution possibility of the project to the climate change measures	(Phase-1 & -2) ➤ Confirmation of the matching between upper level legislations/ plans and the proposed project ➤ Listing up of the issues of the climate change measures in the project area ➤ Consideration of possibility and issues of applying the climate change measures for the proposed project such as, increasing of carbon stock amount, decreasing of carbon emission, climate change measure scheme



Survey TOR		Major outputs
5. Financial analysis and fund procurement	5-1. Role/ cost sharing between government and private sector 5-2. Fund procurement in the initial stage 5-3. Cash flow analysis (Equity IRR, DSCR) and sensitive analysis 5-4. Stakeholders analysis (history, finance, technical matters) 5-5. Confirmation of related legislation	(Phase-1) ➤ Project Implementation organization chart ➤ Fund procurement plan for reforestation and wood chip production ➤ Calculation of Equity IRR, DSCR, identified uncertainties and its impact ➤ Capacity of project company
		(Phase-2) ➤ Same as above. However, accuracy of design and cost estimation of Phase-2 is based on outline design level.
6. Risk analysis and consideration of mitigation measures	6-1. Risk analysis and consideration of mitigation measures related to implementation of the project 6-2. Confirmation of necessary contracts and setting of items for the project implementation	(Phase-1) ➤ Identification of risk, contents of mitigation measures against to risk
		(Phase-2) ➤ Same as above. However, accuracy of design and cost estimation of Phase-2 is based on outline design level.

Source: JICA Survey Team

### 1.3 Survey Schedule

Figure below shows Survey Schedule

No. (ICR)	Work Items	2013					2014								
		July	August	September	October	November	December	January	February	March	April				
	<b>Preparation of the Survey</b>														
3.2.1	Analysis of Related Materials and Understanding of Background of the Project														
3.2.2	Preparation of Plan of Operation for the First Field Survey														
3.2.3	Preparation of Sub-contracts														
3.2.4	List up and Preparation of Check List of Basic Data														
3.2.5	Preparation of Draft Criteria of Selection of Reforestation Areas														
	<b>Reconfirmation of the Necessity and background of the Project</b>														
3.3.1	Reporting of ICR														
3.3.2	Interview to the Industrial Plantation Sector in Indonesia														
3.3.3	Contract and Implementation of Sub-contract Survey														
3.3.4	Review of Latest Information on Industrial Plantation in Indonesia														
3.3.5	Review, Identification of Issues and Information Collection of Achievements of Existing Two Projects														
	<b>Preparation of Project Implementation Plan: Project-1</b>														
3.4.1	Confirmation of the Project Frame														
3.4.2	Reforestation/Logging Plan														
3.4.3	Infrastructure for Reforestation Plan														
3.4.4	Wood Chip Production, Transportation and Marketing Plan														
3.4.5	Port Facilities Plan														
3.4.6	Plan of Trainings for the Employed Workers														
3.4.7	Confirmation of Environment Impacts and Social Consideration														
3.4.8	Consideration of Supports to the Local Communities														
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3.4.11	Risk Analysis														
3.4.12	Organization of Project Operation and Maintenance														
3.4.13	Project Implementation Schedule														
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	<b>Preparation of Project Implementation Plan: Project-2</b>														
3.4.1	Confirmation of the Project Frame														
3.4.2	Reforestation/Logging Plan														
3.4.3	Infrastructure for Reforestation Plan														
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	<b>Preparation of the Survey Report (from the Stage of ITR)</b>														
	Preparation of the Interim Report (IT/R, draft)														
	Finalization of the ITR and Submission to JICA														
	Preparation of the Draft Final Report (DF/R, draft)														
	Finalization of the DF/R and Submission to JICA														
	Preparation of the Final Report (FR) and submission														

Source: JICA Survey Team

### Survey Schedule



## CHAPTER 2 RECONFIRMATION OF PROJECT BACKGROUND AND PROJECT RATIONALE

### 2.1 Socio-Economic Situation of Indonesia

#### 2.1.1 Overview of Indonesia

Indonesia is one of the world's largest archipelagos comprised of 178 principal islands spread over 1,888 km (between latitudes 6°N and 11°S) and 5,110 km (between longitudes 95°E and 141°E). Its surface area is 1.890 million sq.km, which is five times larger than that of Japan. Indonesia is world's fourth populous country after China, India and United States of America with over 238 million people, which is 1.7 times larger than Japan. People of Malay origin dominate the nation while there are approximately 300 distinct native ethnic and linguistic groups, the largest being Javanese and Sundanese. Islam is the religion over 90% of the nation.

Thanks to stabilization in political and financial areas and the robust expansion of individual consumption, economic growth achieved 5-6% in real terms after 2005, compared to only 3.6% in 2001. Then, it dropped to 4.6 in 2009 reflecting the global financial crisis, but it recovered to 6.2% in 2010 and has shown 6% growth afterwards. Indonesian per capita GDP reached US\$3,000 in 2010.

The trade balance has turned negative since 2012 due to the economic slowdown in China, a major importer from Indonesia, especially of the natural resources, while at the same time the import of goods and petroleum products increased due to robust domestic consumption.

#### Trend of major economic indicators in Indonesia

Year	2008	2009	2010	2011	2012
Real GDP growth (%) (price:2000)	6.0	4.6	6.2	6.5	6.2
Nominal GDP IDR billion	4,948,688	5,606,203	6,446,852	7,422,781	8,241,864
Nominal GDP US\$ million	510,229	539,582	709,191	846,342	878,043
Nominal GDP per capita US\$	2,211	2,300	2,986	3,511	3,592
CPI increase (%)	11.06	2.78	6.96	3.79	4.30
Unemployment ratio (%)	8.4	7.9	7.1	6.6	6.1
Industrial Production Index growth (y-o-y) (%)	127.2 3.0	128.9 1.3	134.6 4.5	104.1 4.1	108.4 4.1
current balance (BOP) US\$ million	126	10,628	5,144	2,069	-24,074
trade balance (BOP) US\$ million	22,916	30,932	30,627	35,348	8,619
foreign reserve US\$ million	49,597	63,563	92,908	106,539	108,837
external debt US\$ million	155,080	172,871	202,413	225,375	251,200
foreign exchange rate (year end, US\$)	10,950	9,400	8,991	9,068	9,670
Money supply growth (%)	14.9	13.0	15.4	16.4	n.a.
Foreign Direct Investment US\$ million	14,871	10,815	16,215	19,475	24,565

Sources: Country statistics JETRO (referred from government of Indonesia, including BPS, central bank, BKPM)

In May 2011, to expedite the process of sustainable economic growth by construction of the economic corridors across the archipelago, President Yudhoyono announced "Master plan for Acceleration and

Expansion of Indonesia Economic Development 2011-2025” (Masterplan Percepatan dan Perluasan Pembangunan Ekonomi Indonesia – MP3EI). The master plan aims to leverage the massive infrastructure investment of IDR 4,000 trillion, or JPY40 trillion, for the ambitious target of boosting the nominal GDP per capita from US\$3,000 in 2010 to US\$16,000 in 2025 and transforming Indonesia into one of the top 10 economies in the world (cf. Indonesia was 18th country in the world in 2010). However, it is necessary to consider the impact of slowdown of the world economy.

From a political perspective, Indonesia experienced some instability in administration with three presidents (Habibie, Wahid and Megawati) in six years. However, in September 2004, President Yudhoyono won the nation’s first direct presidential election and then was strongly re-elected in July 2009. It will be interesting to see the outcome of the next presidential election, which is scheduled in 2014.

Japan is the largest donor country and has been supporting infrastructure construction. Indonesia is the most important supplier of natural resources to Japan. The relationship of two countries is an important one.

### 2.1.2 Economic Conditions of West Kalimantan State

The benefits of economic development in Indonesia have been distributed throughout the country; hence, weight of Java and Bali in national GDP growth has been steadily decreasing. Contribution of Kalimantan Province to national GDP also increased from 9.49% in 2004 to 9.55% in 2011. However, economic development in Kalimantan Province has been driven by resource rich East Kalimantan State and growth of West Kalimantan State has been below the national average. West Kalimantan’s proportion to national GDP has decreased from 1.35% in 2004 to 1.11% in 2011. West Kalimantan State was overtaken by South Kalimantan State in provisional Gross Regional Domestic Production in 2011 and currently ranks 3<sup>rd</sup> largest in the region.

#### Contribution of Provinces to national GDP (Nominal)

Province	2004	2005	2006	2007	2008	2009	2010 <sup>1)</sup>	2011 <sup>2)</sup>
(a)Sumatera	<b>22.41</b>	<b>22.12</b>	<b>22.27</b>	<b>22.73</b>	<b>22.90</b>	<b>22.69</b>	<b>23.10</b>	<b>23.54</b>
(b)Jawa & Bali	<b>60.63</b>	<b>60.11</b>	<b>60.68</b>	<b>60.23</b>	<b>59.21</b>	<b>59.88</b>	<b>59.33</b>	<b>58.86</b>
Jawa	59.32	58.84	59.48	58.99	57.99	58.58	58.07	57.64
West Kalimantan	1.35	1.27	1.21	1.22	1.15	1.17	1.14	1.11
Central Kalimantan	0.83	0.79	0.79	0.79	0.77	0.80	0.81	0.82
South Kalimantan	1.27	1.19	1.11	1.11	1.07	1.11	1.13	1.13
East Kalimantan	6.05	6.75	6.40	6.26	7.37	6.14	6.08	6.49
<b>(c)Kalimantan</b>	<b>9.49</b>	<b>10.00</b>	<b>9.51</b>	<b>9.38</b>	<b>10.36</b>	<b>9.21</b>	<b>9.16</b>	<b>9.55</b>
(d)Sulawesi	<b>4.16</b>	<b>4.07</b>	<b>4.04</b>	<b>4.09</b>	<b>4.19</b>	<b>4.46</b>	<b>4.52</b>	<b>4.61</b>
(e)Others	<b>3.30</b>	<b>3.71</b>	<b>3.50</b>	<b>3.58</b>	<b>3.34</b>	<b>3.76</b>	<b>3.88</b>	<b>3.46</b>
Total(a~e)	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

1) Preliminary figures, 2) Very preliminary figures

Source: Created by JICA survey team based on the web site of BPS Statistic Indonesia

Economic researchers at the West Kalimantan Branch of Bank Indonesia mentioned that the economic condition of West Kalimantan is significantly impacted by market conditions of palm oil and rubber. According to Economic Statistics of West Kalimantan State issued by Bank Indonesia in July 2013, the largest economic sector in the state is agriculture, which produced Rp. 8.2 trillion out of the state total of Rp. 34 trillion in 2012, followed by the trading sector with Rp. 7 trillion. Rubber and palm oil

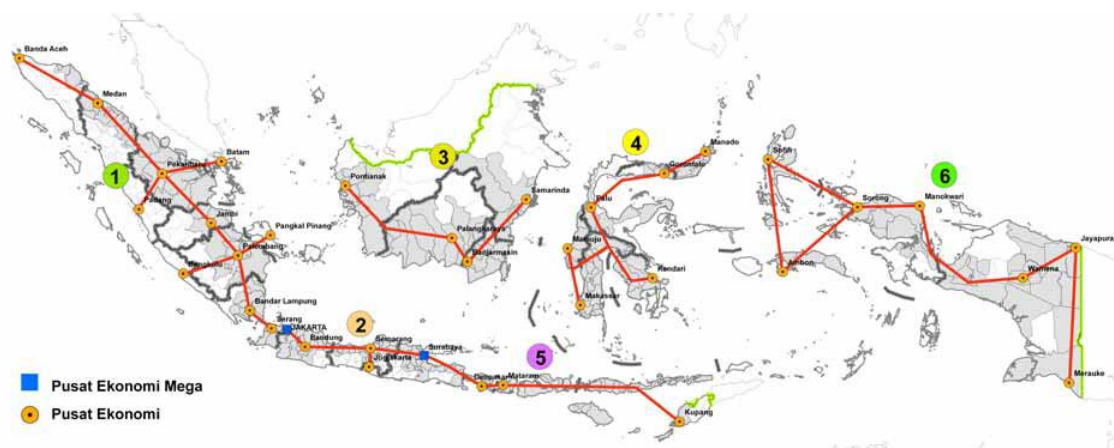
account for a large portion of non-food crop farming and manufacturing sector, that had domestic production of Rp. 3 trillion and Rp. 5.3 trillion respectively in 2012. The mining sector is growing by development of new bauxite mines, but its production accounted for only Rp. 0.6 trillion and remained as a minor sector in the state economy. Leading export products such as plywood, bauxite, and rubber contributed only 5% of gross regional domestic production of the state.

The researchers also mentioned that, while the economic growth is below the national average, West Kalimantan state suffers from higher than average inflation. This is partially because of the rising transport cost due to increase in oil price, since many of the products sold in West Kalimantan are produced in Java and Sumatra and carried by ship. Another reason cited was the larger number of festivities stemming from the multi-ethnic environment. People in West Kalimantan increase their consumptions for not only Muslim events but also Christian or Chinese events held 8 times a year.

Foreign direct investments in West Kalimantan is led by China followed by South Korea, but the actual investment amount is still limited despite the marketing efforts made by the state government. There was a news article reporting that the state investment coordinating committee was in negotiation with China on large-scale rubber plantation, with the area of 100,000 ha and the investment of Rp. 10 trillion<sup>1</sup>, and in an iron ore mine. Because of aggressive marketing to foreign investors, Indonesian Investment Coordinating Board awarded West Kalimantan “the best performer” in Regional Development Competition in 2011. However, economic researchers at West Kalimantan Branch of Bank Indonesia were not aware of any major investment deal announced so far.

### 2.1.3 Development Plan for Kalimantan Economic Corridor

By taking into consideration the potentials and strategic roles of each major island in Indonesia, MP3EI identified six economic corridors shown below: Sumatra, Java, Kalimantan, Sulawesi, Bali - Nusa Tenggara and Papua-Kepulauan Maluku.



- (1) Sumatra EC, (2) Java EC, (3) Kalimantan EC, (4) Sulawesi EC,  
(5) Bali – Nusa Tenggara EC, (6) Papua – Kepulauan Maluku EC

Source: MP3EI

### Economic Corridors in MP3EI

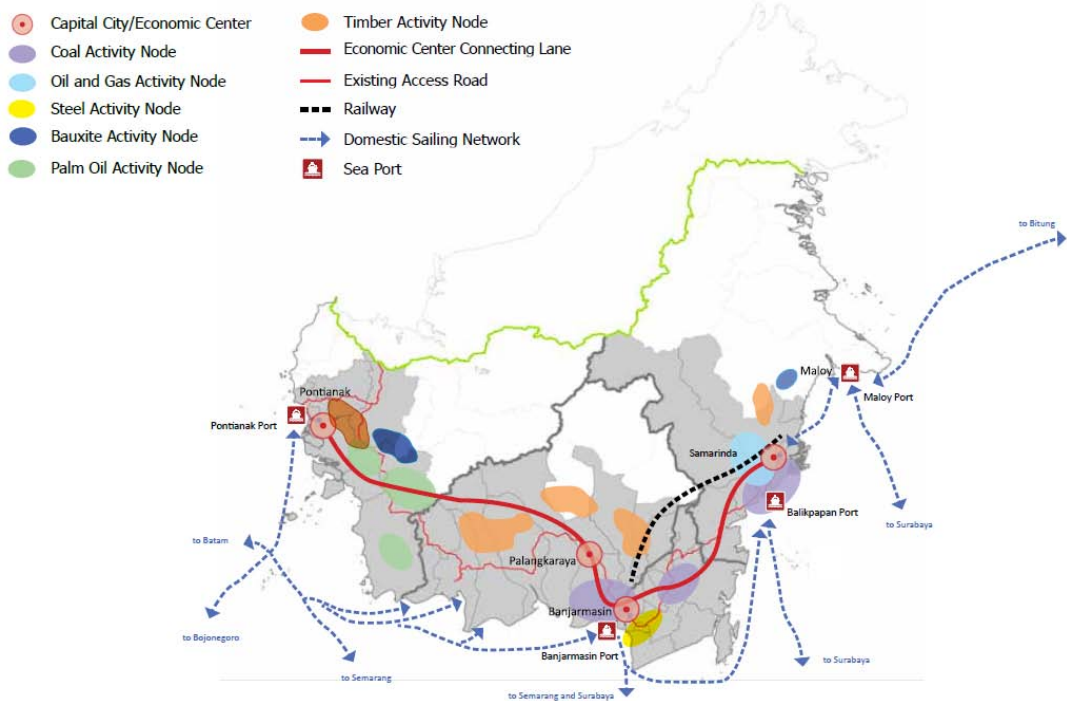
<sup>1</sup> <http://www.antaraneews.com/en/news/80542/chinese-investor-mulling-to-invest-in-west-kalimantans-rubber-plantations>

MP3EI also has identified development themes for each corridor in the acceleration and expansion of economic development as follows:

- (1) **Sumatra Economic Corridor** as a “Center for Production and Processing of Natural Resources and As Nation’s Energy Reserves”
- (2) **Java Economic Corridor** as a “Driver for National Industry and Service Provision”
- (3) **Kalimantan Economic Corridor** as a “Center for Production and Processing of National Mining and Energy Reserves”
- (4) **Sulawesi Economic Corridor** as a “Center for Production and Processing of National Agricultural, Plantation, Fishery, Oil & Gas, and Mining”
- (5) **Bali – Nusa Tenggara Economic Corridor** as a “Gateway for Tourism and National Food Support”
- (6) **Papua – Kepulauan Maluku Economic Corridor** as a “Center for Development of Food, Fisheries, Energy, and National Mining”

The development theme of Kalimantan economic corridor in MP3EI is designated for a center for Production and Processing of National Mining and Energy Reserves by taking into consideration its abundant resources and geographic features. This is shown in the list of “fast track” investment planned in MP3EI with main economic activities in energy (oil, gas, and coal) and minerals (bauxite and steel).

Four capital cities in each province (West, East, Central and South Kalimantan) are designated as centers of economic activities. Six main industries (oil & gas, coal, palm oil, steel, bauxite, and timber) are considered as future potential drivers for economic growth in Kalimantan.



Source: MP3EI

**Development Plan for Kalimantan Economic Corridor**

The table below shows that the Gross Regional Domestic Product (GRDP) of Kalimantan is still dominated by oil and gas of approximately 30%-40%. The oil and gas sector will remain a main

economic driver, and be a focus of economic development activities in the corridor. In addition to oil and gas, other main economic activities that have been identified as a prime economic movers to accelerate and expand the economic growth of Kalimantan Economic Corridor are coal and palm oil. In order to support the MP3EI, the economic sectors of steel, bauxite, and timber are considered as future potential drivers for economic growth in Kalimantan.

#### **Breakdown of GRDP in Kalimantan economic corridor**

	2007	2008	2009
Oil and gas	37.6%	41.1%	30.9%
Other mining	17.4%	15.5%	18.2%
Agriculture	18.7%	19.9%	23.6%
Tourism, transport communication etc.	12.2%	11.4%	13.4%
Construction	7.1%	6.2%	7.1%
Finance and real estate	5.7%	4.7%	5.2%
Others	1.3%	1.2%	1.6%
Total	100%	100%	100%

Source : JICA survey team arranged from Indonesian government statistic in MP3EI

MP3EI mentions some potential shortcomings associated with economic development in the Kalimantan Economic Corridor as follows:

- A decline in annual total production of the oil and gas sector. To ensure economic sustainability of Kalimantan, there is the need to intensify development of non oil & gas sectors to counter the downward turn in production of oil & gas sector.
- A disparity of development among regions in the corridor, both between the oil & gas and the non oil & gas producing regions, as well as between urban and rural areas.
- A gap between the need and the availability of basic infrastructure services: i.e. physical infrastructure such as roads, electricity and clean water, as well as basic non-physical (social) services such as education and healthcare.
- A low realization of development investments within the Kalimantan Economic Corridor.

## **2.2 Current Conditions and Strategy of Forestry & Industrial Plantation Sector in Indonesia**

### **2.2.1 Current Conditions and Issues of Forestry & Industrial Plantation Sector**

Indonesia holds third largest tropical forests in the world, after Brazil and the republic of Congo. With surface area of 8,850 sq.km, tropical forests occupy 46% of the nation and total 10% of world's tropical forests.

However, the area of tropical forests in Indonesia reportedly has decreased by 43 million ha from 1970. This is mostly due to the cutting of logs for export, which is estimated to have covered 24 million ha. The balance of deterioration is due to forest fire, change to oil palm and illegal cutting.

#### **2.1.2 Forestry Industry in Indonesia**

In the forestry industry, the ban on export of round logs was introduced in 1985 with the goal to transform the industrial structure to higher value-added products, and consequently Indonesia has



become the top exporter of plywood to Japan one period in the past.. However, the volume of plywood export has been decreasing recently.

It is necessary to pay attention to: i) changes of both movements of international society and socio-economic condition in Indonesia, ii) changes in the regulations and government policy of forestry sector based on changes of whole political direction, and iii) distortion caused in the process of decentralization of government policy for the forestry sector, those have been caused since 20 – 30 years ago.

In addition to teak plantations, which have 200 years of history, industrial plantation has been encouraged to replace natural forests. Hence, the plantation area reached almost 10 million ha in 2000. In Indonesia, land ownership is not allowed for the purpose of industrial plantation. According to the government regulation No.34/2002 (Forest governance and development of forest management plan, Forest utilization and use of the forest), “The business permit for utilizing wood forest products” in a plantation forest shall be issued by the Minister on Bupati or Mayor and Governor’s recommendation. The plantation project can be implemented based on the permit above.

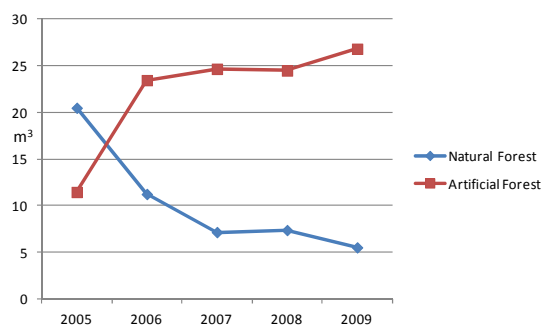
### 2.2.2 Forest Sector Strategy

The supply of timber reached peak in 1980s in Indonesia, the forestry sector got the third largest amount of foreign currency following the oil and natural gas sector.

The timber supply from the natural forest was flat, then started decreasing since a monetary crisis in 1998. As a result, the timber supply from natural forest was higher than from artificial forest until 2005. Timber supply from natural forest decreased rapidly. While, the timber supply from artificial forest tends to increase.

With this background, the forecast of timber supply to the domestic forestry industry was shown in “Road Map –Development of Forest Industry and Plantation”, which was prepared by the Ministry of Forestry. In accordance with the road map, timber supply from artificial forest would reach to 36,200 million m<sup>3</sup> in 2020. While, timber from natural forest would decrease to 14 million m<sup>3</sup>. Based on this, artificial forest will be able to supply 26 times the amount of timber to the supply from natural forest. However, timber from artificial forest is mostly quick growing tree species; therefore, they will mainly supply to pulp and plywood industry. The amount of timber supplied to the furniture industry from artificial forest is small. Natural forest will supply timber to forest product processing industry including plywood and furniture industry the same as before.

Following the policy of the forestry sector, the prior area license and importance of industrial plantation and forestry is shown below.



Source: ” Road Map –D evelopment of Forest Industry and Plantation”, Ministry of Forestry, Indonesia, October 2011

#### Transition Of Timber Supply From Natural Forest And Artificial Forest

### Prior Area License & Importance of Industrial Plantation And Forestry For Each Region

Item	Sumatra	Jawa	Kalimantan	Sulawesi	NTT & NTB <sup>(2)</sup>	Papua & Maluku
<b>License<sup>(1)</sup></b>						
HPH	no	no	yes	no	no	yes
HTI	no	no	yes	yes	yes	yes
HPT-RE	yes	no	yes	yes	yes	yes
HTR	yes	no	yes	yes	yes	yes
HR	yes	yes	yes	yes	yes	yes
<b>Forestry</b>						
Timber processing	important	important	important	important		important
Plywood		important	important			important
Pulp	important		important			important
Paper manufacture	important	important	important			important
Woodchip	important		important		important	important
Furniture		important		important		

Source: "Road Map - Development of Forest Industry and Plantation", Ministry of Forestry, Indonesia, October 2011

Note: (1) License  
 HPH (Hak Pengusahaan Hutan): Natural Forest Logging Concession  
 HTI (Hutan Tanaman Industri): Industrial Timber Plantation Concession  
 HPT-RE: (Hak Pengusahaan Hutan-Restorasi Ekosistem): Forest Ecosystem Restoration Concession  
 HTR (Hutan Tanaman Rakyat): Community Plantation Concession  
 HR: Forest Concession for Individuals in areas for other uses  
 Note: (2) NTT: East Nusa Tenggara, NTB: West Nusa Tenggara

In accordance with the table above, the whole area of Kalimantan is designated as all kinds of license area, also most of forestry industry prior area is important except for the furniture industry. Based on table above, Kalimantan region is understood to be designated as lead region of industrial plantation and industrial forestry sector.

## 2.3 Current Condition of Industrial Plantation and Necessity of the Project

### 2.3.1 Current Condition and Issues of Industrial Forestry in Kalimantan

Issued areas of license to use forest product in natural forest (IUPHHK-HA) and license of industrial plantation project (IUPHHK-HTI) are shown in the table below for each region. The table shows that Kalimantan region holds the largest area of issued IUPHHK-HA in Indonesia, and the second largest area of IUPHHK-HTI, following the Sumatra region.

Forest in Kalimantan is approx. 41 million ha, which is the second largest, following Papua region in Indonesia. In accordance with the data of Ministry of Forestry, Kalimantan region has 29.8 million ha of production forest which is the largest in the nation. Of the production forest in Kalimantan region 52.7% (15.77 million ha) is used for timber production and industrial plantation. This means the potential of industrial plantation in Kalimantan is very high.

#### Issued forest and Forest Area of Production

(unit: million ha)

Item	Sumatra	Papua & Maluku	Kalimantan	Others
IUPHHK - HA	1.41	9.32	11.61	2.17
IUPHHK - HTI	4.56	-	4.16	0.68
Total	5.97	9.32	15.77	2.85

Source: "Road Map - Development of Forest Industry and Plantation", Ministry of Forestry, Indonesia, October 2011

The development plan based on Kalimantan economic corridor in MP3E I includes industrial plantation (HTI) and timber production (IPHHK). Large scale industrial plantation projects are distributed to 4 Provinces in Kalimantan region as follows: 1 million ha in West Kalimantan Province, 417,000 ha in East Kalimantan Province, 270,000 ha in Central Kalimantan Province, and 89,000 ha in South Kalimantan Province.

From the above results, problems of timber production and industrial plantation in Kalimantan region are considered to be as follows:

- (1) A few companies control timber market and not appropriate price of forestry production is used. Currently, the national market price of forestry production shows 30% to 40% lower than the one in the international market.
- (2) A large investment for the industrial plantation is required; however, the local banks are not aggressively supporting for investigation.

The issues to resolve the above problems are:

- (1) To implement plantation operation and timber production in parallel.
- (2) To accelerate new companies' entry in order to reach a more appropriate timber price. Increasing the investigation in the development area is not enough.
- (3) To spread understanding of industrial plantation and timber production including risks to banks in order to accelerate financing.

### 2.3.2 Necessity of the Project

The budget for development of Kalimantan economic corridor is estimated as 945 billion IND. Of it, 32 billion IND is for promotion of industrial plantation and forestry; this accounts for approx. 3% of total estimation. MP3EI assumes that Indonesia Government and private sector would split the estimated budget 50-50. The investigation by private sector into industrial plantation and timber production is essential for realisation of Kalimantan economic corridor. (Refer to table below).

#### Major Economic Development in Kalimantan Region (MP3EI)

No. <sup>(1)</sup>	Place	Major economic activities	Stakeholder	Related infrastructure	Investment Amount (Billion IDR)
1	Bontang, Kutai Timur	Bauxite	Government, SOE, Private	Port, Road, Railway and Power & Energy	36.00
		Palm Oil			5.35
		Coal			62.79
		Timber			7.45
2	Balikpapan	Palm Oil	Government, SOE, Private	Prot, Bridge, Road, Water Utilities	0.30
		Oil and Gas			158.65
		Timber			0.55
3	Radak dan Ganal Kaltim	Oil and Gas	Private	-	70.00
4	Kotabaru, Tanah Bumbu	Steel	SOE, Private	Overland Conveyor, Power & Energy, and Road	6.56
		Palm Oil			2.81
		Coal			5.42
		Timber			1.27
5	Barito	Steel	Government, SOE, Private	Power & Energy, Port and Road	35.00
		Palm Oil			2.79
		Timber			6.29
6	Pontianak, Mempawah	Bauxite	Government, SOE, Private	Airport, Road, and Power & Energy	62.22
		Palm Oil			17.97
		Coal			4.50
		Timber			9.59

No. <sup>(1)</sup>	Place	Major economic activities	Stakeholder	Related infrastructure	Investment Amount (Billion IDR)
7	Coal Railway and Trans Kalimantan Road	Cross Sector	Government, Private	-	61.15

Source: "Master Plan – Acceleration and Expansion of Indonesia Economic Development 2011-2025", Government of Indonesia, 2010

In accordance with table above, necessary investment for timber production in Pontianak and Mempawah is estimated as 9.59 billion IDR, which is the biggest in Kalimantan region. The reasons the investment is so high are assumed to be as follows: i) HTI licenses with more than 1 million ha has been issued in West Kalimantan Province, and ii) there is much high potential in the province for industrial plantation and timber production as was referenced.

Under this situation, to realise the proposed project targeting West Kalimantan Province is extremely significant for the national mid-term development policy.



### **CHAPTER 3 ANALYSIS OF INTERNATIONAL AND DOMESTIC WOODCHIP MARKET**

The results of international woodchip market analysis are summarised in this chapter.

As the results, selling woodchip to China and Japan is expected to have high possibility, while selling to Indonesia can be expected but not sustainable.



# **Part II**

## **Phase 1 (WSL/MTI)**

### **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 proposed project area.

The proposed project is divided into two phases (Phases 1 & 2). This Part II of this report covers Phase 1 (in WSL and MTI areas) which total approximately 115,000 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 manage 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 1 (Part II 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 (Phases 1 and 2). FS study for phase 1 is presented in Part II of this report.

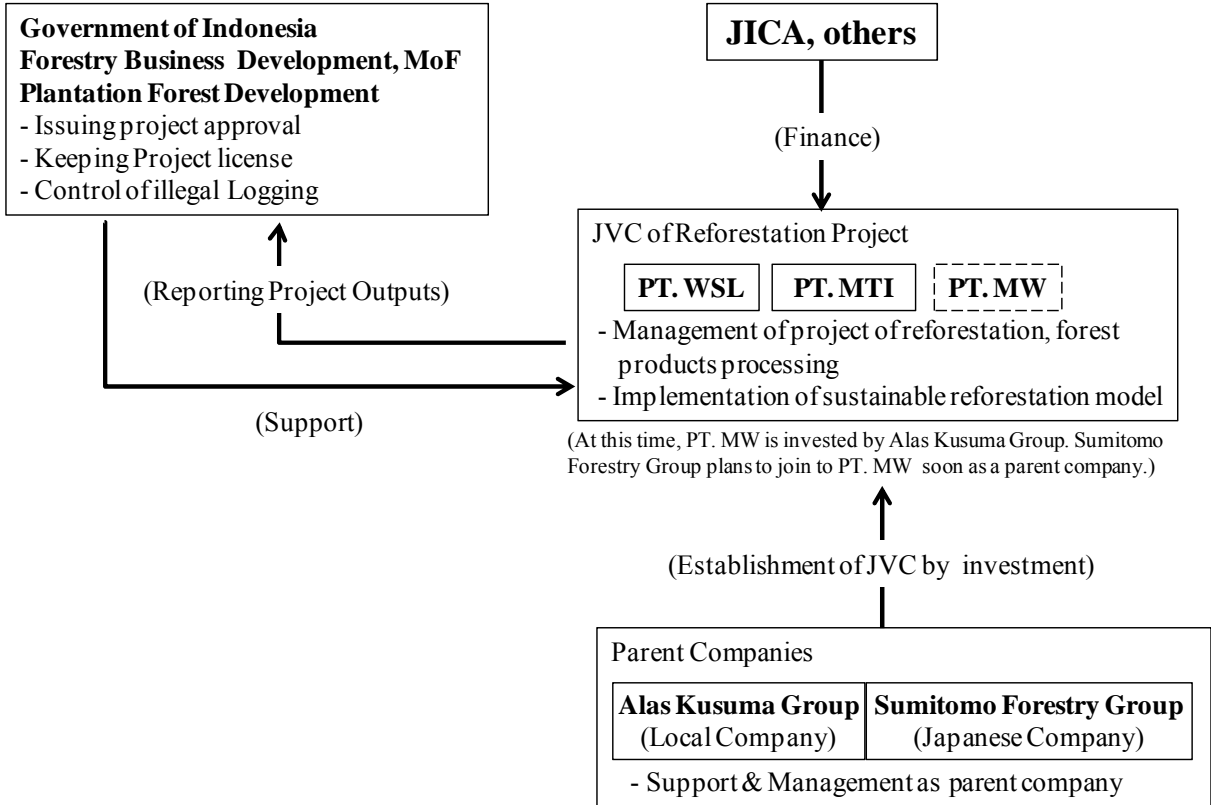
### Outline of the Proposed Project

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 Study 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 maintain necessary business licenses for this project, and strengthen 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 utilize 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 CONDITIONS OF THE PROJECT AREA**

### **2.1 Natural Conditions**

#### **2.1.1 Location of the Project Area**

The target area of this FS study is in Kubu Raya, Sanggau, Ketapang and North Kayang Districts in West Kalimantan Province, Indonesia. They are located practically on the equator. The location of the FS study area is shown in the Figure below.

#### **2.1.2 Topography and Hydrology**

The areas of WSL and MTI consist of quite gentle slopes. Most of the area of WSL is under 30 m in the elevation. There are some hilly areas in MTI area such as: i) more than 300 m in elevation at the northern part, ii) approximately 60 m in elevation in south-east part; however, the ratio of high elevation areas of the project area is small.

There are three major rivers flowing from north-east to south-west in parallel in WSL area; they have typical low swamp area topographic characteristics. In MTI area, one major river (Mendawak River) flows from north to south at the western side of the project area and some branch rivers feed into the major river.

#### **2.1.3 Climate**

The target area of FS study is under the tropical rain forest climate which has high rainfall and temperature year round. There are 2 meteorology stations near the project area. One is located at Pontianak Airport, and the other is Rahadi Osman station located in Kabupaten Kutapan. The data of Pontianak was more recent; therefore, in this Chapter the outline of climate of the FS study area comes from the data of Pontianak meteorology station.

##### **(1) Rainfall**

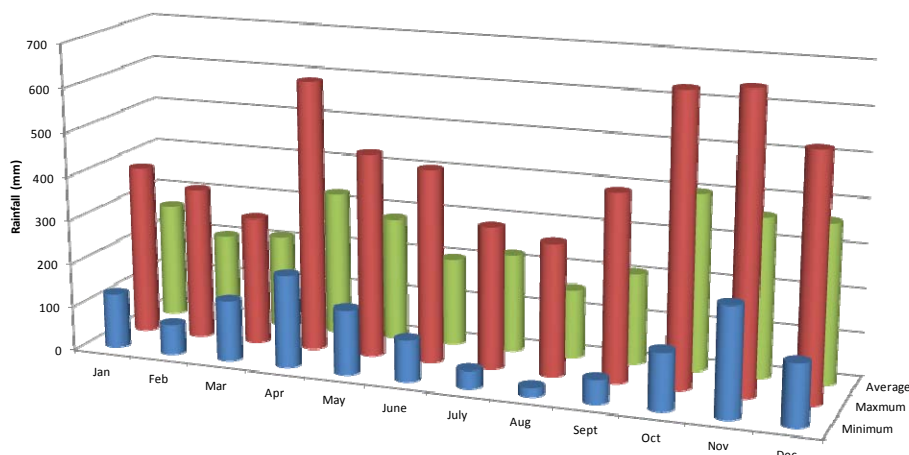
Ten years rainfall data from 2003 to 2012 indicates the average of annual rainfall was 3,182 mm, minimum annual rainfall was 2,547 mm in 2006 and the maximum was 3,666 mm in 2007. This is a large amount of rainfall. The season for lower rainfall is from July to September, with monthly rainfall of about 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. Ten years rainfall data is shown in Table II-2.1-1.

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 range of monthly rainfalls are shown in the Figure 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.

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.

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-2.1-1 to -4 show 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 the 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

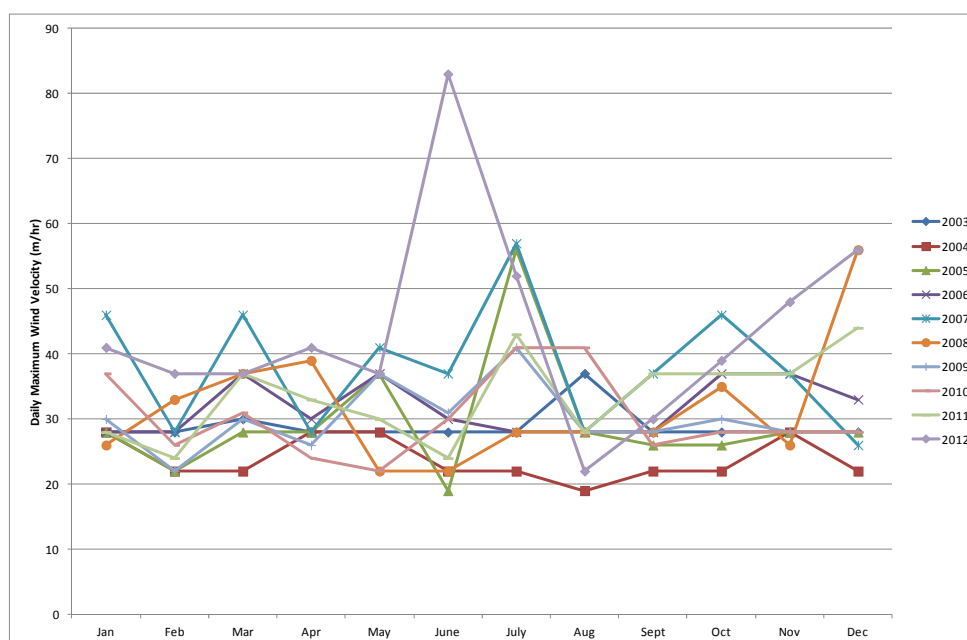
Source: JICA Survey Team prepared based on the data of Spadio-Pontianak Climate Station

### (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 three soil types listed in RKU of WSL area and six types in MTI area. Plural soil types can be found in one soil category in the soil maps, because natural soil types are a mixture and distributed, and it is necessary to show one soil category with plural soil types. Table below shows soil types in WSL and MTI areas.

### Soil Types in WSL Area and MTI Area

WSL Area	MTI Area	Soil Category * <sup>1</sup>	Soil Type* <sup>2</sup>
yes	yes	GBT	Tropohemists, Tropofibrists
-	yes	HJA	Tropudults, Paleudults
-	yes	KHY	Tropaquets, Fluvaquets, Tropohemists
yes	yes	KJP	Sulfaquets, Hydraquets
yes	yes	MDW	Tropohemists, Troposaprists, Tropaquets
-	yes	PLN	Dystropepts, Tropudults, Haplorthox

Source: JICA Survey Team prepared based on soil map of RKU (WSL and MTI)


Note)\*1: Category used in soil map of RKU (The 10 years Plans of the industrial plantation project)


2: Soil types by US soil taxonomy, FAO/UNESCO WRB

GBT includes two soil types (Tropohemists and Tropofibrists) which are generally peat soil and have almost same characteristics; the difference of two soil types is decomposition condition. Three soil types (Tropohemists, Troposaprists, Tropaquets) are categorised in MDW. Tropohemists and Troposaprists are peat soil. Tropaquets is categorised as not-matured soil which can be found on river mouth and river bank. KJP was deposited by a sea and is found along the river bank. Soil types which are categorised in HJA are Tropudults and Paleudults. Tropudults is strongly weathered and acid soil type. Soil types of HJA are generally in this area called mineral soil type, and can be found in hilly area and mountainous places. The characteristics of mineral soil and peat soil are quite different.

The drainage condition of the peat soil is not good; therefore, only tree species, such as Melaleuca, with tolerance to wet condition can survive in case of no water management. But nowadays, water level control is getting common, so selection of tree species for plantation can be expanded. Acacia and Eucalyptus can be used on mineral soil type. The major soil types in WSL and MTI area are shown in Table below.

### Major Soil Types in Study Area

Soil Unit 5 Histosol	
Soil Type 5-1 Troposaprists	
Soil category of soil map MDW	
<p><b>General Description</b> : Peat land soil with highly decomposed soil organic matter.</p> <p><b>Distribution</b> : Peat land</p> <p><b>Fertility/Productivity</b> : Low nutrient content.</p> <p><b>Chemical Property</b> : From acid to neutrality. Subject to be lack of Copper (Cu) because of the Cu-humic acid bond.</p> <p><b>Physical Property</b> : High water holding capacity. Low performance of water penetration. Many soil voids filled with water.</p> <p><b>Remarks</b> : If water is drained, water holding capacity, hydrophilicity and erosion</p>	<p>Soil Profile</p> 

<p>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 planting without drain. <i>Melaleuca cajuputi, Melaleuca leucadendron, Garcinia bancana</i></p>	(ISRIC, www.isric.nl)
<b>Soil Type 5-2 Tropohemists</b>	
<b>Soil category of soil map</b> BLI, GBT, KHY, MDW	
<p><b>General Description</b> : Peat land soil with decomposed soil organic matter.</p> <p><b>Distribution</b> : Peat land</p> <p><b>Fertility/Productivity</b> : Low</p> <p><b>Chemical Property</b> : From acid to neutrality. Subject to be lack of Copper (Cu) because of the Cu-humic acid bond.</p> <p><b>Physical Property</b> : Low performance of water penetration. Many soil voids filled with water.</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 planting without drain. <i>Melaleuca cajuputi, Melaleuca leucadendron, Garcinia bancana</i></p>	<p>Soil Profile Similar to the soil type 5-1</p>
<b>Soil Type 5-3 Tropofibrists</b>	
<b>Soil category of soil map</b> GBT	
<p><b>General Description</b> : Peat land soil with less decomposed soil organic matter.</p> <p><b>Distribution</b> : Peat land</p> <p><b>Fertility/Productivity</b> : Low</p> <p><b>Chemical Property</b> : From acid to neutrality. Subject to be lack of Copper (Cu) because of the Cu-humic acid bond.</p> <p><b>Physical Property</b> : Moderate performance of water penetration. Many soil voids filled with water.</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 planting without drain. <i>Melaleuca cajuputi, Melaleuca leucadendron, Garcinia bancana</i></p>	<p>Soil Profile Similar to the soil type 5-2</p>
<b>Soil Unit 2 Ultisol (Acrisol)</b>	
<b>Soil Type 2-1 Paleudults</b>	
<b>Soil category of soil map</b> HJA	
<p><b>General Description</b> : Highly weathered and acid soil which has developed layers and accumulated clay layers in subsoil.</p> <p><b>Distribution</b> : Highland and Hilly area and mountain areas in the tropics.</p> <p><b>Fertility/Productivity</b> : Low. Little organic matter.</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 be lack of bases and phosphorus, and to have excess Aluminum and acidity problem.</p> <p><b>Adaptive species</b> : <i>Acacia mangium, Acacia auriculiformis</i> <i>Eucalyptus pellita, Eucalyptus camaldulensis</i> <i>Eucalyptus deglupta, Enterolobium cyclocarpum</i> <i>Paraserianthes falcataria, Hibiscus macrophyllus</i> <i>Gmelina arborea</i></p>	<p>Soil Profile</p>  <p>(ISRIC, www.isric.nl)</p>

Soil Type 2-2 Tropudults	
Soil category of soil map HJA, PLN, RGK	
<p><b>General Description :</b> Highly weathered and acid soil which has less developed layers an accumulated clay layer.</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> Law resistivity. Low water holding capacity. Good performance of drainage and water penetration.</p> <p><b>Remarks :</b> Subject to be 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>Enterolubium cyclocarpum</i>  <i>Paraserianthes falcataria</i>, <i>Hibiscus macrophyllus</i>  <i>Gmelina arborea</i></p>	<p>Soil Profile Similar to the soil type 2-1</p>

Source: US soil taxonomy, FAO/UNESCO World Reference Base for soil taxonomy (WRB), Nettai dojou gaku (Japanese)/ Kyuma et. al., 2001 , etc.

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

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

### 2.1.5 Vegetation

The peat swamp forests in Kalimantan Island including the study area, has been damaged much by commercial logging of the natural forest which started in 1990s and was logged by local people after that. Currently, the typical tree species of peat swamp forest are not found much in the forests of WSL and MTI areas. The majority of trees in the forests are small-sized trees in both diameter and height.

In WSL and MTI areas, most of the area is covered by logged forest (Hutan Bekas Tebangan, in Bahasa Indonesia), followed by old shrub (Belukar Tua, in Bahasa Indonesia) and young shrub (Belukar Tua in Bahasa Indonesia). Their vegetation maps are prepared based on the vegetation survey of the environmental assessment report (ANDAL). Logged forests are still covered by trees; however, these forests have been disturbed.

## 2.2 Socio-Economic Condition

This section describes the key features of socio-economic conditions in and around of the project area. Mainly the data and information of ANDAL and KA-ANDAL are quoted.

### 2.2.1 Communities in and around the Project Area

Several size of communities are found in and around of the project area of WSL/MTI. Some neighbour communities (Indonesia language: *Kampung*, *Dusun*) consist an adm inistrational village (Indonesian language: *Desa*). There are different types of community which was developed by some people from other areas such as Jawa. They spontaneously moved to Kalimantan, developed area and settled.

These target communities are mostly located along major rivers in or around the WSL and MTI project

areas as shown in table below.

Project Area	Location of Communities
WSL (40,040 ha)	All communities are located outside of the project area.
MTI (74,870 ha)	All communities are located inside of the project area.

Source: ANDAL report of PT.WSL/MTI

In accordance with KA-ANDAL report, the communities in MTI area are 30 km to 100 km from the centre of District, and the situation is almost the same as WSL area. The people there depend on river transportation along the major rivers. Generally, the communities in and around the project areas are located at social-economic marginal areas of District.

### 2.2.2 Population

The population or numbers of households of sub Districts or communities in and around the project area are surveyed. It is not possible to obtain certain number of the communities in and around the project area; therefore the data of ANDAL report was used.

In according with ANDAL report of MTI, population under 14 years accounts 33% of total population, 15 to 54 years population is approx. 60% and remaining 7% is population of more than 70 years old age.

### 2.2.3 Living Conditions of the Target Communities

Outline of the local people's living environment in and around the project areas of WSL and MTI is described. (1) Land ownership and forest usage, (2) Agriculture, grazing, fishery, (3) Condition of hygiene/ houses, (4) Local medical services, (5) Local religion and (6) Local educational services are surveyed in this project.

## 2.3 Development Condition in/around the Project Area

Legal forests (industrial plantation forest, protection forest, et c.), mining developments, oil palm developments, and residential areas are distributed in and around area of the Project area. Currently, the overlapping of land use by mining and forestry is not found. Conflict between different development sectors due to different supervision policies by government sectors is not studied currently. There are some national protection forests near the project area; therefore, it is necessary to consider prevention of impact to those protection forests.



## 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	WSL	MTI	Total
	Plantation area	24,773 ha	42,645 ha	67,418 ha
	Annual plantation/ logging area*	4,955 ha	8,529 ha	13,484 ha
	Annual logging volume (harvesting volume)*	445,919 m <sup>3</sup>	767,610 m <sup>3</sup>	1,213,524 m <sup>3</sup>
	Annual seedling production*	7.803 million	13.433 million	21.236 million
(Note*: the numbers are planned after 2008, they will be constant.)				
2. Plantation infrastructure (major facilities)	New construction			
	Category 1	Category 2	WSL	MTI
	Log pond		1	7
	Site facilities (one set of site office, accommodation, and other facilities)	B.C specification* <sup>1</sup>	1	1
		Temporary specification	1/ year	1/ year
			(They will be re-constructed by plantation location)	
	Site facilities	Fire tower	3	5
		Security post	1 – 2/ year	2 – 5/ year
			(re-construction by plantation rotation)	
	Canal, water level control facility	Main canal	23,051m	63,735 m
		Branch canal	196,748 m	462,232 m
		Outlet canal	6,593 m	15,594 m
		MC/C* <sup>2</sup> drain	337,065 m	737,242 m
		IF* <sup>3</sup> drain	1,828,246 m	3,173,893 m
		Peat dam	49	117
		Adjustable gate	28	106
		Flap gate	26	3
		Sedimentation pond	17	40
	Road	Transportation of logs, labor and other materials	4,000 m	78,000 m
	Nursery	Permanent nursery	1	—
Temporary nursery		—	3	
Note)*1:B.C.= base camp, *2: MC/C= mid cross/ cross, *3: IF= in field				
3. Chip mill construction/chip production	Facility, Equipment		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 chip		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. Back up diesel generator</b>			
	Backup diesel generator, 1500 KVA		2	Sets
	<b>4. Civil work, buildings, other facilities</b>			
	Land preparation (12 ha)			
	- Land filling (height 3.5 m)		875,000	m <sup>3</sup>
	- Compaction		25	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 12cm)	15,000	m <sup>2</sup>																								
	<b>Infrastructure development</b> - Road (length: 3,380 m, width 10 m) - 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)	33,800	m <sup>2</sup>																								
	<b>5. Buildings</b> Building for: chipper and screen, diesel generator, office, main office, accommodation & guest house, accommodation for workers, canteen for workers, workshop for machines, workshop for heavy equipment, fuel server, weight scale for logs	1	Set																								
4. Port facility development	<table border="1"> <thead> <tr> <th>Facility</th> <th>Major Works</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Log yard berth / Revetment</td> <td>SSP :installation</td> <td>1,167 nos</td> </tr> <tr> <td>Concrete :supply / installation</td> <td>1,814 m<sup>3</sup></td> </tr> <tr> <td>Backfill :supply / installation</td> <td>25,200 m<sup>3</sup></td> </tr> <tr> <td>Riverbed excavation</td> <td>15,300 m<sup>3</sup></td> </tr> <tr> <td rowspan="2">Foundation of Belt conveyor</td> <td>SPP :installation</td> <td>6 nos</td> </tr> <tr> <td>Concrete :supply / installation</td> <td>19 m<sup>3</sup></td> </tr> <tr> <td rowspan="3">Chip berth</td> <td>SPP :installation</td> <td>32 nos</td> </tr> <tr> <td>Concrete :supply / installation</td> <td>63 m<sup>3</sup></td> </tr> <tr> <td>Riverbed excavation</td> <td>1,000 m<sup>3</sup></td> </tr> </tbody> </table>	Facility	Major Works	Quantity	Log yard berth / Revetment	SSP :installation	1,167 nos	Concrete :supply / installation	1,814 m <sup>3</sup>	Backfill :supply / installation	25,200 m <sup>3</sup>	Riverbed excavation	15,300 m <sup>3</sup>	Foundation of Belt conveyor	SPP :installation	6 nos	Concrete :supply / installation	19 m <sup>3</sup>	Chip berth	SPP :installation	32 nos	Concrete :supply / installation	63 m <sup>3</sup>	Riverbed excavation	1,000 m <sup>3</sup>		
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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 standards 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



Classification	Definition	Standard of ratio of area to 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 ( <i>Hutan Lindung</i> ) 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.

### Land Use Plan (Phase 1)

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)						
WSL	24,773	5,849	2,227	6,759	273	39,881
MTI	42,645	9,048	6,612	14,514	693	73,512
Total	67,418	14,897	8,839	21,273	966	113,393
Ratio of Area (%)						
WSL	62.12	14.67	5.58	16.95	0.68	100.00
MTI	58.02	12.31	8.99	19.74	0.94	100.00
Total	59.45	13.14	7.80	18.76	0.85	100.00

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 WSL area is 24,733 ha, of MTI is 42, 645 ha, total plantation area is 67,418 ha. The plantation area shall be planted after logging works in same year; therefore, the planned plantation area and logging area shall be the same. The first logging work & planting work for whole areas is called the first rotation. After finishing the first rotation, the whole plantation area shall be prepared. The table below shows plan of work of the first rotation.

#### Plantation & Logging Area of First Rotation

(Unit: ha)

Project Site	Achievement	Plan	Total
WSL	(2010~2013) 11,489	(2014~2017) 13,248	24,773
MTI	(2010~2013) 9,231	(2014~2017) 33,414	42,645
Total	20,720	46,698	67,418

Source: JICA Survey Team

(Block): The group of plantation areas planted in same year is called “Block” in the plantation plan. As described later, 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 cycle 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 Block is composed with 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 conditions 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.

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 (*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.

2) Planting methodology

(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 (quadrangular pyramid-shape, size of square base is 3.5 cm x 3.5 cm, height is 10 cm, please see the photographs below). 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.

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<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”



Seedling in Plastic Case



Seedling

### (3) Planting and logging plan

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

(Logging methodology): 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. These operation plans are prepared based on the achievements of the Projects WSL and MTI.

(Estimation of harvesting volume): Harvesting volume 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.

### (4) Annual Plantation/logging plan

#### 1) Planting/logging work rotation

5 years is set as logging cycle in the Project. After the first logging cycle for the whole plantation areas will be finished, the second rotation will start from the logging area. The initial work plan shows after the first 5 year whole plantation areas would be logged and planted. However, indeed, there still may be not-operated areas in both of WSL and MTI after 5 years from operation start, because the operation was the first experience and not implemented smoothly for both of WSL/MTI management side and the contractor side. Therefore, the first rotation period is set as 2010 to 2015 (6 years) in WSL, 2011 to 2017 (7 years) in MTI. The rotation plan is shown below.

**Rotation Plan of Plantation and Logging Work**

Project Site	Rotation					
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>
WSL	2010~2015	2016~2020	2021~2025	2026~2030	2031~2035	2036~2039
MTI	2011~2017	2018~2022	2023~2027	2028~2032	2033~2037	2038~2039

Source: JICA Survey Team

#### 2) Adjustment of rotation

Plantation/ logging area in WSL is 24,773 ha, in MTI 42,645 ha. Total area, 67,418 ha, is divided by 5 years, then approx. 13,500 ha will be operated a year. In WSL, the logging

operation of existing trees will be finished by 2017, all planted area with 6 year old trees and a part of planted area with 5 year old trees will be operated from 2017. The average of yearly operated areas for each year are different; therefore, adjustment for this will be done by the end of 2017. From 2018, annual operation area, approx. 13,000 ha will be implemented.

### 3) Operation capacity

(Existing tree logging work): The maximum operation achievement was approx. 8,000 ha in total of WSL and MTI in 2011. And approx. 8,700 ha will be implement in 2013. The contractor will add more sub-contractors to handle larger amounts of works from 2014.

(Planted trees logging work): the second rotation will start from 2016 and the annual amount of work will increase. WSL and MTI will add some other contractor to handle those.

(Plantation work): this operation has been implemented by different contractors from existing tree logging work. WSL/MTI will increase the number of contractors from 2014 for increasing the operation.

### 4) Annual operation plan

The operation plan of existing tree logging work, planted tree logging work and plantation work are summarized in the table below.

#### Annual Plantation/Logging Operation Plan (Summary)

Existing tree logging work (Unit: ha)

Project Site	Plantation area	Achieved area	Planned Area					Total
		2010 to 2013	2014	2015	2016	2017	Subtotal	
WSL	24,773	11,489	4,818	5,000	2,292	1,174	13,284	24,773
MTI	42,645	9,231	6,316	9,000	12,000	6,098	33,414	42,645
Total	67,418	20,720	11,134	14,000	14,292	7,272	46,698	67,418

Source: JICA Survey Team

Note): This operation will be finished by 2017.

Planted tree logging work (Unit: ha)

Project Site	Plantation area	Planned Area					
		2014	2015	2016	2017	2018	2019
WSL	24,773	-	-	4,955	4,955	4,955	4,955
MTI	42,645	-	-	-	4,043	8,529	8,529
Total	67,418	-	-	4,955	8,998	13,484	13,484

Source: JICA Survey Team

Note): From 2018, same area in 2017 will be operated.

Plantation work (Unit: ha)

Project Site	Plantation area	Achieved area	Planned Area					
		2010 to 2013	2014	2015	2016	2017	2018	2019
WSL	24,773	11,489	4,818	5,000	2,292	1,174	4,955	4,955
MTI	42,645	9,231	6,316	9,000	12,000	6,098	8,529	8,529
Total	67,418	20,720	11,134	14,000	14,292	7,272	13,484	13,484

Source: JICA Survey Team

Note): from 2018, same area as in 2017 will be operated.

### 5) Estimation of Logging volume (harvesting)

The logging volume is estimated using the MAI mentioned above, 5 years logging cycle and logging area. Table below shows an estimated summary of logging volume.

#### Estimation of Logging Volume of Planted Trees (Summary)

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

Site	Area(ha)	2016	2017	2018	2019
WSL	24,773	445,914	445,914	445,914	445,914
MTI	42,645	—	363,870	767,610	767,610
Total	67,418	445,914	809,784	1,213,524	1,213,524

Source: JICA Survey Team

Note: Same logging volume of one in 2017 is estimated after 2017

### 3.2.3 Seedling Production Plan

#### (1) Number of Seedlings

##### 1) Seedling production methodology

All operation of seedling production will be handled by WSL/MTI, purchase from outside is not planned. For the seedling production, one permanent nursery for each site (WSL/MTI) 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. There are no records of amount of loss by the transportation, so the ratio is estimated by general knowledge as less than 10%. The seedlings produced in the nurseries of PT. WSL and PT. WTI 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 1 kg 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 geminated seedlings).

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

Number of required seedlings production =

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

The amount of yearly required seedlings production is calculated and shown in the next table. The required number of yearly seedlings production in WSL area will be fixed as 7.804 million and in MTI area 13.433 million seedlings from 2018. Totally, approx. 21.236 million seedlings production is required.

### Required Number of Yearly Seedling Production

(Unit: '000 seedlings)

Site	2014	2015	2016	2017	2018
WSL	7,588	7,875	11,413	9,653	7,803
MTI	9,948	14,175	18,900	15,972	13,433
Total	17,536	22,050	30,313	25,625	21,236

Source: JICA Survey Team

Note: Number will be fixed from 2018

#### (2) Seedling supply plan

The permanent nursery in WSL has enough capacity for annual plantation operation. While, the capacity of the existing nursery in MTI is approx. 9.8 million seedlings<sup>2</sup> a year and it is not enough for all planting operation in MTI. Also, MTI has large area; therefore, seedling supply from a temporary nursery near the plantation site will lower cost and workability is better than the permanent nursery. Thus, three temporary nurseries are planned to be established in Block L, M and N in MTI. The seedlings produced in the temporary nurseries will be transported to the neighbor plantation sites.

There are 2 routes of seedling transportation as follows.

i) Permanent nursery -> log pond -. TPK (temporary log yard) -> plantation site

ii) Temporary nursery -> TPK -> plantation site

i): The seedlings are transported from the permanent nursery by big boat to log pond, transported to TPK by truck and to plantation sites by small boat through canals.

ii): The seedlings will be transported from temporary nursery to TPK by truck and to plantation site by small boat.

Seedling handling work will be done by manpower mainly without heavy equipment.

Table below shows seedlings supply plan in MTI.

### Seedling Supply Plan In MTI (Summary)

(unit: '000seedlings)

Block	2014	2015	2016	2017	2018	2019	2020	2021	2022
H				8,944					8,944
I	1,468					1,468			
J	4,084				9,730				
K	4,248	1,917			70	5,135			
	148				3,633				
L		5,583				1,950			
						3,633			
M		2,300	5,842			1,247	9,800	3,936	

<sup>2</sup> The maximum production of MTI permanent nursery is 11.5 million seedlings. However, 9.8 million seedlings is set as capacity of nursery with consideration of safety against to accidents.

		4,375	6,100				3,633		
N			3,958	856				5,864	856
			3,000	6,172				3,633	3,633
Total	9,948	14,175	18,900	15,972	13,433	13,433	13,433	13,433	13,433

→ Same rotation (2018 – 2022) will be repeated from 2023

Source: JICA Survey Team

Upper: Number of seedlings supplied from permanent nursery

Lower: Number of seedlings supplied from temporary nurseries (highlighted)

### 3.3 Plantation Infrastructure Plan

The construction plan of plantation infrastructure such as log pond, site facilities (accommodation, office, etc), canal and water level control facilities, road and nursery are reviewed in this chapter. The Infrastructure plan is based on the plantation plan explained in Section 3.2.

#### 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 equipment 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. Figures II-3.3-1 and 2 show the layout and design of log ponds.

#### Log pond Construction Plan

	No.	Existing/New	Block	Log yard (ha)	Jetty (ha)
WSL	WSL-A	Existing	A	0.5	0.2
	WSL-B	Existing	B, C (Western area)	0.6	0.2
	WSL-D	Existing	D	0.7	0.2
	WSL-E	Existing	E, C	0.9	0.5
	WSL-F	New	F	1.0	0.5
MTI	MTI-H	Existing	H	1.4	0.6
	MTI-J1	Existing	J, K (North area)	1.5	0.5
	MTI-J2	New	J (North area)	1.0	0.5
	MTI-K	Existing	K (Southern area)	1.1	0.3



	MTI-I	New	I, L, M (Southern area)	2.0	1.0
	MTI-M1	New	M (Western area)	2.0	1.0
	MTI-M2	New	M (Eastern area)	2.0	1.0
	MTI-N1	New	N (Western area)	2.0	1.0
	MTI-N2	New	N (Eastern area)	2.0	1.0
	MTI-N3	New	N (Southern area)	1.0	0.5

Source: JICA Survey Team

Seven log ponds were constructed from 2010 to 2013 and 8 more log ponds will be constructed by 2016. All of the log ponds will have periodic maintenance in every rotation year.

### Annual Log Pond Construction Plan

Area	Block	Year				Remarks
		2014	2015	2016	Total	
WSL	A&B	—	—	—	0	Existing
	C	—	—	—	0	Using Block E log pond
	D	—	—	—	0	Existing
	E	—	—	—	0	Existing
	F	1	—	—	1	
	Total	1	—	—	1	
MTI	H	—	—	—	0	Existing
	I	1	—	—	1	
	J	1	—	—	1	
	K	—	—	—	0	Existing
	L	—	—	—	0	Using Block I log pond
	M	—	2	—	2	
	N	—	—	3	3	
Total	2	2	3	7		
Grand Total	3	2	3	8		

Source: JICA Survey Team

## (2) Site facilities plan

### 1) Function & Specification

The table below shows the function & specification of site facilities. Figure II-3.3-3 - 5 shows the design of site facilities.

### Function & Specification of Site Facilities

Facility	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 100 m <sup>2</sup>
Accommodation	Accommodation is utilized by WSL/MTI site staff, 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 20 m <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 200 m <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 20 m <sup>2</sup>
Fire Tower : Iron construction, Not to be rebuilt at the harvesting rotation		
Fire Tower	Watching for 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: 20 m and 25 m types
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 is not constructed in WSL and MTI yet. Base camp will be constructed at WSL Block E in 2014 and MTI Block I in 2018. Office, accommodation, other facilities will be constructed as a same 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 rebuild at every harvesting rotation.

(Fire Tower): Fire Tower was constructed in WSL Block B (1 unit) and MTI Block H (2 units). Fire Towers will be constructed in the WSL Block D, E, F and MTI Block J, K, M, N from 2014 to 2017. Two units of fire towers are to be constructed in Block M and 1 unit in other blocks.

The table below shows the amount of site facilities.

### Annual Site Facilities Construction Plan

Facilities	Area	2014	15	16	17	18	19	20	21	22	23	24	25	26	27
B.C. *1	WSL	1					Periodic maintenance will be conducted from 2019.								
	MTI					1									
	Total	1				1									
Normal*2	WSL		1	2	1		1	1	1	1		1	1	※	
	MTI		1	1	1		1		1	1	※				
	Total		2	3	2		2	1	2	2		2	1	1	1
S.P. *3	WSL		1	2	1	1	1	2		1	1	1	2	※	
	MTI	2	3	2	1	3	4		2	1	※				
	Total	2	4	4	2	4	5	2	2	2	4	5	2	2	2
Fire Tower	WSL	1	1	1		Periodic maintenance will be conducted from 2018.									
	MTI	1	1	2	1										
	Total	2	2	3	1										

※ 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 and water control facilities plan

1) Function & Specification

Table below shows the list of canals and water control facilities. The canals are distributed surrounding compartments, and they function to prevent expansion of forest fires. Figure II-3.3-6 - 9 shows the outline figure of canals and water control facilities.

Peat dam will be constructed in main canal and branch canal at every 1 m increment of elevations for maintaining the water level. Infield drain, mid drain and cross drain are constructed to decrease the water levels in case of the high water levels due to the heavy rain. If the water level will increase in the plantation area, the surplus water will flow to infield drain, mid drain, cross drain and branch canal and drainage to river through outlet canal at last. Adjustable gate is constructed to drain surplus water gradually. Flap gate is constructed in the area affected by a high tide and flood to protect the backward flow from river.

Those canals and water control facilities will work to maintain the water level in plantation site and conserve peat swamp.

**Function & Specification of Canals and Water Control Facilities**

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 12m 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 by-pass of the peat dam to the down-stream.
Adjustable gate	Adjust water level of the canals.	-	In the area affected by the rise and fall of tide, we will construct a Flap gate instead of adjustable gate.
Flap gate	Stop backflow of water from a river to a canal	-	The number of flap gates in WSL area is larger than the one in MTI area.
Sedimentation Pond	Remove the soil and suspended particles from the water.	Width : 10m Depth : 3m Length : 140m	Two (2) canals (Width: 10m, Length: 140m) standing in line.

Source: JICA Survey Team

2) Annual construction plan

Table below shows the annual construction plan of canals and water control facilities from 2014 to 2017.

### Annual Canal Construction Plan

(Unit : m)

Canals	Area	2014	2015	2016	2017	Total
Main Canals	WSL	5,819	8,819	7,522	892	23,051
	MTI	7,093	15,635	28,295	12,712	63,735
	Total	12,911	24,454	35,817	13,604	86,786
Branch Canals	WSL	73,596	70,683	30,937	21,531	196,747
	MTI	110,399	117,396	147,513	86,924	462,232
	Total	183,994	188,080	178,450	108,455	658,978
Outlet Canals	WSL	2,025	2,241	1,650	678	6,594
	MTI	6,463	5,125	2,629	1,379	15,595
	Total	8,487	7,366	4,279	2,057	22,188
Mid drain Cross drain	WSL	122,752	127,128	57,679	29,507	337,065
	MTI	160,190	189,141	246,647	141,264	737,241
	Total	282,942	316,269	304,325	170,771	1,074,307
Infield drain	WSL	559,747	672,520	461,429	134,551	1,828,248
	MTI	730,467	862,481	1,124,709	456,236	3,173,894
	Total	1,290,214	1,535,001	1,586,138	590,787	5,002,141

Source: JICA Survey Team

### Annual Water Control Facilities Construction Plan

(Unit : Unit)

Facilities	Area	2014	2015	2016	2017	Total
Peat dam	WSL	15	15	15	4	49
	MTI	24	35	39	19	117
	Total	39	50	54	23	166
Adjustable gate	WSL	7	10	8	3	28
	MTI	30	30	30	16	106
	Total	37	40	38	19	134
Flap gate	WSL	6	11	7	2	26
	MTI	1	1	1	0	3
	Total	7	12	8	2	29
Sedimentation Pond	WSL	6	6	4	1	17
	MTI	10	12	13	5	40
	Total	16	18	17	6	57

Source: JICA Survey Team

#### (4) Road plan

##### 1) Function & Specification

Temporary roads are used for log and labor transportation from canal to log yard by truck. Roads have 2 types of specifications: wet land and 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 : 10m	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 : 6m	Simple road, constructed by only using of excavator

Source: JICA Survey Team

In the wet land, there is 15 m space as 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

Table below shows the construction amounts of roads.

### Construction Amounts of Roads

(Unit : m)

Area	Existing	New	Total
WSL	2,100	4,000	6,100
MTI	5,500	78,000	83,500
Total	7,600	82,000	89,600

Source: JICA Survey Team

## 3) Annual construction plan

Table below shows the annual roads construction plan from 2014 to 2016.

### Annual Roads Construction Plan

(Unit : m)

Area	Block	2014	2015	2016
WSL	A&B	-	-	-
	C	-	-	-
	D	-	-	-
	E	3,000	-	-
	F	0	1,000	-
	Total	3,000	1,000	-
MTI	H	-	-	-
	I	-	-	-
	J	-	-	-
	K	1,000	-	-
	L	-	10,000	-
	M	-	24,437	36,563
	N	-	0	6,000
	Total	1,000	34,437	42,563
Total		4,000	35,437	42,563

Source: JICA Survey Team

## (5) Nursery Plan

### 1) Function & specification

There are two types of nurseries: i) permanent nursery and ii) temporary nursery. Basically, permanent nursery produces most of the seedlings and temporary nursery supplies the balance when the permanent nursery cannot reach the required amount.

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. (Figures II-3.3-10, 11)

The temporary nurseries will be constructed near the plantation area which is located far from the permanent nursery to reduce transportation cost (Figure II-3.3-12). The composition of

temporary nursery is almost same as the permanent nursery. As it is temporary facility, all materials are simple and wood is used for facilities; also, a foundation is not necessary.

## 2) Amount & location

WSL and MTI will provide the necessary 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 WSL

● WSL Seedling production (Unit: Million pcs)

	Block	Area (ha)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
WSL	A&B	5,550		1.7	7.1				7.1	1.6				7.1	1.6	
	C	4,896			4.4	3.4				6.2	1.5				6.2	1.5
	D	5,052				6.3	1.7				6.3	1.7				6.3
	E	5,183	7.3				6.1	2.0				6.1	2.0			
	F	4,092	0.3	6.2					5.8	0.7				5.8	0.7	
	<b>Total</b>	<b>24,773</b>	<b>7.6</b>	<b>7.9</b>	<b>11.4</b>	<b>9.7</b>	<b>7.8</b>	<b>7.8</b>	<b>7.8</b>	<b>7.8</b>	<b>7.8</b>	<b>7.8</b>	<b>7.8</b>	<b>7.8</b>	<b>7.8</b>	<b>7.8</b>
Seedling Production	*1		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
	*2		-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: JICA Survey Team

Notes: \*1 Capacity of permanent nursery

\*2 Required amount of seedling production in satellite nursery

In WSL, the permanent nursery which can annually produce 11.5 million seedlings will be constructed in Block E. It will be able to supply enough seedlings to all plantation areas in WSL. Currently, WSL produces all seedlings in the temporary nursery in block D. After the operation of permanent nursery starts, the seedling production will be halted from temporary nursery.

### Seedling Production and Nursery Capacity in MTI

● MTI Seedling production (Unit: Million pcs)

	Block	Area (ha)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
MTI	H	5,679				8.9					8.9					8.9
	I	932	1.5					1.5					1.5			
	J	6,178	4.1				9.7					9.7				
	K	5,611	4.4	1.9			3.7	5.1				3.7	5.1			
	L	3,545		5.6				5.6					5.6			
	M	11,820		6.7	11.9			1.2	13.4	3.9			1.2	13.4	3.9	
	N	8,880			7.0	7.0				9.5	4.5				9.5	4.5
<b>Total</b>	<b>42,645</b>	<b>9.9</b>	<b>14.2</b>	<b>18.9</b>	<b>16.0</b>	<b>13.4</b>	<b>13.4</b>	<b>13.4</b>	<b>13.4</b>	<b>13.4</b>	<b>13.4</b>	<b>13.4</b>	<b>13.4</b>	<b>13.4</b>	<b>13.4</b>	<b>13.4</b>
Seedling Production	*1		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
	*2		-	2.7	7.4	4.5	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9

Source: JICA Survey Team

Notes: \*1 Capacity of permanent nursery

\*2 Required amount of seedling production in satellite nursery

The capacity of the existing permanent nursery in Block H (11.5 million seedlings / year) is not sufficient for supplying seedlings to the entire plantation area in MTI. Therefore, temporary nurseries are required to produce the shortfall of seedling production. The temporary nursery will be constructed in Blocks I, M and N.

### Annual Construction Plan of Temporary Nurseries in MTI

● MTI Temporary nursery (Unit: Place)

	Block	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
MTI	H														
	I					1					1				
	J														
	K														
	L														
	M		1				1					1			
	N				1				1						1
<b>Total</b>			1	1		1	1		1		1	1		1	

Source: JICA Survey Team

### 3.3.2 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

Area	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
<b>Grading</b>	(Unit: m)									
WSL	400	200	200	200	400	0	200	200	200	400
MTI	0	200	600	600	0	600	200	600	600	0
<b>Total</b>	400	400	800	800	400	600	400	800	800	400
<b>Additional Gravel and silt</b>	(Unit: Units)									
WSL	2	1	1	1	2	0	1	1	1	2
MTI	0	1	3	3	0	3	1	3	3	0
<b>Total</b>	2	2	4	4	2	3	2	4	4	2
<b>Replacement of wood piles</b>	(Unit: Units)									

Area	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
WSL	2	1	1	1	2	0	1	1	1	2
MTI	0	1	3	3	0	3	1	3	3	0
Total	2	2	4	4	2	3	2	4	4	2
<b>Jetty Dredging</b> (Unit: m)										
WSL	1,200	600	600	600	1,200	0	600	600	600	1,200
MTI	0	600	1,800	1,800	0	1,800	600	1,800	1,800	0
Total	1,200	1,200	2,400	2,400	1,200	1,800	1,200	2,400	2,400	1,200

Source: JICA Survey Team

Note: Repeat the same rotation of 2021 – 2025 in WSL and 2018 – 2022 in MTI.

## (2) Site facilities maintenance plan

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

### Schedule 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 lists Canals and Water control facilities maintenance works.

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

	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. Remaining 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. Remaining 50% will be implemented after 4 years from construction
Water control facilities	Peat dam	Rebuild the damaged facilities	30% of all the canals	Rebuild 30% of facilities in every harvesting rotation
	Adjustable gate	Rebuild the damaged facilities	50% of all the canals	Rebuild 50% of facilities in every harvesting rotation
	Flap gate	Rebuild the damaged facilities	50% of all the canals	Rebuild 50% of facilities in every harvesting rotation
	Sedimentation Pond	Dredging	50% of all the canals	Implement 50% of canals after 2 years from construction. Remaining 50% will be implemented after 4 years from construction

Source: JICA Survey Team



2) Annual maintenance plan

The Table below shows the annual maintenance plan.

**Annual Maintenance Plan of Canals**

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Main Canals (Unit: m)												
WSL			15,988	9,811	5,483	6,755	14,316	17,251	6,477	5,483	6,755	14,316
MTI				6,501	7,297	11,485	20,601	19,660	15,570	7,297	11,485	20,601
Total			15,988	16,311	12,780	18,240	34,917	36,911	22,047	12,780	18,240	34,917
Branch Canals (Unit: m)												
WSL			67,006	80,235	79,044	72,061	67,756	66,407	86,096	79,044	72,061	67,756
MTI				75,956	133,209	134,129	103,355	106,216	142,581	133,209	134,129	103,355
Total			67,006	156,191	212,253	206,190	171,111	172,623	228,677	212,253	206,190	171,111
Outlet Canals (Unit: m)												
WSL	1,928	108	1,513	2,940	1,228	2,338	3,279	1,228	2,338	3,279	1,228	2,338
MTI	91	380	2,149	3,322	2,942	3,463	4,011	2,942	3,463	4,011	2,942	3,463
Total	2,018	488	3,662	6,262	4,170	5,801	7,290	4,170	5,801	7,290	4,170	5,801
Mid drain, Cross drain (Unit: m)												
WSL	76,482	6,466	61,594	137,858	70,030	90,433	152,612	70,030	90,433	152,612	70,030	90,433
MTI	24,430	35,447	56,615	104,525	130,017	179,939	175,157	130,017	179,939	175,157	130,017	179,939
Total	100,912	41,913	118,209	242,383	200,047	270,372	327,768	200,047	270,372	327,768	200,047	270,372

Source: JICA Survey Team

Note 1: (Main and Branch Canals) Repeat the same rotation of 2021 – 2025 in WSL and 2018 – 2022 in MTI.

2: (Outlet Canals, Mid drain and Cross drain) Repeat the same rotation of 2018 – 2020.

**Annual Maintenance Plan of Water Control Facilities**

Area	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Peat dam (Unit : Units)												
WSL			6	6	2	5	3	11	8	4	5	3
MTI				4	6	13		13	14	6	13	
Total			6	10	8	18	3	24	22	10	18	3
Adjustable gate (Unit : Units)												
WSL			3	7	3	3	4	6	10	5	3	4
MTI				7	11	26		16	21	11	26	
Total			3	14	14	29	4	22	31	16	29	4
Flap gate (Unit : Units)												
WSL			5	3	3	3	4	10	4	4	3	4
MTI						1		1	1		1	
Total			5	3	3	4	4	11	5	4	4	4
Sedimentation Pond dredging (Unit : m)												
WSL	1,120	560	1,120	2,240	1,680	1,960	2,520	1,680	1,960	2,520	1,680	1,960
MTI	280	560	1,120	1,680	2,240	3,080	2,520	2,240	3,080	2,520	2,240	3,080
Total	1,400	1,120	2,240	3,920	3,920	5,040	5,040	3,920	5,040	5,040	3,920	5,040

Source: JICA Survey Team

Note 1: (Peat dam, Adjustable gate, Flap gate) Repeat the same rotation of 2021 – 2025.

2: (Sedimentation Pond) Repeat the same rotation of 2018 – 2020.

(4) Roads maintenance plan

1) Maintenance items

The Table below lists road maintenance works.

**List of Road 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 Maintenance Plan of Roads**

(Unit : m)

Area	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Grading (Wet land)										
WSL	500	1,600	3,000	1,000	500		1,600	3,000	1,000	500
MTI		3,900	2,600	4,000		6,000	3,900	2,600	4,000	
Total	500	5,500	5,600	5,000	500	6,000	5,500	5,600	5,000	500
Grading (Mineral soil)										
WSL										
MTI				13,819	41,130	12,051			13,819	41,130
Total				13,819	41,130	12,051			13,819	41,130
Additional Gravel and Silt										
WSL	250	800	1,500	500	250		800	1,500	500	250
MTI		1,950	1,300	2,000		3,000	1,950	1,300	2,000	
Total	250	2,750	2,800	2,500	250	3,000	2,750	2,800	2,500	250
Dredging the drain										
WSL	100	320	600	200	100		320	600	200	100
MTI		780	520	800		1,200	780	520	800	
Total	100	1,100	1,120	1,000	100	1,200	1,100	1,120	1,000	100

Source: JICA Survey Team

(5) Nursery maintenance plan

The Table below shows the permanent nursery maintenance plan. The maintenance of permanent nursery will be conducted annually. Satellite nurseries will be rebuilt at every harvesting rotation.

**Maintenance Plan of Permanent Nursery**

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

Source: JICA Survey Team

### 3.4 Chip Mill Construction / Chip Production Plan

#### 3.4.1 Chip Mill Plan

(1) Chip mill location

Chip mill is planned to be established along Mendawak river which is located at the centre of MTI.

(2) Chip production plan

Log harvest volume is described in Section 3.2.2 (4) of Part II in this report. The Table below shows planned harvest volume of the planted species from each plantation during 2016-2018. The estimated harvest volume will be stable from 2018.

#### Estimation of Harvest Volume from Plantation

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

Plantation	2016	2017	2018
WSL	445,914	445,914	445,914
MTI		363,870	767,610
Total	445,914	809,784	1,213,524

Source: JICA Survey Team based on WSL data

Expected chip production amount based on the harvest volume is described below.

#### Chip Production Plan

(per year)

items	unit	2016	2017	2018
Harvestable volume	m <sup>3</sup>	445,914	809,784	1,213,524
Actual available volume for chip	m <sup>3</sup>	380,365	690,746	1,035,136
Chip production amount	GMt	296,220	537,938	806,142
Same as above	BDt	201,510	365,944	548,396

Source: JICA Survey Team based on WSL data

Chip mill will receive 1.2 million m<sup>3</sup> logs annually, therefore a facility which can produce 806,000 GMt (= 548,000 BDt) chip will be installed. Total effective working days is assumed as 300 days (long Islamic holiday is included) so estimated log consumption for chipping per day is 4,600m<sup>3</sup>.

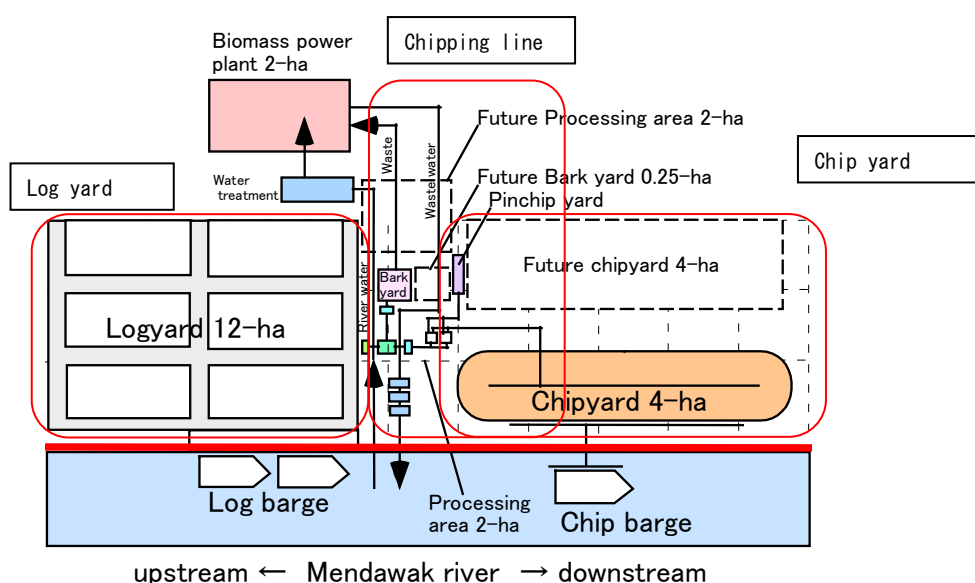
(3) Components, outline of the facility, layout and machine type of MTI chip mill

The design of each facility and its basic specification of MTI chip mill is fixed as summarized below. It was designed based on the concept of wood flow so that the wood material can move from upstream to downstream, such as from the log yard located at upstream, to the processing area and BPP at intermediate area and chip yard at downstream.

### Summary of MTI Chip Mill Facility

Items	Simple description of the facility, with 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 the 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 pieces. Horizontal feed type disc chipper was selected
Screen	A machine select the proper chip size There is no specific requirement except for capacity and price
<b>vi) Chip yard</b>	
Chip yard	A facility which temporarily stocks 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

### Simple Layout of MTI Chip Mill

#### 3.4.2 Layout of MTI Chip Mill Facilities

##### (1) Design 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 are 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 necessary 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>	
Log feeder	The capacity which can handle the plantation logs at the speed of 340 m <sup>3</sup> SOB/hr.
Debarker	Rotary debarker which can handle the plantation logs at the speed of 340 m <sup>3</sup> SOB/hr after comparison between drum style and rotary style debarker.
Chipper	Slice style horizontal disc chipper was selected, after coparison of slice type and crush type, horizontal type and vertical type. The required capacity is 300 m <sup>3</sup> SUB/hr.
Screen	Two machines with capacity to handle 800 m <sup>3</sup> loose chips per hour are selected.
<b>Chip yard</b>	
Chip yard	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 machines 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 (m<sup>3</sup>) = Area (m<sup>2</sup>) × Effective area (%) × loadable height (m) × Solid part (%)</p> <ul style="list-style-type: none"> <li>• monthly required log amount (m<sup>3</sup>) : 101,127 m<sup>3</sup>/month</li> <li>• among above logs needed for stock at log yard : 50,563 m<sup>3</sup>/month</li> <li>• available area for log stock : 60%</li> <li>• loadable height : 3 m</li> <li>• solid proportion : 40%</li> </ul> <p>70,227 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 : 101,127 m<sup>3</sup>/month</li> <li>• Weight base : 78,879 ton/month (log fresh weight : 0.78 GMt/m<sup>3</sup>)</li> <li>• Debarked bark amount at mill : 6,310 ton/month</li> <li>• volume base : 17,810 m<sup>3</sup>/month (bulk density : 0.274 GMt/m<sup>3</sup>)</li> <li>• bark pile height : 15 m</li> </ul>

	<ul style="list-style-type: none"> <li>• form of bark pile : continuous hill style</li> </ul> <p>Required area is estimated as 4,606m<sup>2</sup>, 1ha 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> <p>Capacity : 7 Mwh Combustion system : Travelling grate (chain grate) Boiler capacity : 40 T/hr×1 Steam temperature : 450°C Steam pressure : 40 bar(g) Output from generator : 6.3kV Synchronised to 0.4kV, eventually, using 8,000KVA transformer</p>
<b>Chipping facility</b>	
Log feeder	Capacity 340 m <sup>3</sup> /SOB/hr×1
Debarker	<p>Model : DDR (Demuth) Capacity : 340 m<sup>3</sup>/SOB/hr×1 Debarking length : Total length 78,000 mm Module length : 13,000 mm Module number : 6 modules Rotor number per module : 3 rotors Operational width per module : 2,800 mm Motor power per module : Upper rollers 30kW×1 Lower rollers 55kW×1 Discharge gate power : 7.5 kW×1 Weight (Approx.) 450,000 kg</p>
Chipper	<p>Model : DPDI 3000 (Demuth) Capacity : 300 m<sup>3</sup>/SOB/hr×1 Rotor disc diameter : 3,000 mm Disc thickness : 220 mm Knives number : 14 Nominal chip length : 25 mm Installed power : 700 kW×2 Rotor weight (Heaviest part) : 20,200 kg Total weight (Approx) : 54,000 kg Feeding spout diameter : 835 mm</p>
Screen	<p>Capacity : 800 m<sup>3</sup> loose/ hr×2 Lenght : 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></p>
<b>Chip yard</b>	
Chip yard	<p>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</p>

Source: JICA Survey Team

### 3.4.3 Chip Mill Construction Plan

#### (1) Summary of construction method

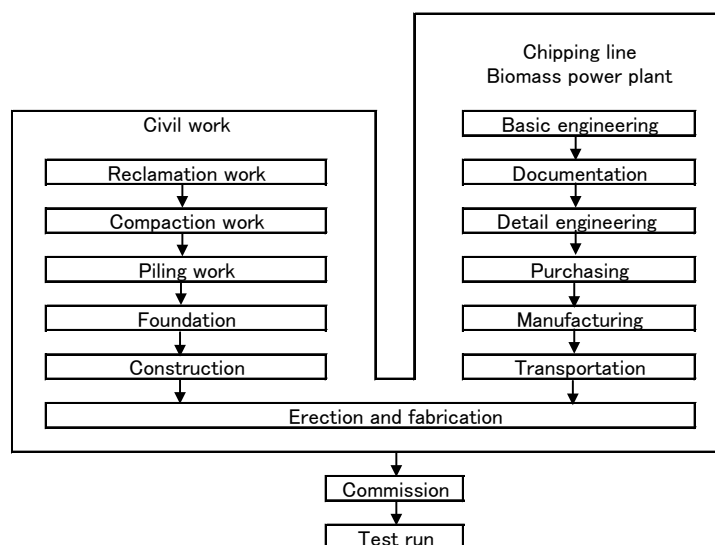
##### 1) Adopted conditions

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.

Construction work flow of chip mill establishment is shown below.



Source: JICA Survey Team

### Construction work flow of chip mill establishment

#### (2) Summary of construction quantities

Construction quantities based on design engineering 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

Facility • Machine	Quantity	Unit
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 (7 Mwh) - BOILER - TURBINE - GENERATOR - OTHERS (MATERIALS, CHEMICALS, ERECTION, 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) - MULTI FILTER PUMP (60 m <sup>3</sup> /day)	1 2 2 2 2 2 2	Set
<b>3. BACK UP DIESEL GENERATOR</b>		
- BACK UP DIESEL GENERATOR 1500 KVA	2	machine
- ELECTRIC PANEL (MAIN ELECTRICAL PANELS + DISTRIBUTION PANELS)	1	set
- CABLE + CABLE TRAY	1	set
- FUEL TANK	2	tank
<b>4. CIVIL WORK, BUILDINGS, OTHER FACILITIES</b>		
LAND RECLAMATION (12 ha) - LAND FILLING HEIGHT: 3.5 m - COMPACTION	875,000 12	m <sup>3</sup> ha
PILING WORK - 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	1	set
LOGYARD - LAND PREPARATION FOR 6 UNITS × 200 m × 100 m - SMALL WOOD PILE (1 TREE PER 1.5 m <sup>2</sup> ) - CONCRETE WORKS (120,000 m <sup>2</sup> ×40% ×THICKNESS 12 cm)	120,000 80,000 48,000	m <sup>2</sup> pole m <sup>2</sup>
CHIP PRODUCTION AREA PREPARATION - CONCRETE WORKS (THICKNESS 12 cm)	20,000	m <sup>2</sup>
BARK YARD PREPARATION	15,000	m <sup>2</sup>



Facility • Machine	Quantity	Unit
- 75 m × 200 m, THICKNESS 12 cm		
<b>INFRASTRUCTURE</b>		
- 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 (10m×20m ×4m) (CONCRETE THICKNESS 30cm)	1	set
<b>5. BUILDINGS</b>		
- BUILDING FOR CHIPPER&SCREEN (H=12 m) 2 units × W 30 m× L 20 m	1,200	m <sup>2</sup>
- BUILDING FOR DIESEL GENERATOR H=4 m) 1 unit × W18 m × L15 m	270	m <sup>2</sup>
- BUILDING FOR MMC, GRINDING MACHINE, TRANSFOMER, OFFICE (H=16 m) 1 unit × W 12 m × L 12 m	144	m <sup>2</sup>
- BUILDING FOR MAIN OFFICE (H=4m) 1unit × W30m × L10m	300	m <sup>2</sup>
- BUILDING FOR MESS & GUEST HOUSE(H=4m) 10 rooms× W6m × L6m	360	m <sup>2</sup>
- 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 CANTEEN H=4 m) 40 tables × W 6 m × L 6 m (300 PERSONS CAN USE AT ONE TIME)	1,440	m <sup>2</sup>
- BUILDING FOR CHIPPING MACHIN WORKSHOP H=4 m) W 10 m × L 10 m	100	m <sup>2</sup>
- BUILDING FOR HEAVY MACHINERY WORKSHOP H=4 m) W 10 m × L 10 m	100	m <sup>2</sup>
- BUILDING FOR FUEL STRAGE (PUMP, TANK 150 TON, DISTRIBUTION PIPE, VALVE SYSTEM)	1	set
- LOG WITH SCALE (50 TONS)	3	set

Source: JICA Survey Team

### (3) Estimated construction period

Construction period was estimated by “ Total task number ÷ (number per day × efficiency × necessary days)”. Estimation of team number which can complete the task effectively is considered based on the significance of the task, standby time, and sufficient area to use. Period of each task is shown in the Table below.

#### Chip Mill Construction Period

	Tasks	Unit	Number	Team	Number per day	Efficiency	Necessary days	Necessary month
<b>1 Preparation</b>								
1.1	Purchasing or renting of heavy equipment and material needed for initial stage of construction	L.S.	1	-	-	-	-	2
1.2	Preparation	L.S.	1	-	-	-	-	1
<b>2 Whole area</b>								
2.1	Land reclamation	m3	875,000	1	2,431	0.80	450	18
2.2	Land compaction	m2	250,000	1	4,167	0.80	75	3
<b>Chipping line</b>								
3	3.1 Piling	nos	1,746	1	15	0.60	200	8
	3.2 Concrete works	m3	16,076	1	51	0.60	525	21
	3.3 Pavage	m2	33,800	1	423	0.80	100	4
<b>4 Biomass power plant</b>								
4.1	Piling	nos	1,091	1	9	0.60	200	8
4.2	Concrete work	m3	2,400	1	23	0.60	175	3



	<ul style="list-style-type: none"> <li>➤ The breasting dolphin is supported by five steel pipe piles and its upper part is rolled by concrete.</li> <li>➤ The mooring dolphin is supported by three steel pipe piles and its upper part is also rolled by concrete.</li> <li>➤ Each dolphin is connected with trestles, and a trestle with a long span is supported by steel pipe piles.</li> <li>➤ A fender (old tire) and a bollard are set on the coping concrete of dolphin.</li> <li>➤ Each steel pipe pile for mooring is located along the riverside at both edges of berth.</li> </ul> <p>(Damages)</p> <ul style="list-style-type: none"> <li>➤ Some corners of coping concrete are chipped and rounded.</li> <li>➤ Some dolphins are tilted landward, pushed by barges.</li> </ul> <p>(Others)</p> <ul style="list-style-type: none"> <li>➤ Tires are attached to steel pipe piles as fenders, as barges may hit against steel pipe piles.</li> <li>➤ Mooring rope is hanging down from each bollard to connect with barge's mooring rope.</li> <li>➤ Bauxite is loaded on the front half and the rear half of barge causing shifting of barge's position from the front to the rear.</li> </ul>
Chip Loading Facility (Batu Ampar)	<p>(Structure)</p> <ul style="list-style-type: none"> <li>➤ Chip loading facility is composed of three breasting dolphins, which are supported by four RC piles, at the upstream side.</li> </ul> <p>(Conditions)</p> <ul style="list-style-type: none"> <li>➤ Two breasting dolphins excluding that in front of loading facility are out of service due to the destruction of piles, which may have been caused by barge collision.</li> <li>➤ All four RC piles of broken dolphins are destroyed below the coping concrete.</li> <li>➤ The conditions of fenders and bollards look like comparatively clean and new.</li> </ul> <p>(Loading)</p> <ul style="list-style-type: none"> <li>➤ Currently, mooring ropes are stretched with 3-pair wood piles and a landside wood pile.</li> <li>➤ Chips are loaded, the same as bauxite, on the front half and the rear half of barge causing shifting of barge's position from the front to the rear. A bulldozer is working on the barge.</li> </ul>
Log Loading Facility (Opposite bank of the Project site)	<p>This facility is to load logs onto the barges.</p> <p>(Structure, damages)</p> <ul style="list-style-type: none"> <li>➤ It has a pier made by wooden piles in the river bank.</li> <li>➤ Barges berth to the pier and trucks bring logs through connecting bridge.</li> <li>➤ Mooring ropes of barge are connected to near-by natural trees or wood piles.</li> <li>➤ The pier made by wooden piles may have been used with reinforcing damaged parts step by step.</li> </ul>

Source: JICA Survey Team

Note: All description in table above are based on site observation of JICA Survey Team

## (2) Determination of facilities to be studied

In the chip factory plan, the following facilities will be developed as port facilities.

### List of Planned Port Facility

Planned port facility	Objectives	Quantity	Remarks
Chip berth	Loading chip	1 berth	Parallel berthing is not considered due to the limited river width.
Bases for Chip Loading Equipment	bases for chip loader and belt conveyor for chip handling operation	1 berth	It is planned that these bases will be connected to the land by trestle, which will be a patrol passage for chip loading equipment and port facilities.
Log Yard Berth	Loading logs	2 berths	
Mooring Facility for Tugboats			In case the tugboats are isolated from barges, tugboats will stand-by at an appropriate location downstream of the river.
Riverside Revetment	Sheet pile will be driven at the river bank behind chip loading berth		

Source: JICA Survey Team

## (3) Berth operation and cargo handling plans

Berth operation and cargo handling plans in the chip loading berth and log yard berth are decided as below.

Operation	Assumed Operation Type	Necessary Structure	Remarks
-----------	------------------------	---------------------	---------

Chip Loading Bert			
Berthing and Unberthing Operations	Berthing and unberthing operations will be done by crew.	Thus, the installation of trestles connecting bases for chip loader and belt conveyor are planned to enable landside crew to go over to mooring and breasting dolphins.	Barges are to turn around not in front of berth but at a sufficient area for turning around in the downstream.
Chip Loading Operation	Chip is loaded from conveyor on the front half and the rear half of barge causing shifting of barge's position from the front to the rear.	The position of loading conveyor is planned to be at one-fourth of barge length from both front and rear while barge is moored	Barge's position from the front to the rear is shifted, assisted by tugboat or pulling ropes.
Log Yard Berth			
Berthing and Unberthing Operations	berthing and unberthing operations in the log yard berth will be done by crew as well as chip loading berth.		
Log Unloading Operation	log unloading operation will be done by a fixed crane on the berth and a grabber on barge, and logs will be transported by trucks.	Mobile ramp connected between log yard berth with barge is required for the log unloading operation.	

Source: JICA Survey Team

#### (4) Port facility layout

##### 1) Chip loading berth

The berth line of port facility is determined to be 20 m inside from the riverside based on chip factory plan.

##### a Proposed location

The location of port facility will be selected for easy transport from chip factory or stock yard and no obstacle for ship maneuvering. If water depth is insufficient, dredging works will be required.

##### b Port facility layout

Loading facility is to be at the centre of berth. It is assumed that barge's position from the front to the rear is shifted during loading. Considering barge berthing with at least two BDs, MDs are to be constructed at each edge of berth.

##### Breasting Dolphin (BD)

At least two BDs for each barge position. So total four BDs will be required: two will be at 15 m upstream and downstream each from the centre of berth and the other two BD will be at 45 m upstream and downstream each from the centre. Bollards will be installed on MDs to stretch supplemental ropes

##### Mooring Dolphin (MD)

Barge is to be moored with MDs by ropes with an angle of 45 degrees. MDs are to be located at 35 m upstream and downstream from BDs at each edge of berth. There are examples of the destruction of MDs, which may be caused by barge collision. Therefore, MDs are to be set back 5 m from berth line to prevent barge collision.

### Base for Chip Loader

It is assumed that chip loader will be installed at the centre of the berth and barge's position from the front to the rear will be shifted during loading. The chip will be dropped at the height of 15 m from barge deck. The base for chip loader is to be set back 5 m from berth line to prevent barge collision.

### Base for Belt Conveyor

Chip will be transported by belt conveyor from chip factory or stock yard to chip loader, which will be installed at 15 m inside from the revetment of the chip factory. Thus, a base for belt conveyor will be required at the middle between the location of chip loader and the revetment of chip factory.

### Trestle

Trestle from the revetment will be installed to access to chip berth and to maintain chip loader and belt conveyor.

## 2) Log yard berth

### a Proposed location

According to the chip factory plan, two log yard berths are planned 400 m upstream of the river. They will be located at the downstream side of log yard berth.

### b Berth length and location

Berth length is calculated at the following considering the maximum barge 300 ft for log transport and mooring ropes with an angle of 45 degrees.

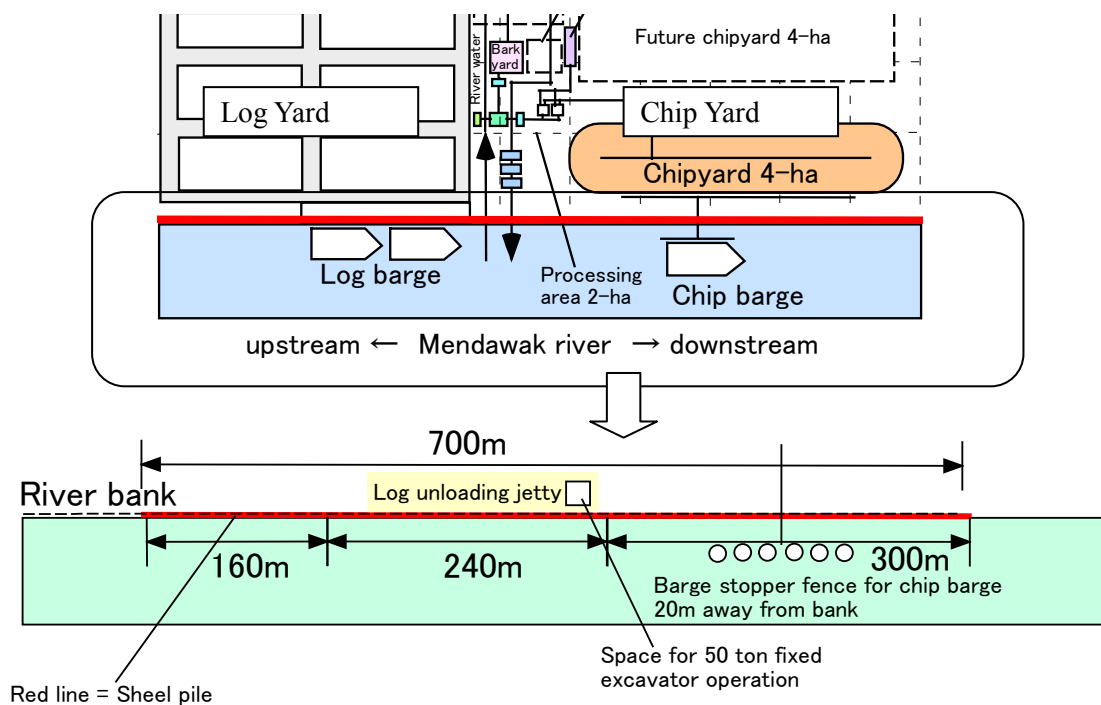
$$1 \text{ berth: } 95 \text{ m} + 24 \text{ m} = 119 \text{ m} \gg 120 \text{ m}$$

$$2 \text{ berths: } 120 \text{ m} \times 2 = 240 \text{ m}$$

Berth is planned to be continuous type to receive several small barges at the same time.

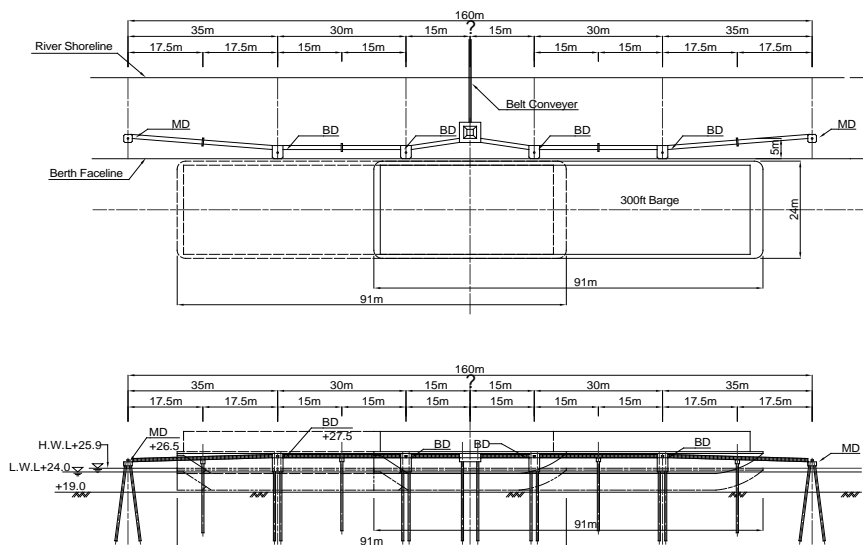
### c Revetment

Revetment will be constructed at 160 m upstream part of log yard berth and 300 m of chip factory area, which is behind chip loading berth.



Source: JICA Survey Team

### Port Facility Layout



Source: JICA Survey Team

### Berth Layout

## 3.5.2 Preliminary Port Facility Design

### (1) Design conditions

Design conditions are composed of natural condition and operational condition as below.

#### Natural Conditions for Preliminary Port Facility Design

Topographic	Bench mark	Tentative bench mark is set on the bauxite loading berth, which is located
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Conditions		at upstream from the Project site.
	Used maps for design	Topographic survey map and bathymetric survey map are provided by PT. WSL and JICA Survey Team
Subsoil Conditions	Soil conditions	No soil investigation except standard penetration test (SPT) was conducted. The characteristics have been assumed based on N-value and other peat soil.
River Condition	Design water levels	HWL: 25.9 m LWL: 24.0 m
	Current	Current is not considered in the preliminary design in this report.
Meteorological Condition	Temperature, wind, rainfall conditions	They are not considered in the preliminary design in this report.
Seismic Condition	Seismic coefficient	Design seismic coefficient is not considered in this port facility design.

Source: JICA Survey Team

### Operational Condition for Preliminary Port Facility Design

Chip Loading Berth	Design Vessel: Barge	300-ft ocean barge Length 300 ft = 91.44 m (1 ft = 0.3044 m), width 24.0 m, height 5.5 m, draft 4.5 m
	Design Vessel: Tugboat	Capacity: 800 HP x2, length: about 24 m, width: about 7 m, draft: about 3 m
	Loading Equipment	System: natural drop method with conveyor Height: 15 m from land surface Length: Reach of loading equipment is about 12.5 m from the berth line, which is half of barge width plus height of fender
	Berthing condition	Barge is to be berthed in parallel with mooring ropes and tugboat's assistance. Its berthing force is to be received by two breasting dolphins. Barge will be empty when berthing and it will be full when unberthing. Berthing speed is to be 0.15 m/s
	Mooring condition	Mooring mode: single mooring Design wind pressure is calculated based on the understanding than projected area of barge is affected by wind pressure.
Log Yard Berth	Design Vessel: Barge	180 ft, 230 ft 250 ft and 300 ft barges are considered.
	Design Vessel: Tugboat	
	Loading Equipment	Fixed crane, grabber, 20 t truck, etc are considered.
	Berthing Condition	Barge is to be berthed in parallel with mooring ropes and tugboat's assistance. Barge will be full when berthing and it will be empty when unberthing. Berthing speed is to be 0.15 m/s considering direct berthing.
	Mooring Condition	Mooring mode: single mooring Calculation of mooring force Design wind pressure is assumed to be almost the same as fully loaded barge

Source: JICA Survey Team

## (2) Selection of port facility configuration

Port facility configuration is determined as shown below.

### Port Facility Configuration

Berth	Facility	Structure	Considerations
Chip Loading Berth	Berthing and Mooring Facility	Dolphin type, (this is supported by piles and does not have apron)	Dolphin type, pier type and quaywall type are considered with following issues; a) Profitability b) Workability c) Impacts to river current and surrounding riverside d) Effect to chip loading system
	Base for chip loader	Base for handling equipment is supported by pipe piles. 4.0 m x 4.0 m fixed platform is planned. Pipe pile will be steel, the same as berth.	Based on the existing berth equipment.

	Base for belt conveyor	Base for belt conveyor is planned to be 3.0 m x 1.0 m, located at the inside of the river from the revetment.	Based on the existing berth equipment.
	Base for trestle	Trestle from the revetment will be installed to access to chip berth and to maintain chip loader and belt conveyor.	Based on the existing berth equipment.
Log Yard Berth	Berth Facility	Steel pile type (Both handling operations are considered: handling equipment on barge will handle logs transported by trucks, and fixed crane on berth will handle logs. Therefore, apron is required behind the berth.)	Jetty type, Cellular type and Steel pile type are listed. These are considered from: i) construction aspect, ii) economic aspect, and iii) environmental aspect.

Source: JICA Survey Team

### (3) Examination of structure section

The structure section is examined based on the design conditions.

#### Structure Section of Port Facility

Berth	Structure Section	Decided Structure Section	Consideration Points
Chip Loading Berth	Top Elevation	BD : +27.5 m MD : +26.5 m	water level and barge height
	Pipe Material	Steel Pipe Pile	Wood Pile, RC Pile, PC Pile, Steel Pipe Pile are considered with features of durability, workability, and economic aspect
Log Yard Berth	Top Elevation	+27.4 m	
	Sheet Pile	Steel sheet pile	Concrete and steel types are considered
	Apron Width	20 m width of apron	Unloader on berth and traffic abilities of handling equipment and trucks are considered.

Source: JICA Survey Team

### (4) Structural Design

Structural design for each facility is shown below. Preliminary drawings of port facility are shown in Figures II-3.5-1 to 6.

#### Structural Design of Port Facility

Chip Loading Berth			
Breasting Dolphin			
Steel Pipe Pile	Front vertical pile x 2	0 degree	φ=500mm t= 10mm L =20m
	Rear batter pile x 2	15 degrees	φ=500mm t= 10mm L=25m
Superstructure	2.5m x 3.25m x 1.0m		
Mooring Dolphin			
Steel Pipe Pile	Front batter pile x 2	15 degree	φ=500mm t= 10mm L=13m
	Rear batter pile x 2	15 degrees	φ=500mm t= 10mm L =23m
Superstructure	2.0m x 2.0m x 1.0m		
Log Yard Berth			
Front steel sheet pile	III w type III	Tip elevation	+12.5 m
Tie rope			TR-117 (ctc 2.4 m)
Front bracket			2[ - 250x90x9x13
Anchorage bracket			2[ - 250x90x9x13
Anchorage pile	Steel pipe pile	Tip elevation	φ=600 t=12 +16.0 m
	Bracket		2[ - 250x90x9x135
	Location		10.0 m back from the center of sheet



Examination of circular failure	Examined with circular sliding through the tip of steel sheet pile Safety ratio:4.534
Revetment	
Front steel sheet pile	III w type Tip elevation +13.5.0 m
Tie rope	TR-91 (ctc 2.4m)
Front bracket	2[ - 250x90x9x13
Anchorage pile	Steel pipe pile Tip elevation +16.5 m Bracket 2[ - 250x90x9x13 Location 8.0 m back from the center of sheet pile
Examination of circular failure	It is judged to be safer than log yard berth Safety ratio: 4.534

Source: JICA Survey Team

### 3.5.3 Construction Plan

#### (1) Tentative construction method

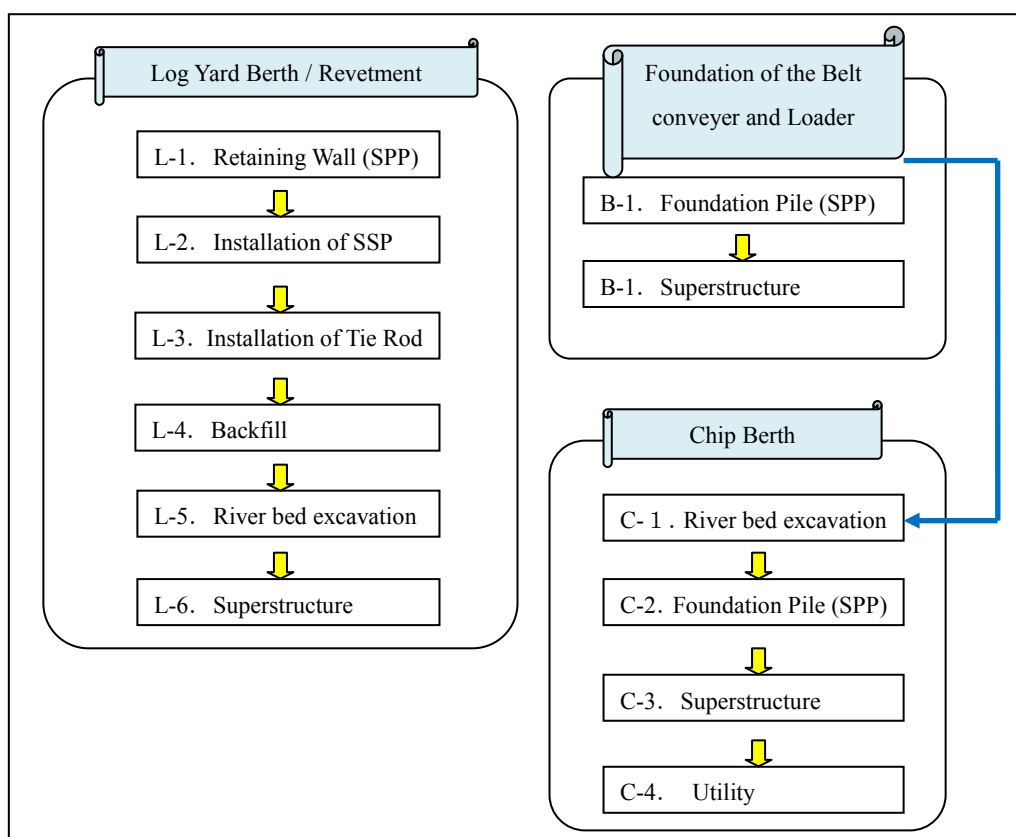
##### 1) Applied conditions

The construction method is considered based on following conditions and then adopted.

- Applied construction methods are popular in the project area and have enough satisfactory experiences.
- Local materials and equipment will be used as much as possible.
- Special method or risky method with purpose of cost saving or shortening construction period is not applied.
- Construction works have required qualities.
- The contractor which has sufficient skill and experience in the project area will carry out works.

##### 2) Execution work flow

Figure below shows the execution work flow of the overall construction works.



Source: JICA Survey Team

### Execution Work Flow

#### (2) 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 conveyer	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

Facility	Work Item	Unit	Quantity
	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

### (3) Tentative construction period

Tentative construction period is calculated based on the Work quantity, 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 the Table below..

### Tentative Construction 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

### (4) Tentative construction schedule

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

No.	WORK ITEM	Unit	Qty	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	SPP 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 are shown in the 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 and Chip Transport 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

### Category of Log and Chip Transportation

Log · Chip	Task	Plan
Log transport		
(1)	Log transportation from plantation log pond to mill jetty	Log barge transportation plan (Location : Mendawak river)
(2)	Log unloading, loading and transportation at jetty, log yard and feeder	Log transportation plan (Location : Mill jetty, log yard, log feeder)

Log • Chip	Task	Plan
Chip transportation		
(3)	Chip loading at mill jetty (chip loading facility)	Chip loading plan Location : Chip yard, Barge)
(4)	Chip transportation from mill to offshore loading point	Chip barge transportation plan (Location : Mendawak river)
(5)	Chip unloading from barge and loading to vessel	Chip loading plan (Location : Offshore loading point)

Source: JICA Survey Team

### 3.6.2 Log Transport Plan

Plantation logs were gathered to the plantation log pond and loaded on to log barge which MTI chip mill prepare. Log loading cost at plantation log pond is covered by plantation side. Therefore, after the log is loaded on barge, chip mill side will start handling the logs. This chapter plans the log transportation from plantation log pond to mill jetty. Log transportation from plantation site to log pond is planned in this section.

#### (1) Barge pathway

Plantation logs from each log pond in MTI is planned to transfer by barge through Mendawak river. Plantation logs from each log pond in WSL is planned to transfer by barge to downstream of Kelabau river then go up to mill jetty.

#### (2) Log transportation plan

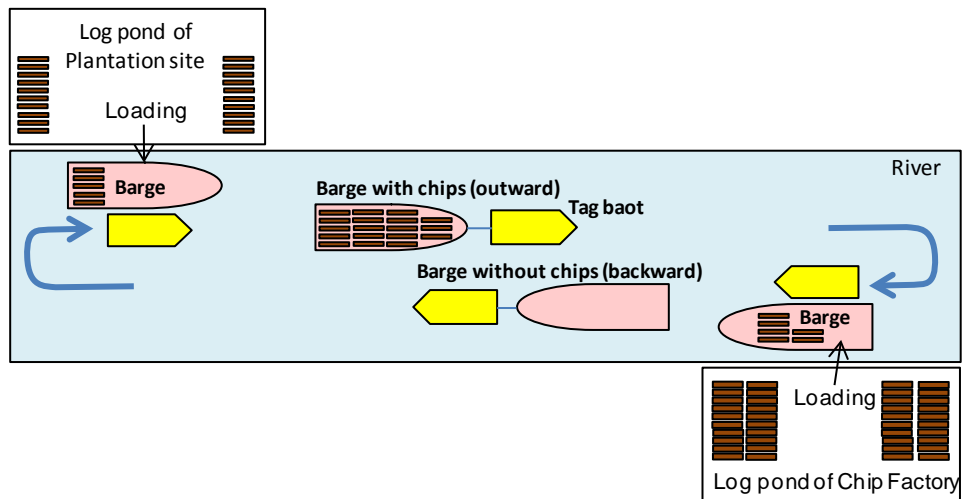
Log transportation is planned to be carried out by the barge through river. The barge size used in WSL and MTI is fixed as 230 ft and 300 ft respectively, in accordance with the result of past log transportation by barge in both Kelabau and Mendawak river. Based on the loadable log volume, travelling time of barge, log loading and unloading time, the required number of log transportation barges for travelling to WSL and MTI is estimated at 2 barges each.

### Annual Log Transportation Plan

Plantation	Barge spec	Loadable log volume (m <sup>3</sup> )	Required barge number	Annual travelling time by one barge	Annual transportable log volume (m <sup>3</sup> )	Necessary log volume to be transported (m <sup>3</sup> )
WSL	230ft (Middle size)	4,300	2	52	447,200	445,914
MTI	300ft (Large size)	8,200	2	47	770,800	767,610

Source: JICA Survey Team

Two barge operation cycle is shown in the figure below.



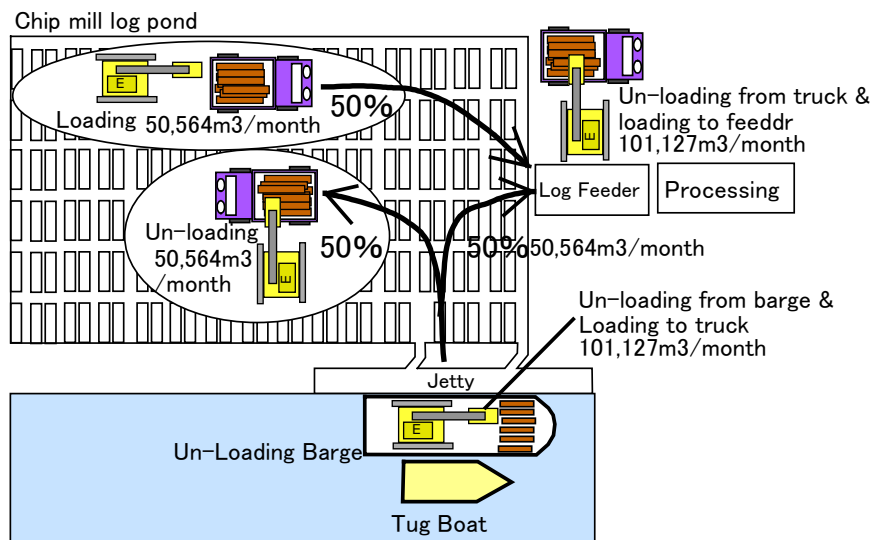
Source: JICA Survey Team

### Cycle of Log Transport by Barge

#### 3.6.3 Log Handling Plan

##### (1) Procedure of log unloading, loading and transportation

50% of the plantation logs which are transported to mill jetty are unloaded from the barge by excavator and carried straight into log feeder of the chipping line by truck. Log unloading from the truck is carried out by excavator. The other 50% which is carried from the plantation by barge is transported to the log yard by truck after being unloaded from the barge. Then unloaded from the truck by excavator. The logs stocked at the log yard carried by truck are loaded to truck again by excavator then transported to the log feeder of the chipping line. Then they are unloaded from the truck by excavator to feed the log feeder.



Source: JICA Survey Team

#### Log Handling at Log Yard (log unloading, log loading and log transportation)

(2) Specifications of vehicle and heavy equipment for log handling

**Vehicle and Heavy Equipment Planned to be Used at Jetty, Log Yard and Log Feeder for Log Handling**

Location	Loading or transportation task	Planned vehicle/heavy equipment		
		Type of vehicle/heavy equipment	Loading capacity	Loading/ unloading capacity
Jetty	Log unloading from barge and loading to the truck	Komatsu PC-300	—	2m <sup>3</sup> /machine • 1 time
Jetty to log feeder Jetty to Log yard Log yard to log feeder	Transportation by truck	Hino FM260JD	32m <sup>3</sup> /truck	—
Log yard Log feeder	Log loading and unloading to and from truck	Komatsu PC-200	—	2m <sup>3</sup> /machine • 1 time

Source: JICA Survey Team

(3) Log handling operation plan

1) Log transportation plan

Log transportation plan by truck is shown in the table below

**Log Transportation Plan by Truck (Log Yard)**

Number of trips per day (times/number of vehicle • day)	Loading capacity of one truck (m <sup>3</sup> /vehicle • time)	Transport volume (m <sup>3</sup> /vehicle • day)	Number of trucks (number/yr)	Transport volume per day (m <sup>3</sup> /yr)	Annual operation days (day/yr)	Annual transport volume (m <sup>3</sup> /yr)	Annual required volume to be transported (m <sup>3</sup> /yr)
Jetty to log feeder							
23	32	736	3	2,208	300	662,400	606,762
Jetty to log yard							
17	32	544	4	2,176	300	652,800	606,762
Log yard to feeder							
23	32	736	3	2,208	300	662,400	606,762

Source: JICA Survey Team

2) Log handling plan

Log handling plan by heavy equipment is planned as shown in the table below.

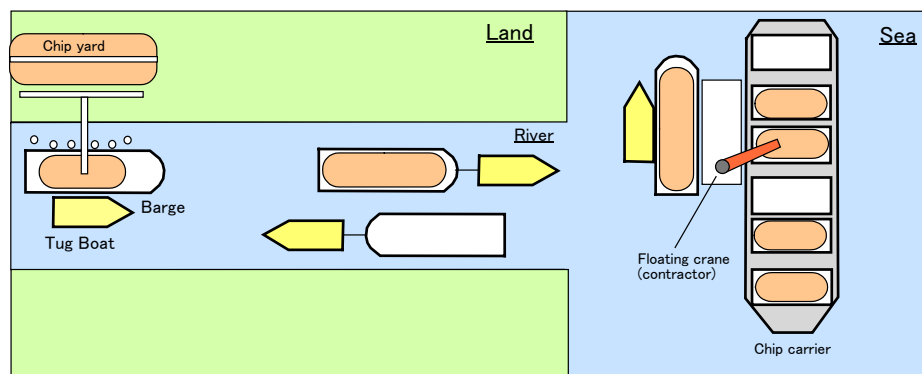
**Log Handling Plan by Heavy Equipment (Log Yard, Log Feeder)**

Log loading/unloading time hr/day	Log loading/unloading time per unit m <sup>3</sup> /hr/ unit	Log loading/unloading volume m <sup>3</sup> / unit/ day	Unit number units/day	Log loading/unloading volume per day m <sup>3</sup> /day	Annual operation days day	Annual handling capacity m <sup>3</sup> /yr	Annual required handling volume m <sup>3</sup> /yr
Log unloading/loading @ Feeder							
17	120	2,040	2	4,080	300	1,224,000	1,213,524
Log unloading @ Log yard (from truck)							
17	60	1,020	2	2,040	300	612,000	606,762
Log loading@ Log yard (to truck)							
17	60	1,020	2	2,040	300	612,000	606,762

Source: JICA Survey Team

### 3.6.4 Chip Handling Plan

Produced chip at the mill is transported to the chip carrier (vessel) at offshore loading point. 1) Chip handling at chip yard and chip loading at jetty (loading operation of the chip to the chip barge at mill), 2) Chip transportation by chip barge (from jetty to offshore loading point). 3) Chip unloading from chip barge and chip loading to vessel at offshore loading point



Source: JICA Survey Team

#### Concept of in-site Chip Transportation

Annual chip amount need to be transported from mill to vessel is 548,396 BDt (= annual chip production = annual chip sales amount). This is 45,700 BDt in monthly basis and 1,663 BDt in daily basis. Chip produced at mill is once stocked at the chip yard then loaded into barge by chain conveyor. Chip feeding to the chain conveyor from chip yard is done by wheel loader. Chip loaded into barge is compacted by small dozer<sup>3</sup>. Crane is used for the removal of dozer from jetty to barge and barge to jetty. Number of heavy equipment units and machine type is shown in the table below.

#### Planned Heavy Equipment for Chip Loading at Chip Yard and Barge

Heavy equipment	Unit	Machine type
Chain conveyor	1 set	
Wheel loader	3 units	Wheel loader CAT G980
Crane	1 unit	Crane P&H 550AS
Dozer	2 units	CAT Dozer 966F

Source: JICA Survey Team

### 3.6.5 Chip Barge Travelling Plan

Hold capacity of the vessel assumed in this project is 18,950 BDt. Chip loading capacity of barge is 2,915 BDt. Therefore, at least 6.5 barges are required to fill up the vessel. In this project 7 barges are assumed for the chip transportation. This requires 29 vessels in a year based on the annual chip production (548,396 BDt). Therefore, totally 203 barges are needed to transport the annual production to vessels. Chip loading operation at mill jetty is consecutively done from 1<sup>st</sup> to 7<sup>th</sup> barge. Barges filled up with chips start travelling to offshore loading point and start chip loading operation to the vessel at offshore loading point. When barges complete the chip loading, they will return to the mill.

<sup>3</sup> Dozer compact the chip on the barge to increase loadable chip amount



(1) Chip barge specification

Chip barge specification is shown below

**Chip Barge Specification**

Specification	data	unit
300ft barge with tug boat		
Length (inside of sideboard)	85.0	m
Width (inside of sideboard)	22.0	m
Sideboard height	5.0	m
Excess more than sideboard	3.0	m
Excess more than sideboard (conservatively assumed)	2.5	m
Chip volume on the barge	14,025	m <sup>3</sup>
Chip weight on the barge	5,500	GMt
	2,915	BDt

Source: JICA Survey Team

(2) Chip barge route

Chip barge travels down the Mendawak river and go to the offshore loading point which is located 30 km from the Mendawak river mouth then it loads the chips to the vessel. The travelling distance of barge is shown below.

**Distance and Speed for Barge Navigation**

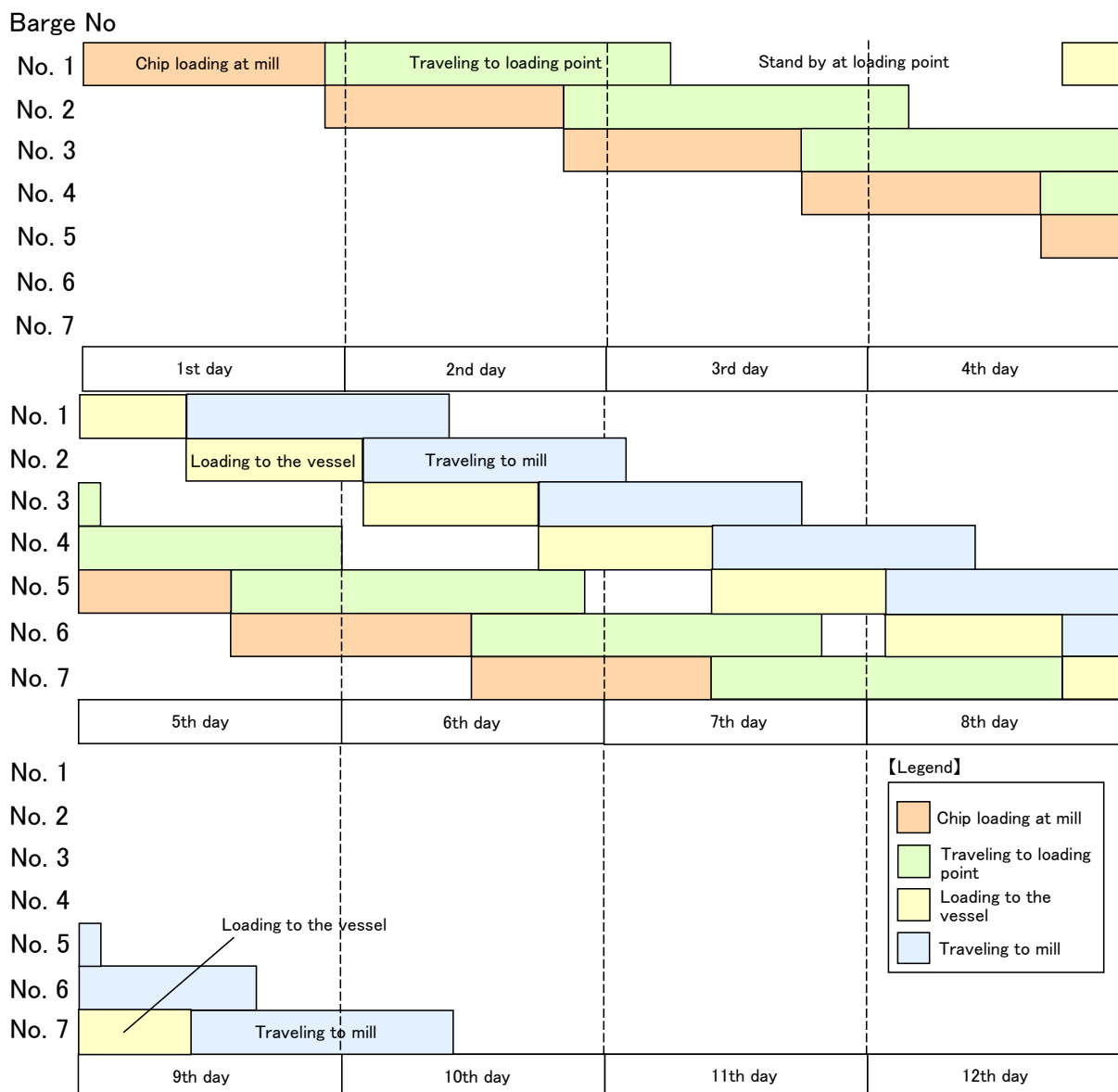
Item	data	unit
<b>One way distance</b>		
Mill to offshore loading point (near from river mouth)	132.0	km
Mill to offshore loading point (far from river mouth)	142.0	km
<b>Barge speed</b>		
With load	2.8	knot
	5.1	km
Without load	3.0	knot
	5.6	km

Source: JICA Survey Team

Note : 1knot=1.852 km/hr

(3) Chip transportation plan

Seven 300-ft barges will be used for chip transportation between mill and offshore loading point. In this project plan, the barge rotation to fill up the chips into 3,500,000 CFT hold capacity vessel is shown below. The target vessel number is 2.5 vessel per month. The chip loading operation at offshore (yellow bar in the figure below) is planned to be completed at least within net 7.0 days using 7 barges (travelling time and loading time at the mill is not included)



Source: JICA Survey Team

### Chip Barge Operation Plan

#### 3.6.6 Chip Loading Plan (Vessel)

Chip unloading from the barge and loading to the vessel is assumed to use floating crane consisting of a large-size barge with large-size crane. Floating crane will be enabled to use large-size chip carrier which does not have a low-power vessel crane, even at the offshore loading point. The barge and vessel will sandwich the floating crane at offshore loading point, and then the chips on the barge will be removed to the vessel by the floating crane. In the barge operation plan, all the barges will standby at the offshore loading point before the vessels arrives; loading will start just after the vessel arrives. Seven barges will berth beside the floating crane one by one and continuously load the chips to the vessel. For the trimming and compaction of the chips, 3 dozers are assumed to operate on the barge and 1 dozer is assumed to operate in the hatch. Dozers on the barge will gather the chips at one point so that the floating crane can easily grab the chips. The dozer in the hatch will compact and trim the chips so that the chip loading amount can be maximized. CAT Dozer 966F of D3 is assume to be used

for these operations. Chip loading amount per a MOL vessel is 18,950 BDt. The specifications of floating crane are summarised in the table below.

### Specifications of Floating Crane

Items	Number	Unit
Number of shifts per day	3	Shift
Time of 1 shift	8.0	hrs
Effective time of 1 shift	6.5	hrs
Effective operation time in a day	19.5	hrs
Chip amount movable by one time lifting	50.0	m <sup>3</sup> /time
	19.8	GMt/time
	9.3	BDt/time
Swing number per 1 hour	25	Times/hrs
Movable chip amount per 1 hour	1,250	m <sup>3</sup> /hr
	494.4	GMt/hr
	232.4	BDt/hr
Total loading time to vessel (7 barges)	112	hrs

Source: JICA Survey Team

Chip carrier to carry the chips from the offshore loading point to the destination assumed in this project is below.

### Assumed Vessel Specification

Items	Number	Unit
Draft	11	m
Grain Capacity	101,941	m <sup>3</sup>
	3,600,000	CFT
Loadable chip amount	35,754	GMt
	18,950	BDt
Necessary number of 300-ft barges	6.5	Barge
	Round up 7.0	Barge
Loading and unloading days included in freight	9	days

Source: JICA Survey Team

## 3.7 Chip Sales Plan

Chip sales plan of the chip produced in this project is developed based on the assumed purchasers, chip amount, and chip price.

### 3.7.1 Selection of Potential Chip Purchaser

Based upon Part I, Chapter 3 “International and domestic chip market analysis of hardwood chip”, the potential companies which would be able to purchase the chip were selected and their possibility as purchasers is considered.

### 3.7.2 Unit Price of each Chip Purchaser and Sales Volume

The potential purchasers’ current chip import volume and estimation in future, assumed sales volume of the Project to them (after 2018) and ratio of sales volume of each purchaser to the whole sales volume, estimated unit price (FOB) are surveyed.

### 3.7.3 Annual Chip Sales Plan

Annual chip sales volume plan is shown in the table below. The chip production will start in the third

quarter of 2016. Planned chip production of the Project is estimated below; the total sales volume in 2016 is 201,510 BDt, in 2017 365,944 BDt, in 2018 548,396 BDt, and after 2018 the sales volume will be the same.

### 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. WSL/MTI 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. They will usually work with employees in communities (called as HUMAS) and aim to be a familiar the person in the communities designated as “a post man for the community”. 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, and ii) the scale of the Project area and number of target villages.

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

The community training will be implemented following the implementation of plantation/logging operations.

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. 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

Item	Target community, activity, methodology	Input/ frequency
Training with regard to forest conservation and protection against forest fire	<ol style="list-style-type: none"> <li>1) Target community: 6 villages in WSL , 8 villages in MTI</li> <li>2) Time for stay in a place: half to one day</li> <li>3) Contents of activity: <ul style="list-style-type: none"> <li>➤ Introducing the project and asking cooperation to the Project,</li> <li>➤ Discussion, advice and talk regard to plantation area and forest conservation</li> <li>➤ Instruction of putting fire operation at</li> </ul> </li> </ol>	<p>Input per one visit</p> <ol style="list-style-type: none"> <li>1) Staff members: 3 to 4 persons</li> <li>2) Boat: 1</li> <li>3) Equipment for activity: simple documents of the Project, text documents/books for protection against of forest fire</li> <li>4) Frequency: 4 times per month</li> </ol>

	cultivation area (workshop style, and visit communities for direct visiting/teaching style during land preparation/putting fire on the cultivation land)	(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 WSL and MTI 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. WSL/MTI 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.

#### Amount of community support (Number of activities)

Year	Number of target community	Number of activity	Number of activity on activity category basis					
			CA	CC	RC	SI	PS	GS
<b>WSL</b>								
2010	2	2	-	1	-	-	-	1
2011	7	21	2	6	3	3	2	5
2012	8	52	7	12	10	2	11	10
2013	5	22	2	2	3	-	12	3
<b>Subtotal in WSL</b>		<b>97</b>	<b>11</b>	<b>21</b>	<b>16</b>	<b>5</b>	<b>25</b>	<b>19</b>
<b>%</b>		<b>100</b>	<b>11</b>	<b>22</b>	<b>16</b>	<b>5</b>	<b>26</b>	<b>20</b>
<b>MTI</b>								
2011	6	8	0	1	1	0	1	5
2012	9	44	11	26	1	0	2	4
2013	7	18	6	5	0	2	3	2
<b>Subtotal in MTI</b>		<b>70</b>	<b>17</b>	<b>32</b>	<b>2</b>	<b>2</b>	<b>6</b>	<b>11</b>
<b>%</b>		<b>100</b>	<b>24</b>	<b>45</b>	<b>3</b>	<b>3</b>	<b>9</b>	<b>16</b>
<b>Grand Total</b>		<b>167</b>	<b>28</b>	<b>53</b>	<b>18</b>	<b>7</b>	<b>31</b>	<b>30</b>
<b>%</b>		<b>100</b>	<b>17</b>	<b>32</b>	<b>11</b>	<b>4</b>	<b>18</b>	<b>18</b>

Source: JICA Survey Team

### (3) Implementation Plan

The actual activities will be decided through discussion with community and staff members of the Project.

## 3.9 Implementation Organization and Schedule

### 3.9.1 Implementation Organization

For the two project SPCs in Phase 1, WSL and MTI have been already granted the HTI forestry license and started the plantation. As of 28 December 2012, the total number of staff is 287, including double assignment of Alas Kusuma. At the head office in Pontianak, there are 66 staff, including four expatriates from Sumitomo Forestry.

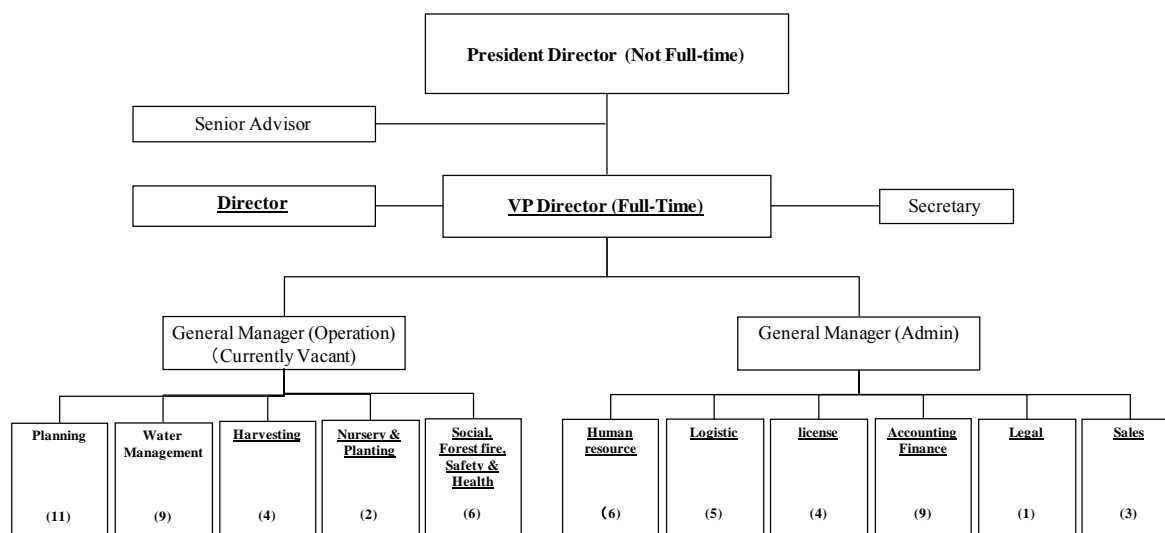
The organization consists of three categories shown below. Total number of staff members is 287.

1. Head office as double assignment for both WSL and MTI, in Alas Kusuma's office at Pontianak (66 staff)
2. On-site office of WSL (97 staff)
3. On-site office of MTI (124 staff)

The organization for chip production (64 staff) will be added; thus four organizations with total 351 staff members will implement the Project. The outline of each organization is described below.

#### (1) Head Office

The president of PT. WSL is the president of two project SPCs. The head office is organized as shown in the chart below.



Source: PT. WSL and PT. MTI (end of December, 2013)

Note: () shows number of staff members.

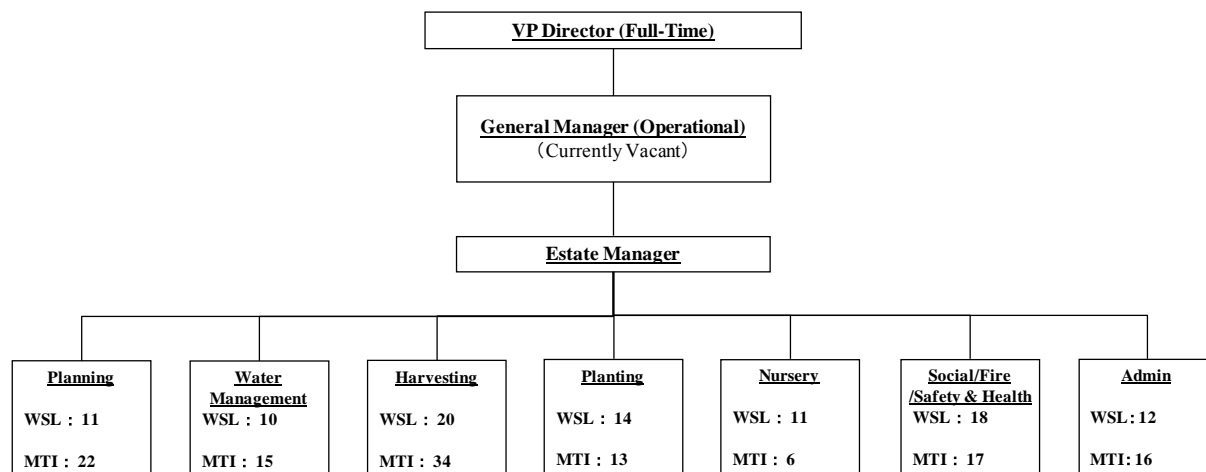
### Organization Chart of Head Office of PT. WSL/MTI

#### (2) Site office

Under responsibility of VP Directors from Sumitomo Forestry based in Pontianak, the WSL/MTI on-site offices will be organized as shown in the chart below. The operation division of the head office

has duty to manage the site office. The site office manages the actual operation including management of operation by the contractors.

An estate manager is to be dispatched to each site and will manage the whole operation at site. The organization chart for each site office is the same but number of staff is different between 2 site offices. The organization chart of the site office and list of positions/ number of staff are shown below.



Source: PT. WSL and PT. MTI (end of December, 2013)

Note: ( ) shows number of staff members.

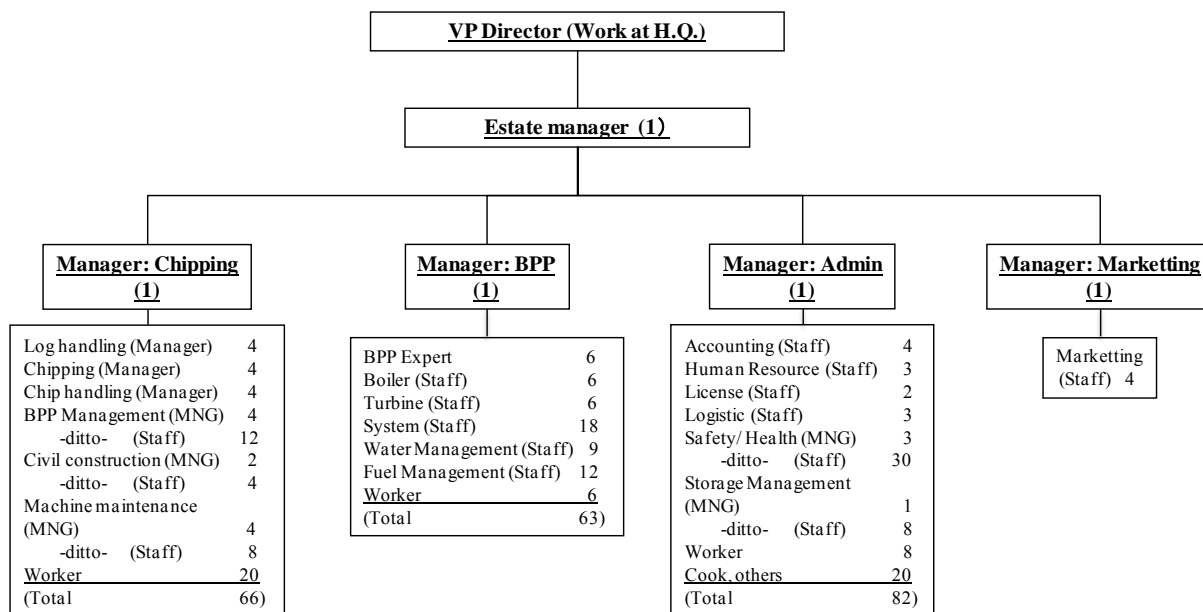
### Organization Chart of Site Office

#### (4) Chip Mill

The VP Directors of the head office also manage the whole operation of the chip mill and one estate manager 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 equipment 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.

The total number of staff is 220. The figure below shows organization chart of chip mill and list of staff.



Source: JICA Survey Team

Note: () shows number of staff members.

### Organization Chart of Chip Mill

### 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

Project period (30 years, 2009 to 2038)	Year (2010 to 2039)																													
	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
<b>1. Infrastructure Development</b>																														
1.1 Chip mill construction																														
1.1.1 Detail design																														
1.1.2 Selection of contractors, negotiation																														
1.1.3 Construction of chip mill																														
Land acquisition for 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																														
<b>2. Operation</b>																														
2.1 Plantation/logging/ plantation infrastructures																														
2.1.1 logging existing trees/plantation (WSL)	I (First rotation)																													
2.1.2 Logging planted trees/plantation (WSL)	I (2nd rotation) (3rd) (4th) (5th) (6th)																													
2.1.3 Seedling production (WSL)																														
2.1.1 logging existing trees/plantation (MTI)	I (First rotation)																													
2.1.2 Logging planted trees/plantation (MTI)	I (2nd rotation) (3rd) (4th) (5th) (6th)																													
2.1.3 Seedling production (MTI)																														
Land acquisition for plantation (WSL/MTI)																														
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 WSL target area does not encompass any villages inside, while the MTI target area includes several villages within. Such geographical condition shall relate to the characteristics of the social impacts to be given by 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 raw timbers and wood chips, which could cause negative impacts, were targeted by the scoping under the Survey. The size of target area of is 113,393 ha in total: namely, 39,881 ha for the WSL target area and 73,512 ha for MTI target area.

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

Type	Target activity of the scoping	Outline 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</li> <li>- Canal and water level control facility: Main canal (86,786 m), branch canal (658,980 m), MC/C*<sup>1</sup> drain (1,074,307 m), IF*<sup>2</sup> drain (5,002,139 m), outlet canal (22,187 m), peat dam (166), adjustable gate (134) and flap gate (29)</li> <li>- Log pond (8), log yard (6, 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 (10m x 20m x 4m): Sedimentation pond and other facilities which treat discharges from the Project offices and accommodation (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	<ul style="list-style-type: none"> <li>Facilities for seedling production: permanent nurseries (1) and temporary nurseries (3)</li> <li>Facilities for security: fire tower (8) and security post (3~7)</li> <li>Other facilities: Office (Three new offices per year), accommodation (Newly constructed for each rotation), workshop for machines (Base camp type-1, temporary type-1-: newly constructed for each rotation), facilities for logistic arrangement and others</li> </ul>
	Construction and operation of chip mill	<ul style="list-style-type: none"> <li>Biomass power plant (7Mwh) : Ground works for the installation of electric power generating plant and coal feeding facility</li> <li>Chip facilities: Ground works for the installation of rotary debarker (25 ha,</li> </ul>

		height of mounding: 3.5 m)
Others	Transportation of log and chip	Transportation of log: Transportation of lots 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 Survey Team

## 6.2 Natural Conditions 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 conditions of the respective area are summarized in this section.

### (1) Climate and Air Quality

According to Köppen climate classification, the target area belongs to the tropical rainforest climate 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 WSL target area (2003-2012) and MTI target area (1997-2006) are available at Pontianak climate station and Rahadi Osman climate station in Ketapan Province, respectively. The following table shows the annual rainfall and average temperature of two Project areas.

**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)
WSL	3,182	400 (Oct.)	156 (Aug.)	26.8	27.4 (May)	26.1 (Feb.)
MTI	2,144	462 (Dec.)	5.8 (Aug.)	27.7	32.3 (May)	22.4 (Aug.)
Area	Average humidity (%)	Max. Average humidity (%)	Min. average humidity (%)	Average wind velocity (km/h)	Wind direction (%)	Wind direction (%)
WSL	85.8	89.1	83.1	14.95	41.7 (West)	33.3 (South)
MTI	84.0	88.0	79	4.2	-	-

Source : ANDAL of WSL and MTI target areas

CO, SO<sub>x</sub>, NO<sub>x</sub>, dust and noise were measured in four (4) sites surrounding WSL target area. Consequently, data obtained in the mentioned measurement are under or within the standard values regulated by Environmental Standards of the Indonesian Government (Environmental Ministry No. 13/MENLH/31/1995), which indicates the air quality of the target area is quite good.

### (2) Topography and Soil

As for the topographic features, flat area with less than 8% of slope and 100 m ASL extends both in WSL and MTI target areas. The features of soils in the target areas are summarized.

### (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.

### Hydrology in the Target Area

Area	Features of Hydrology																															
<b>WSL</b>	<p>1) <u>Watersheds in the target area</u> : Kapuas River : Keaau river in Keaau micro watershed, Kelang river in Keluang micro watershed, Sapar river in Sapar watershed</p> <p>2) <u>Water volume of the rivers</u> : Following table shows the result of measurement of width, depth and flow velocity of the river.</p> <table border="1" data-bbox="512 376 1268 607"> <thead> <tr> <th>Part</th> <th>River</th> <th>Width of river (m)</th> <th>Depth of river (m)</th> <th>Flow velocity (m/s)</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Upper streams</td> <td>Kelabau</td> <td>35</td> <td>6</td> <td>1.5</td> </tr> <tr> <td>Keluang</td> <td>70</td> <td>6</td> <td>1.5</td> </tr> <tr> <td>Sapar</td> <td>10</td> <td>3</td> <td>2.0</td> </tr> <tr> <td rowspan="3">Down streams</td> <td>Kelabau</td> <td>80</td> <td>3</td> <td>2.0</td> </tr> <tr> <td>Keluang</td> <td>135</td> <td>4</td> <td>2.0</td> </tr> <tr> <td>Sapar</td> <td>30</td> <td>2</td> <td>1.5</td> </tr> </tbody> </table> <p>Especially, Width of river of Kelabau river and Keluang river become wider in the downstream. Water level varies depending on the rainfall pattern.</p> <p>3) <u>Concentration of suspended solids</u> : Concentration of suspended solids is regulated under "Government Regulation No. 82/2001 Control of Water Pollution".</p> <ul style="list-style-type: none"> <li>- TDS (Total Dissolved Solids) is relatively high but within the government standards in the upper stream of Kelabau and Sapar rivers.</li> <li>- TSS (Total Suspended Solids) is over the threshold limit value set under the government regulation with high suspended ratio in the upper stream of Kelabu river.</li> </ul> <p>4) <u>Water quality in the river</u> :</p> <ul style="list-style-type: none"> <li>- BOD and COD in the major rivers except the downstream of Sapar river are below the threshold limit value set under the government regulation. based on the sample survey.</li> <li>- Concentration of NO<sub>2</sub>, NO<sub>3</sub>, SO<sub>4</sub> and H<sub>2</sub>S is below the threshold limit value set under the government regulation in all the rivers except Sapar river.</li> <li>- Concentration of H<sub>2</sub>S in Sapar river is 0.017~0.020mg/l, which is much higher than the threshold limit value set under the government regulation (0.002mg/l).</li> <li>- Metal content, such as iron, zinc, lead, mercury, copper and chromium in the water of Sapar river is below the threshold limit value set under the government regulation.</li> </ul> <p>⇒Consequently, the river water in the target area could be used for drinking and domestic purposes with proper treatment based on the water quality standards of the government (I &amp; II).</p>	Part	River	Width of river (m)	Depth of river (m)	Flow velocity (m/s)	Upper streams	Kelabau	35	6	1.5	Keluang	70	6	1.5	Sapar	10	3	2.0	Down streams	Kelabau	80	3	2.0	Keluang	135	4	2.0	Sapar	30	2	1.5
	Part	River	Width of river (m)	Depth of river (m)	Flow velocity (m/s)																											
Upper streams	Kelabau	35	6	1.5																												
	Keluang	70	6	1.5																												
	Sapar	10	3	2.0																												
Down streams	Kelabau	80	3	2.0																												
	Keluang	135	4	2.0																												
	Sapar	30	2	1.5																												
<b>MTI</b>	<p>1) <u>Watershed in the target area</u> : Watersheds of Mendawak, Labai and Kapuas. The northern part of the target area is located in the Kapuas watershed.</p> <p>2) <u>Water discharge of Labai river and sediment</u> :</p> <p>Water discharge of Labai river : 19m<sup>3</sup>/sec            Concentration of solid : 82ppm            Volume of sediment: 135 ton/day and 49,133 ton/year (Estimated volume of soil erosion in the watershed is 2.76 ton/ha · year)</p> <p>3) <u>Water quality of the three major rivers</u> : Turbidity: 8~21 NTU(Nephelometric Turbidity Unit), Concentration of solid: 54-104 ppm Concentration of suspended matter : 3-43ppm. The concentration in higher of suspended matter is noted in Mandawak river than Labai river.            Acidity: pH 4.0~5.5, Concentration of organic substance: 13.36~164.62 mg/l            Major ions dissolved in the water: Ca<sup>2+</sup>, Mg<sup>2+</sup>, Na<sup>+</sup>, K<sup>+</sup>, CL<sup>-</sup> and SO<sub>4</sub><sup>-2</sup>            N content: 0.540~0.611 ppm (high level due to pollution by human activities and animal feces)            COD (Chemical Oxygen Demand) : 3.2~5.6ppm (below threshold limit value: 10 ppm)            BOD (Biochemical Oxygen Demand) :1.4 ~2.8ppm (below threshold limit value: 6 ppm)</p>																															

Source : ANDAL of WSL and MTI 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.



Due to the initiatives by the local communities to introduce fruit trees and multi-purpose trees, mostly composed of alien species, such trees are found to be grown wildly, forming mixed vegetation with native species. So far, invasion of alien tree species which could affect the native vegetation has not arisen yet in the Project area thus the possibility is predicted to be low in the future that existing ecosystems will be severely disturbed and replaced thoroughly with an alien species.

#### (5) Terrestrial Animals

Some protected species of mammals, birds and reptiles have been found in the swamp 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 WSL and MTI project areas. 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.

#### Table 6.4.1: Laws and Regulations related to Environmental and Social Considerations

1. Environmental Management and Conservation	1-1. Law No. 23/1997 concerning Environmental Management 1-2. Law No. 32/2009 on Environmental Protection and Management <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.
2. Natural Environment	2-1. Law No.41/1999 concerning Forestry 2-2. Government Regulation No.6/1998: Forest Exploitation and Collection of Forest Products in Production Forest 2-3. Law No. 5/1990 concerning Conservation of Biological Resources and Their Ecosystem 2-4. Government Regulation No.7/1999: The Preservation of Plants and Animals <u>Relation to the Project</u> : 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.
3. Air quality	3-1. Government Regulation No. 41/1999; Control of Air Pollution

standards	<p>3-2. State Minister of Environment Decree No. 13/1995: Emission Standards for Stationary Sources</p> <p>3-3. State Minister of environment Decree No. 7/2007: Emission Standards for Stationary Sources of Stream Boiler</p> <p>3-4. State Minister of Environment Decree No.13/2009: Emission Standards for Stationary Sources of Oil and Gas Industry Activities</p> <p>3-5. State Minister of Environment Decree No. 5/2006: Emission Standards for Old Motor Vehicles</p> <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>
4. 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 watered 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>
5. 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>
6. 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>
7. 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>
8. 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 Survey 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 is 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

Project	Area (ha)	Date of Approval	Approval Document
PT. WSL Project	40,684	Sept. 4, 2006	Decision, Regent of Pontianak No, 660 1/1235/IX/PLHESDM-B/0409-2006
PT. MTI Project	74,870	May 7, 2009	Decision, Governor of West Kalimantan Province, No. 270/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 on AMDAL by the Ministry of Forestry, the Project owner will be fined to pay penalty. However, PT. WSL and PT.MTI started plantation in 2010 and 2011, respectively.

### 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 key activities of the Project are surveyed 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

Source: Prepared by JICA Survey Team based on the JICA Guidelines

#### (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
Determination to conduct the preparatory survey and preparation of survey TOR		
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.
Conduct of feasibility study		
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 to be targeted 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 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's 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
1. Sensitive Sectors	1. Project Activities that require AMDAL
Forestry sector is not included in the category of sensitive sectors.	Forest and Forestry: Project to produce wood chip from natural and plantation wood
2. Sensitive characteristics	2. Screening of the project activities
(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 environment
(4) Large-scale logging	
3. Sensitive areas	3. Screening of the location
(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) To change the quantity, quality and sustainability of natural resources
(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 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 Guidelines 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. 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 (Option 3) was, among all options, the 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

Items	Option 1	Option 2	Option 3	Option 4
				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 basis	<u>This option is not recommended.</u> Illegal cuttings and activities remain uncontrolled. Forest resources decrease. Sustainability of forest, natural and social environments cannot be secured.	<u>This option is not recommended.</u> Plantation can be developed and expanded however the natural forests are left unprotected thus will be further degraded. The Project environment is still unstable.	<u>Among all options, this option is most recommended.</u> The Project costs are high but this option can establish the long-term stable environment of the Project.	<u>This option is not recommended.</u> 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 socio-economic baseline survey and environmental and social considerations 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 considerations survey.



## 6.6.2 Items of the Environmental and Social Considerations 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 canals 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 pond will be constructed at certain areas of the project sites while the log yard and the water purification facilities will be allocated at chip factory site in MTI Project area. 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 unloads 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 environment and the society. Other than operations of several types of heavy equipment and vehicles, impacts of mineral soil dressing on peat soil to the environment, 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>
Pollution Control	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 (Qty) and expected distances of their trips</li> <li>4) Estimation of the impacts based on the above review</li> </ol>
	Water pollution	<ol style="list-style-type: none"> <li>1) Environmental Standards of Indonesia, Japan, WHO, etc.</li> <li>2) Degree 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 (Qty) and expected distances of their trips</li> <li>4) Estimation of the impacts based on the above review</li> </ol>
	Solid waste	<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	<ol style="list-style-type: none"> <li>1) Environmental Standards of</li> </ol>	<ol style="list-style-type: none"> <li>1) Review of the existing materials and</li> </ol>

Category	Items	Survey Items	Survey Methods
	vibration	Indonesia, Japan, WHO, etc. 2) Scale and degree of noises and vibrations generated by the Project vehicles and heavy equipments 3) Impacts anticipated in the surrounding areas	documents 2) Field reconnaissance survey and interview to the personnel 3) Review of duration, frequency and period of using the Project vehicles and heavy equipments 4) Estimation of the impacts based on the above review
	Land subsidence	1) Environmental Standards of Indonesia, Japan, WHO, etc. 2) Ground levels in/around the site of chip factory 3) Scale and degree of land subsidence	1) Review of the existing materials and documents 2) Field reconnaissance survey and interview to the personnel 3) Measurement of land subsidence
	Stench	1) Scale, degree and frequency of stench generated by the Project vehicles, heavy equipments and solid wastes 2) Impacts anticipated in/around the operation sites	1) Field reconnaissance survey and interview to the personnel 2) Inventory and confirmation of operation 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

Category	Items	Survey Items	Survey Methods
			3) Examine the validity of acquisitions and compensation procedures of the actual cases by referring the existing decrees and guidelines
	Poverty	<ol style="list-style-type: none"> <li>1) Definitions of the poor in the government decrees and regulations</li> <li>2) Distribution of poor households who are subject to land acquisitions</li> <li>3) Impacts of the land acquisitions and plantation to poor households</li> </ol>	<ol style="list-style-type: none"> <li>1) Review of the decrees and the regulations of the government</li> <li>2) Identifications of poor households in the socio-economic baseline survey</li> <li>3) Estimation of the impacts on land acquisitions, employment and other Project activities to poor households.</li> </ol>
	Minority/ indigenous people	<ol style="list-style-type: none"> <li>1) Laws and regulations on the ethnic minority and indigenous people</li> <li>2) Distribution of ethnic minorities and indigenous people</li> <li>3) Issues and problems in their rural lives which the ethnic minorities and indigenous people are facing with</li> <li>4) Impacts given by the Project activities</li> </ol>	<ol style="list-style-type: none"> <li>1) Review of the decrees and the regulations of the government</li> <li>2) Identifications of the households of ethnic minorities and indigenous people by the socio-economic baseline survey</li> <li>3) Identifications of the issues and problems in their rural lives which they are facing with</li> <li>4) Estimation of the Project impacts</li> </ol>
	Local economy (employment /livelihood means)	<ol style="list-style-type: none"> <li>1) Conditions of livelihoods of the households in the Project target areas</li> <li>2) Types of livelihood activities and their cash income</li> <li>3) Employment performance by the Project</li> </ol>	<ol style="list-style-type: none"> <li>1) Understanding the livelihood activities and their cash income through socioeconomic baseline survey</li> <li>2) Understanding of employment performances through socioeconomic baseline survey</li> </ol>
	Land use and local resource use	<ol style="list-style-type: none"> <li>1) Ongoing practices of forest and land uses by the community members</li> <li>2) Changes brought about by the Project activities</li> </ol>	<ol style="list-style-type: none"> <li>1) Understanding of the existing practices on the community resource uses through socioeconomic baseline survey</li> <li>2) Verification of the plantation design and the existing practices of forest and land uses by the community members</li> <li>3) Estimation of the Project impacts</li> </ol>
	Water utilization	<ol style="list-style-type: none"> <li>1) Ongoing practices of water uses in the community</li> <li>2) Anticipated impacts given by the constructions of several infra and Project facilities</li> </ol>	<ol style="list-style-type: none"> <li>1) Understanding of the ongoing practices of water uses in the community through socio-economic baseline survey</li> <li>2) Understanding of the impacts given by the construction of forestry infra and Project facilities to the existing practices of water uses</li> </ol>
	Social capital and social organizations to determine collective actions	<ol style="list-style-type: none"> <li>1) List of households and their members and leadership to manage the community group</li> <li>2) Community groups and mechanisms to determine their collective actions</li> </ol>	<ol style="list-style-type: none"> <li>1) Interview to the community leaders in the socio-economic baseline survey to ask their views and opinions on the Project</li> <li>2) Understanding on the structures and functions of the community groups</li> </ol>
	Uneven distributions of negative impacts and project benefit	<ol style="list-style-type: none"> <li>1) Locations of the activity sites of the Project and the target communities</li> <li>2) Annual target area of the Project and the plan of employment of the community people</li> <li>3) Performance and achievements to employ the community people</li> </ol>	<ol style="list-style-type: none"> <li>1) Review of the achievements of employment and confirmation of the annual plan of reforestation and employment</li> <li>2) Verification of the procedures to employ the community members</li> <li>3) Confirmation of the employment performances of the community members (their home village and accumulated number of the employed members)</li> </ol>
	Conflict of interests among the community	<ol style="list-style-type: none"> <li>1) Cooperation of the Project and the target community</li> <li>2) Cooperation between the target communities</li> <li>3) Conflicts of interest and problems among the target communities</li> </ol>	<ol style="list-style-type: none"> <li>1) Interview to the Project staff on the cooperation and conflict/problems between the Project and the communities and among the communities</li> <li>2) Survey on the achievements of the Project activities targeting to support the community members</li> </ol>

Category	Items	Survey Items	Survey Methods
	Landscape	<ol style="list-style-type: none"> <li>1) Scale of the Project facilities such as infra/port and surrounding environment</li> <li>2) Continuity and harmony of the landscape which are formed by the plantation sites/project facilities and surrounding natural vegetation</li> </ol>	<ol style="list-style-type: none"> <li>1) Verification of the construction plans for several Project facilities from the view of harmony and continuity of the landscape</li> <li>2) Interview to the Project staff and field reconnaissance survey</li> </ol>
	Gender	<ol style="list-style-type: none"> <li>1) Negative impacts to the gender and gender balance (Newly emerged imbalances such as differences of cash income)</li> </ol>	<ol style="list-style-type: none"> <li>1) Interview to the Project staffs and other personnel on the past performances and achievement by the Project</li> <li>2) Verifications of procedures of employment and personnel affairs</li> </ol>
	Children's human rights	<ol style="list-style-type: none"> <li>1) Impact of the Project activities to the lives and security of the community members</li> </ol>	<ol style="list-style-type: none"> <li>1) Interviews to the Project personnel on the existing issues and problems on the children's human rights.</li> <li>2) Verification of the policy on education and social welfares.</li> </ol>
	Infectious diseases e.g. HIV/AIDS	<ol style="list-style-type: none"> <li>1) Scale of migrant staff 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 staff</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>
<b>Others</b>	Accident	<ol style="list-style-type: none"> <li>1) Environments for the employers of civil works and constructions</li> <li>1) Project policies to ensure the security during the operation</li> <li>2) 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>1) Field reconnaissance survey of the accident sites and interviews to the personnel on them.</li> </ol>

Source: JICA Survey Team

## (2) HCV Assessment

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 as follows:

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) Subcontracted survey

#### 1) Socio-economic baseline survey

The JICA Survey Team carried out the socio-economic baseline survey in the target communities in the 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 ceremonies)
- 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, loans)
- 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.

## 2) 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-year 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 affected by 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). The WSL and MTI Projects have already been started in 2010 and 2011 respectively thus the Survey Team collected data/information from the Project staff and in the field reconnaissance survey.

### **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 br easting 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 vehicl es. In particular , around 200 to 300 people are supposed to resi de 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 biom ass 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 im pact assessment in log and chip transportation. The transportation does not include any civil works or constrictions; 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 followings are the summary of the findings of HCV assessment done in the WSL and MTI Project area.

#### (2) Finalization of the plantation target

The following table shows the revised and finalized figures of the plantation target and other positions in the land use plan of WSL and MTI. Responding to the recommendations of HCV assessment, more areas have been allocated to conservation to ensure the protection of rare species and peoples' traditional uses of the natural forests. Other than the protection area, social forestry area and indigenous monitoring area were also expanded.

**Revised Land Use Plan of WSL and MTI**

	Plan <sup>1)</sup>	TP	TU	TK	KL	SP	Total
WSL (ha)	RKU	27,300	4,265	2,000	5,156	1,319	40,040
	JICA Survey	25,046	5,849	2,227	6,759	2)	39,881
MTI (ha)	RKU	46,567	8,236	5,019	12,318	2,730	74,870
	JICA Survey	43,338	9,048	6,612	14,514	2)	73,512

Source: JICA Survey Team

Note 1: RKU: Ten-Year Plan for Industrial Plantation, "JICA Survey": Figures finalized in the Survey  
TP (Tanama Popok): Plantation area, TU (Tanaman Unggulan): Indigenous tree monitoring area  
TK (Tanaman Kehidupan); Social Forestry area, KL(Kawasan Lindung): Protection area,  
SP (Sarana dan Prasarana): Infrastructures, etc.



2: The area of SP is included in TP as "Non Planting 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 entities to implement the measures are the Project companies: PT.WSL and PT. MTI. The supervising organizations are the Ministry of Forestry which provided the concession of HTI and provincial government of West Kalimantan and municipal council of Pontianak 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</p> <p>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 staff 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</p>	Cost to construct forestry infra and chip factory

	Items	Mitigation Measures	Cost
		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.	
	Noise and vibrations	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.	Cost of the Project management  Cost of the chip factory
	Land subsidence	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	Cost to construct and maintain the forestry infra
	Stench	Minimization of negative impacts <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.	Cost to remove the contaminated soils as a part of the Project management cost Cost to treat the solid waste Cost to conduct dredging
	Bottom sediment	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.	Cost to treat solid waste and sewage in the chip factory
Natural environment	Protection area	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 <i>A. crassiparva</i> in the protected forest land. To strictly continue to avoid the expansion of the planted species by monitoring collaborating with the community members and local government.	Cost of plantation and harvesting
	Ecosystem	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. Indigenous trees shall be planted in the degraded protection area.	Cost of community-related activities
	Hydrology	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 remarkable impacts are identified.	It hasn't been cleared yet because the impacts are not well identified.
	Topography	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	It hasn't been cleared yet because the impacts are not well identified.

	Items	Mitigation Measures	Cost
		infra. To monitor the rate of land subsidence caused by the canal construction and to take measures in case some impacts are identified.	
Social environment	Resettlement (Land acquisition)	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.	Cost included in land acquisition plan
	Poor households	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.	Cost included in land acquisition plan
	Minority ethnic groups and indigenous people	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.	Cost included in the community-related activities  Cost of plantation and chip production
	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. To allocate the social forestry plots for the people to plant trees around the residential areas.	Cost included in the community socialization activities before the Project activities are started
	Water utilization	Negative impacts To design the log pond, berth 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 boats and ships.	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 capital 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

	Items	Mitigation Measures	Cost
	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 a campaign for the workers and staff 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 indicates 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	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 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).	Cost included in the Project management  Cost of chip factory construction
	Water pollution	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.	Cost of maintaining the chip factory
	Solid wastes	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	Cost of maintaining the forestry infra and chip factory

	Items	Mitigation measures	Cost
		<p>machines: To store the used oils at the Project facilities and request the collection traders specialized for hazardous waste to collect them regularly.</p>	
	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>	<p>Cost of removing the contaminated soils  Cost of solid waste treatment and dredging</p>
	Stench	<p>Minimization of negative impacts <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>	Cost of treatments of solid wastes and sewage
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 <i>A.crassiparva</i> in the protected forest land. To strictly continue to avoid the expansion of the planted species by monitoring collaborating with the community members and local government.</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. Indigenous trees shall be planted in the degraded protection area.</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 remarkable 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 monitor the rate of land subsidence caused by the canal construction and to take measures in case some 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.

Items	Mitigation measures	Cost
Poor households	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.	Cost included in the implementation of land acquisition.
Minority ethnic groups and indigenous people	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.	Cost included in the community support activities and in the plantation development and chip production.
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. To allocate the social forestry plots for the people to plant trees around the residential areas.	Cost included in the Project socialization activities in the target community.
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 plantation/forestry infra development and community support.
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 support
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 shows 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
Pollution control		
Air pollution	<To apply the Indonesian standards> Environmental standards of air: Exhausts of construction equipments and vehicles	SO <sub>x</sub> , NO <sub>x</sub> , CO, PM <sub>10</sub> , PM <sub>2.5</sub> CO, HC (Hydrocarbon)

Items	Standards and Guidelines	Items focused and remarks
	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	
Water pollution	<To apply the Indonesian standards> 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.	pH, BOD, COD, SS (Suspended solids), Dissolved oxygen, Phosphate, Nitrate, Ammoniac nitrogen., Escherichia coli  Temperature, Dissolved solids (DS), Suspended Solids (SS) pH, Dissolved iron, Copper, Other materials
Solid waste	<Indonesian law and regulations> Encouragement of 3R according to the Waste Management Act No.18/2008 Treatment of solid waste: Government Decree No.18/1999, No.85/1999	Implementation of 3R by collecting separately and conduct the followings  1) Composting of the organic wastes, 2) Recycling and reusing of the wastes by the collection traders 3) Reducing the amount of the solid waste
Soil contamination	<Indonesian law and regulations> 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 <Japanese guidelines> Guidelines to be referred is “Guidelines of oil pollution control in prepared in March 2006 by the council of the government on environment, subcommittee on soil and pesticide”	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.
Noise/vibration	<Indonesian law and regulations> 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:	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))
Stench	<Japanese law, regulation and standards> Odour Control Act: to target specific malodorous substance to cause stench and give damages on living environments, 22 types of substances	Substances to cause specific malodour: exhausts, oil and gasoline, solid wastes, human wastes (feces and urine excretion), etc.
Bottom sediments	Followings are the standards on bottom sediment <Japanese standards> 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	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

Source: JICA Survey Team

## 6.9.2 Environmental Monitoring Plan

This section describes 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 entities to implement the monitoring and recording their results and taking countermeasures are the Project companies: PT. WSL and PT. MTI. Those companies have been conducting the monitoring for a half year on water quality and habitat distribution of fauna and flora in the Project area. Based on the performances, achievements and capacity of the companies 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**

### **6.10.1 Necessity of the 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.

### **6.10.2 Results of the Public Consultation Meeting about the HCV Assessment in the WSL and MTI Areas**

The public consultation meeting was held in September 2013 to share the results of the HCV assessment in the WSL and MTI areas. The project proponents indicated the areas with high conservation value in the project area and the potential natural and social environmental impacts which might be caused by the Project. The participants had a question-and-discussion session with the project proponents and another session for group discussions on specific topics in the meeting. All the comments given by the participants were considered in the finalization of the project plans.

## **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> 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 rights of land clearance, rights of leases, rights of building a house, and rights of collection of forestry products</p> <p>These rights should be fully considered when the amount of compensation for land acquisition is estimated.</p> <p><b>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)</b> 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 rights 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>2.1 Presidential Decree No.36/2005: Procurement of Land for Realizing the Development for Public Interest</b></p> <p><b>2-2. Presidential Decree No. 65/2006: Amendment to Presidential Decree No. 36/2005: Procurement of Land for Realizing Development for Public Interest</b> 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 affected 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 Policies**

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 socio-economic 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 (including customary and traditional land rights 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 rights 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

### (4) 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 policy is also based on the review of the actual cases of the land acquisition conducted since the Projects started in 2010 in WSL and 2011 in MTI respectively. The main aim of the policies introduced here is to gap between the JICA principles and Indonesian laws and regulations.	
1. Actual cases of land	1-1. Process of land acquisition:

Item	Approaches
acquisition	<p>The Project company, PT. WSL and PT. MTI negotiates with the affected households about compensataion and alternative land. When both sides reach mutual agreement, the company pays compensation, offer the land for alternative to the households and secure the land for plantation.</p> <p>The above process is examined by referring the Indonesian decree (Presidential Decree No. 36/2005 and No. 65/2006, Head of National Land Agency Decree No. 3/2007) and JICA Guideline.</p> <p>1) <u>Eligibility of the Project company as the proponent of land acquisition:</u> PT. WSL and PT. MTI have been vested with the consession of industrial plantation in the production forest (HTI) by the Ministry of Forestry. In the process of acquisition, they will negotiate directly with the people affected, which is different from the government regulations claiming to set up the third party such as “Land Acquisition Committee” to lead the negation, compensation and acquisition of land. In order to secure transparency and objectivity of the process, the local government and the police officers will act as a third party supervise and support the implementation of the land acquisition. In case the negotiateion gets tough, those third parties will intervene to move the process forward to reach the agreemert of the companies and the affected people.</p> <p>2) <u>Basis of estimating compensation:</u> The targets of compensation are people who have customary rights of land use or loss of agricultural products. Price to be paid for the loss of agricultural products is determined according to the district regulations on compensation price for loss of food products and referng the actual market prices. The customary right of land use is compensated by offering the alternative land which has same conditions in the Project area. The government regulations do not stipulate any compensation for the the customary land rights; however from the practical point of view, the Project companies take the policy to secure their “<i>de-facto</i>” rights of land and thus offer alternavite land in their Project area even though the people do not have legal rights of land ownership in the current lesislative system of the country.</p> <p>3) <u>Eligibility of providing the alternative land:</u> The provision of alternative land to the affected people aims to minimize the adverse impact of land acquisition by the Project companies, which is regarded as non-legal measures in the current legislative system of land rights. However from another point of view, it complies with the Indonesian Act No. 39 of 1999 on Human Rights. Meanwhile it follows the JICA Guideline referring O. P. (Operational Policy) 4.12 of the World Bank which sti:ipulates the target people for compensation include those who have no recognizable legal rights to the land they are occupying.</p> <p>4) <u>Issues to be addressed:</u> The following issues shold be taken into the process of land acquisition in the Project: (1) formulation of land acquisition plan and its implementation accordingly, (2) Enhancement of local government’s involvement into the process of land acquisition in order to secure and sustain the transparency and the objectivity, (3) Establishment firm and open mechanism to address the claims and complaints of the affected people.</p> <p>1-3.</p>
2. Overall Policy	<p>Taking the above into consideration, the following overall policies are determined.</p> <p>2-1. Try to avoid land acquisition</p> <p>2-2. 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.</p> <p>2-3. Not to conduct land acquisition without the full consent of affected people as the Project is implemented by private companies.</p> <p>2-4. Implement the land acquisition following the process and steps scheduled in the plan</p>
3 Objects and coverage of compensation	<p>3-1. 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.</p> <p>3-2. 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.</p> <p>3-3. Any people who might be affected by land acquisition, regardless history of living or social status, will have a right to get compensation.</p> <p>3-4. 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.</p>
4. Estimation of the amount of compensation	<p>The amount of compensation shall be estimated based on the full replacement cost in principle.</p>
5. Provision of	<p>For affected people who significantly rely on their lands for their livelihoods, the Project</p>

Item	Approaches
alternative sites	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.
6. 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.
7. 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.
8. 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. The schedule and the steps of land acquisition as mentioned above should be clearly indicated in the plan.
9. 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.
10. 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 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 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.

#### (4) Eligibility of land acquisition in view of the current Indonesian legislation system and JICA Guideline

The eligibility of actual cases of land acquisition are examined by referring current Indonesian laws/regulations and the JICA Guidelines. The legislative system of Indonesia mainly regulates the land acquisition for the purpose of pursuing the public interest; thus no independent decree and acts have been issued to determine the land acquisition by the private entities. However, this section tries to evaluate the eligibility and legal validity of past land acquisition carried out in the Project sites by adopting the framework of the current decree/act and the Guideline.

### Evaluation of the actual land acquisitions cases from the view of current legislation and Guidelines

Items	Presidential decree No. 36/2005 Presidential decree No. 65/2006 Head of Land Authority Act No. 3/2007 JICA Guideline	Actual cases of land acquisition
Oveall	“Ad hoc” task force such as Land Acquisition Committee and Land Assessment Committee engage in negotiation and compensation caused by the Project pursuing the public interests. This approach makes the process of land acquisition and compensation more transparent and open, which could avoid any injustice or disadvantages to the affected people.	The process of land acquisition is initiated by the Project companies targeting the affected people. No “ad hoc” committees are established. In order to keep objectivity and stansparency of the process, but the local governments are involved to witness the eligibility and validity of the land acquisition.
Proponets of land acquisition	Land Acquisition Committee is established and engages in preparing an inventory to indicate the right holders of the land.	Social and Security Team (SST) is organized in PT. WSL and PT. MTI. SST does not conduct the inventory at this stage. It will be done after the socialization of the Project.
Estimation of compensation	Land Assessment Committee estimates the value of compensation by referring the public-designated privee (NJOP) and the market prices.	Based on the officially-determined price in the district decree and the market price, SST proposes the price of compensation to the affected people and decides it through negotiation for the payment. SST provides the alternative land to the affected people in the Project area.
Socialization of the Project to the right owners and negotiation	The implementing agency of the Project will have an opportunity to socialize the Project to the target communities. The Land Acquisition Committee will hold negotiations on the price of compensation and its approach/methodology.	SST briefs the implementation plan of the Project to the target communities. At the same time they grasp the area to be acquired and the households affected by the land acquisition. SST presents the price of compensation and the alternative land and negotiate with the affected people. In order to minimize the adverse impact to the people, SST takes their needs and claims as much as possible in deciding the compensation and the alternate land.
Issuance of agreements	Minutes of agreement is issued if the Project proponents and the affected people agree all issues of land acquisition within 120 days since they start negotiation. If it is difficult for both sides to get mutual agreement, the issue will be remitted to the local court where the affected people present their claim to the local government. The Land Acquisition Committee will declare the results of mediate the issue to settle.	SST and the affected people reach mutual agreement through negotiation. If they do not reach an agreement, SST will not conduct the land acquisition thus exclude the claimed area from target of plantation. Because SST does not have an option to enforce the acquisition, no objections have been claimed so far by the affected people.
Compensation	Project implementing entities pay compensation to the affected people in the presence of the Land Acquisition Committee.	The Project companies pay compensation and privude the alternative land.
Transer of land rights	Land ownership is transferred based on the written procedures.	People construct their houses and huts or plant trees/perennial crops to claim their right to occupy the land.

Source: Prepared by JICA Survey Team based on the current decrees, the act and the guidelines

The procedure of land acquisition whi ch was conducted in the Project to look more simple and straightforward to address the issues than those stipulated in the regulations. No objection or appeal to the local court has been raised by the affected people since the Project started; thus the ongoing procedure can be assessed to work well in protecting and securing the customary rights of the affected persons. As already mentioned in the approaches to the land acquisition, three issues should be addressed in the near future: (1) formulate the land acquisition plan and implement accordingly, (2)

enhance the involvement of the local government (the ir supervision) in order to sustain the openness and the transparency of the acquisition, and (3) establish firm mechanism to address the objections and the appeals of the affected people through the support by the local government

(5) Living and Livelihood Conditions of Local Communities

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

(6) 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 it, 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 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).

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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



The specific approaches to be taken were described in the LARP so as to give due consideration 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 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 held 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 cutoff 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 any significant risk of affecting the feasibility of the Project. In case local communities take a 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.

#### 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. The following table shows the personnel composition of the SSTs.

A total of 63 personnel are working in the SSTs of PT. WSL and PT. MTI at present. As the plantation area will keep expanding until 2020, the SSTs plan to increase the number of staff by 150% by 2020.

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 cutoff 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, PT.WSL and PT.MTI.

### 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 land <input type="checkbox"/> Completion of all the processes
(ditto)				
2				
3				
4				
5				

Source : The JICA Survey 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 (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 fullscale 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 cut-off 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) Measures to implement key recommendations of HCV assessment

The preparation stage requires certain implementation of the key recommendations given by the HCV assessment. To do this, organizational and budgetary arrangements are necessary.

## CHAPTER 7 ECONOMIC ANALYSIS (calculation of EIRR)

The project aims to export all the products of wood chip from its plantation activities in the forestry concession. It is reasonable that the sales revenue in hard currency should be recognized as socio-economic benefit of the project. If the project were not to be implemented, which corresponds to “without project case” in the calculation of EIRR, it is assumed that the project site remains the deteriorated forest and no revenue will be generated at all. In this economic analysis, the EIRR will be calculated by using the cashflow model, which is developed in the financial analysis in Part II Chapter 4.

First, the Standard Conversion Factor (SCF) will be calculated by using the macro-economic statistical data of Indonesian foreign trade, which is shown below.

### Calculation of SCF from Indonesian trade statistics

	2007	2008	2009	2010	2011	5-yr average
Total Import (CIF)	942,431	1,032,278	932,249	1,074,569	1,221,229	1,040,551
Total Export (FOB)	756,895	833,342	708,529	831,418	942,297	814,496
Import Tariff	3,961	22,764	18,105	19,759	28,856	18,689
Export Tariff	16,976	0	0	0	25,266	8,448
SCF	0.99	0.99	0.99	0.99	0.98	<b>0.99</b>

Source: JICA survey team from JETRO and World Bank, world development indicators

The SCF is defined as the mathematical formula below.

$$SCF = \frac{\text{Total Import (CIF)} + \text{Total Export (FOB)}}{(\text{Total Import (FOB)} + \text{Import Tariff}) + (\text{Total Export (FOB)} + \text{Export Tariff})}$$

The economic cost will be referenced from the cashflow model in the financial analysis with minor adjustment by using SCF. It is not considered to be economic cost for the effect of inflation, interest payment of loan and taxes such as corporate tax and VAT because there is no decrease of resources in the total economy.

The economic benefit is recognized as the sales revenue in hard currency. Thus, it is directly referred from the cashflow model of the financial analysis.

From the assumptions above, the EIRR is calculated to 13.27%, which surpasses the base socio-economic discount rate of 12% rate. Therefore, the project is justified from socio-economic perspective.



# **Part II**

## **Phase 1 (WSL/MTI)**

### **Implementation Plan**

#### **Tables**





**Table II-2.1-1 Monthly Rainfall**

(Unit: mm)

No	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total	Min	Max
1	2003	349	297	202	614	146	134	213	207	132	302	334	257	3,187	132	614
2	2004	384	163	216	312	386	113	249	19	309	182	351	422	3,106	19	422
3	2005	291	166	222	256	410	168	152	162	230	538	309	139	3,043	139	538
4	2006	184	345	137	260	228	220	41	57	171	130	297	477	2,547	41	477
5	2007	281	92	203	314	462	438	312	142	215	591	250	366	3,666	92	591
6	2008	125	106	210	321	234	102	317	279	201	656	246	426	3,223	102	656
7	2009	262	67	291	372	183	135	122	299	189	382	668	309	3,279	67	668
8	2010	234	274	266	210	321	381	320	174	424	242	450	203	3,499	174	450
9	2011	355	229	152	241	204	193	174	144	148	533	293	464	3,130	144	533
10	2012	149	257	209	359	222	94	323	73	54	444	405	551	3,140	54	551
Minimum		125	67	137	210	146	94	41	19	54	130	246	139	2547	19	246
Maximum		384	345	291	614	462	438	323	299	424	656	668	551	3,666	291	668
Average		261	200	211	326	280	198	222	156	207	400	360	361	3,182	156	400

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

Note: Data (2003 to 2012, 10 years)

**Table II-2.1-2 Monthly Average of Daily Maximum Temperature**

(Unit: ° C)

No	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Min	Max	Average
1	2003	31.9	31.8	33.0	32.7	33.2	33.2	32.2	33.1	32.6	32.3	30.5	31.3	30.5	33.2	32.3
2	2004	31.9	32.4	32.8	32.7	33.4	33.2	31.6	33.3	32.1	32.6	32.0	31.6	31.6	33.4	32.5
3	2005	32.4	33.0	33.4	33.0	32.7	32.7	32.5	33.3	32.9	32.0	31.7	31.1	31.1	33.4	32.6
4	2006	32.1	32.6	33.6	32.5	32.8	32.2	33.6	33.3	32.9	32.4	32.2	32.4	32.1	33.6	32.7
5	2007	31.8	32.8	32.8	32.8	33.2	32.6	32.3	32.4	32.7	32.6	31.5	31.2	31.2	33.2	32.4
6	2008	32.5	31.4	31.8	32.9	33.1	32.2	31.9	32.1	32.0	31.6	32.3	30.6	30.6	33.1	32.0
7	2009	30.7	32.0	32.3	32.4	33.2	33.2	32.8	33.0	33.2	32.3	31.2	31.3	30.7	33.2	32.3
8	2010	32.0	32.4	32.8	33.4	33.1	32.4	31.6	32.1	31.8	31.7	30.9	30.8	30.8	33.4	32.1
9	2011	31.2	31.2	32.2	33.0	33.2	32.8	32.1	32.8	32.8	32.3	32.2	31.6	31.2	33.2	32.3
10	2012	31.9	32.0	32.6	32.9	33.7	33.6	32.6	32.8	33.8	32.3	32.4	32.0	31.9	33.8	32.7
Minimum		30.7	31.2	31.8	32.4	32.7	32.2	31.6	32.1	31.8	31.6	30.5	30.6	30.5	32.7	31.6
Maximum		32.5	33.0	33.6	33.4	33.7	33.6	33.6	33.3	33.8	32.6	32.4	32.4	32.4	33.8	33.2
Average		31.8	32.2	32.7	32.8	33.2	32.8	32.3	32.8	32.7	32.2	31.7	31.4	31.4	33.2	32.4

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

Note: Data (2003 to 2012, 10 years)

**Table II-2.1-3 Monthly Average of Daily Minimum Temperature**

(Unit: ° C)

No	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Min	Max	Average
1	2003	23.2	23.3	23.2	23.4	24.0	23.2	22.9	23.3	23.2	23.4	23.4	23.2	22.9	24.0	23.3
2	2004	23.4	23.1	23.3	23.3	23.6	23.1	22.9	22.5	22.9	23.1	23.3	23.1	22.5	23.6	23.1
3	2005	23.1	23.3	23.3	23.4	23.6	23.4	23.0	23.2	23.2	23.2	23.4	22.9	22.9	23.6	23.3
4	2006	22.9	23.1	23.3	23.4	23.2	23.1	23.6	23.0	23.0	23.3	23.2	23.3	22.9	23.6	23.2
5	2007	23.5	22.9	23.2	23.4	23.5	23.3	23.1	23.1	23.5	23.1	23.1	23.1	22.9	23.5	23.2
6	2008	22.9	23.1	23.1	23.3	23.4	23.5	23.4	23.4	23.9	23.5	23.7	23.7	22.9	23.9	23.4
7	2009	23.4	23.0	23.4	23.9	24.3	24.0	23.2	23.8	24.1	23.6	23.0	23.7	23.0	24.3	23.6
8	2010	23.5	24.0	24.0	24.5	24.5	24.0	23.6	23.7	23.6	23.8	22.9	23.4	22.9	24.5	23.8
9	2011	23.2	23.2	23.7	23.8	24.1	23.0	23.2	23.6	23.8	23.3	23.7	23.6	23.0	24.1	23.5
10	2012	23.3	23.2	23.7	23.7	23.9	23.9	23.8	22.1	23.5	23.8	23.8	23.6	22.1	23.9	23.5
	Minimum	22.9	22.9	23.1	23.3	23.2	23.0	22.9	22.1	22.9	23.1	22.9	22.9	22.1	23.3	22.9
	Maximum	23.5	24.0	24.0	24.5	24.5	24.0	23.8	23.8	24.1	23.8	23.8	23.7	23.5	24.5	24.0
	Average	23.2	23.2	23.4	23.6	23.8	23.5	23.3	23.2	23.5	23.4	23.4	23.4	23.2	23.8	23.4

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

Note: Data (2003 to 2012, 10 years)

**Table II-2.1-4 Monthly Average of Daily Average**

(Unit: ° C)

No	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Min	Max	Average
1	2003	26.4	26.5	26.7	26.6	27.7	27.4	26.7	27.3	26.7	26.7	26.4	26.2	26.2	27.7	26.8
2	2004	26.4	26.7	26.9	26.8	27.3	27.4	26.0	27.2	26.4	26.7	26.3	26.0	26.0	27.4	26.7
3	2005	26.6	26.9	27.1	27.2	27.1	27.3	27.0	27.3	26.9	26.4	26.1	26.1	26.1	27.3	26.8
4	2006	26.3	26.8	27.3	25.8	26.9	26.9	27.9	27.4	26.6	26.9	26.5	26.5	25.8	27.9	26.8
5	2007	26.7	26.7	26.7	27.4	27.1	26.7	26.7	26.9	27.1	26.5	26.1	26.2	26.1	27.4	26.7
6	2008	26.7	24.5	26.1	25.9	27.1	27.0	26.6	26.8	27.0	26.3	26.9	26.1	24.5	27.1	26.4
7	2009	26.2	26.2	26.7	27.2	28.0	27.8	27.2	27.7	27.7	26.7	26.5	26.4	26.2	28.0	27.0
8	2010	27.0	27.3	27.3	27.9	27.8	27.5	26.7	27.0	26.6	26.8	27.2	26.3	26.3	27.9	27.1
9	2011	26.3	23.3	26.9	27.3	27.5	27.2	27.0	27.2	27.1	26.5	26.7	26.5	23.3	27.5	26.6
10	2012	26.5	26.4	27.0	27.0	27.7	27.8	27.3	27.3	27.6	26.7	27.1	26.6	26.4	27.8	27.1
	Minimum	26.2	23.3	26.1	25.8	26.9	26.7	26.0	26.8	26.4	26.3	26.1	26.0	23.3	26.9	26.1
	Maximum	27.0	27.3	27.3	27.9	28.0	27.8	27.9	27.7	27.7	26.9	27.2	26.6	26.6	28.0	27.4
	Average	26.5	26.1	26.9	26.9	27.4	27.3	26.9	27.2	27.0	26.6	26.6	26.3	26.1	27.4	26.8

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

Note: Data (2003 to 2012, 10 years)

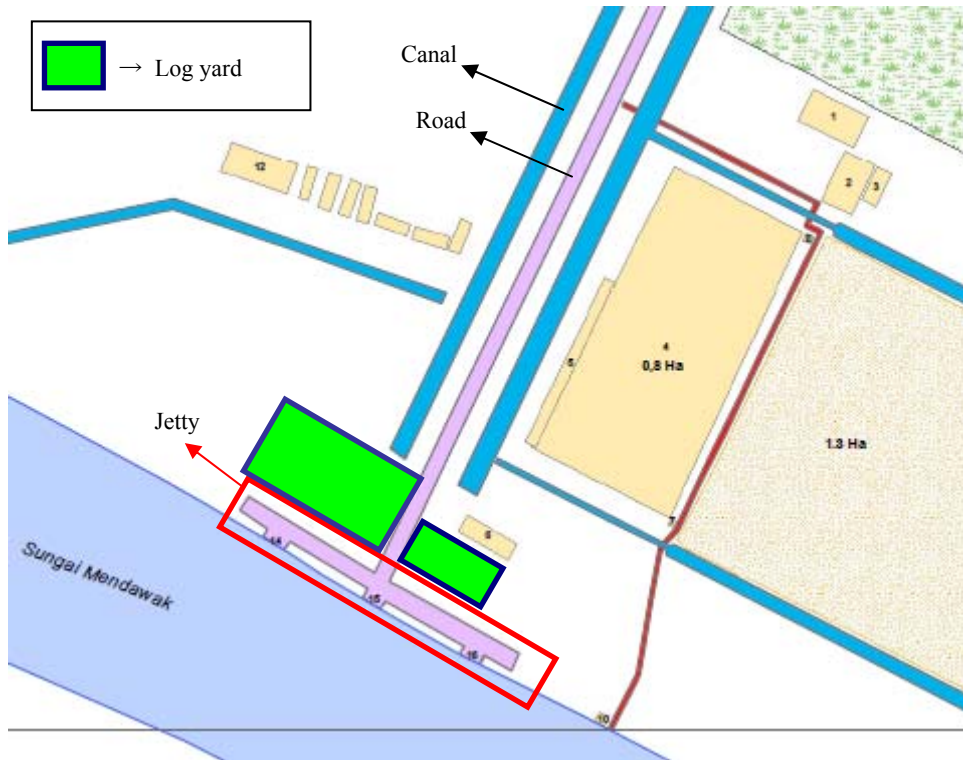
# **Part II**

## **Phase 1 (WSL/MTI)**

### **Implementation Plan**

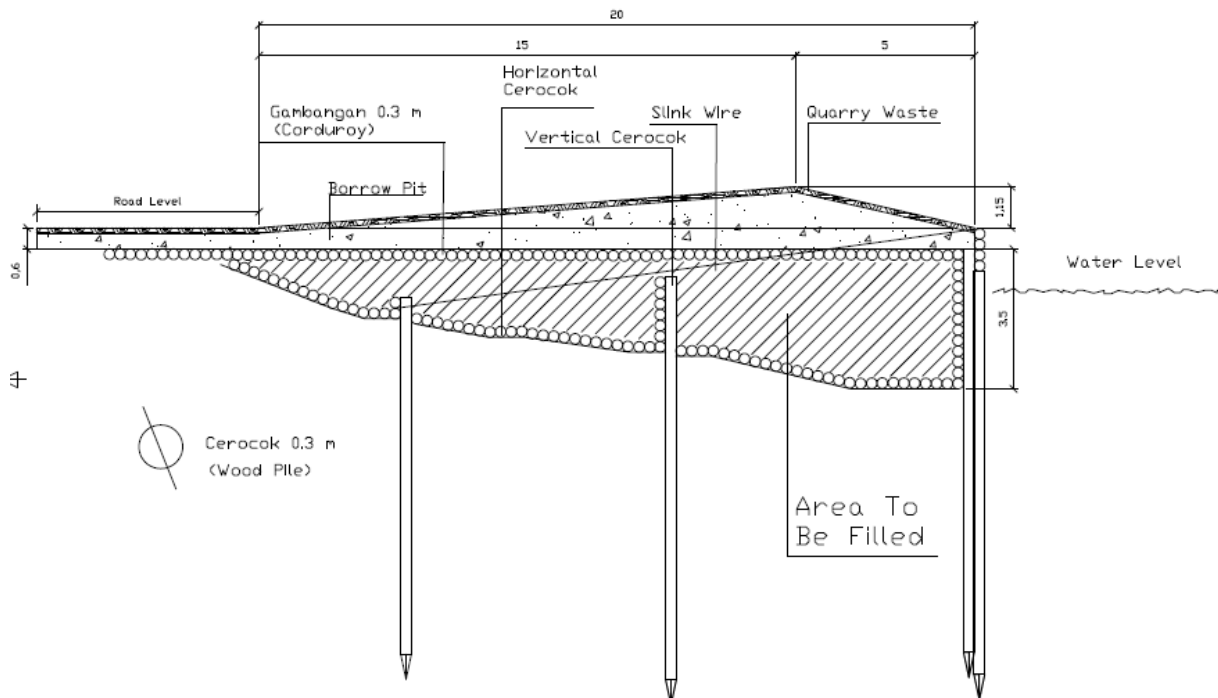
## **Figures**





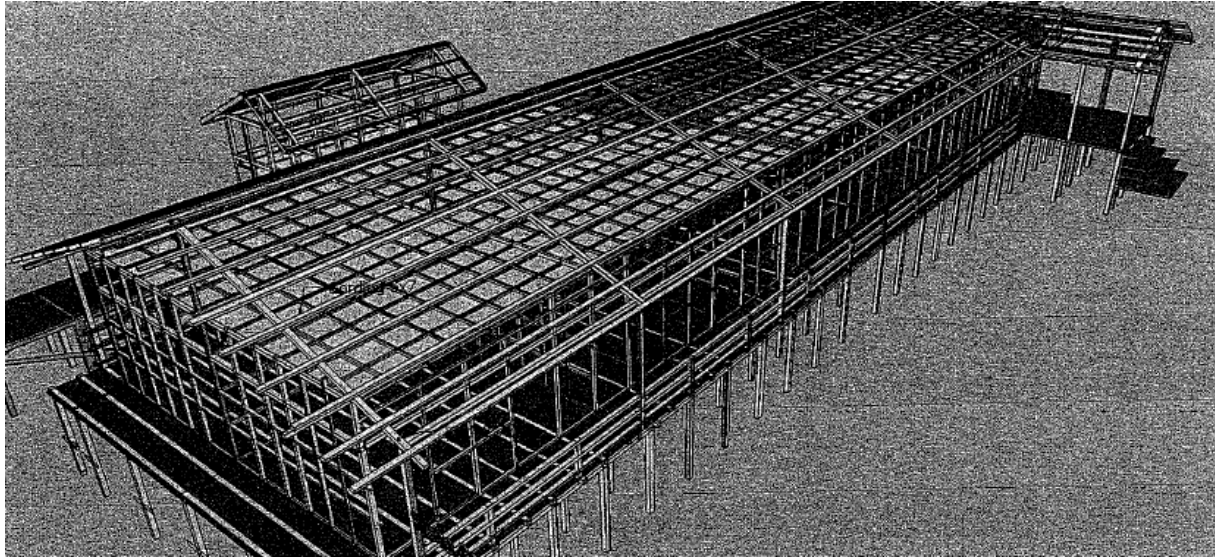
Source: JICA Survey Team

**Figure II-3.3-1 Log pond Layout (MTI Block H)**



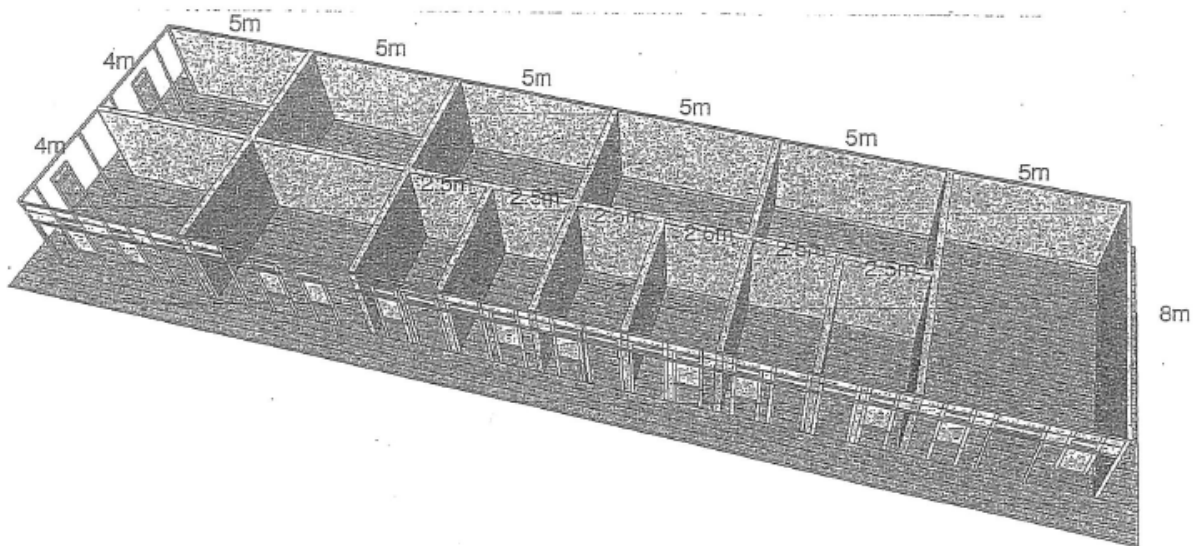
Source: JICA Survey Team

**Figure II-3.3-2 Log pond design**



Source: JICA Survey Team

**Figure II-3.3-3 Image of Office**

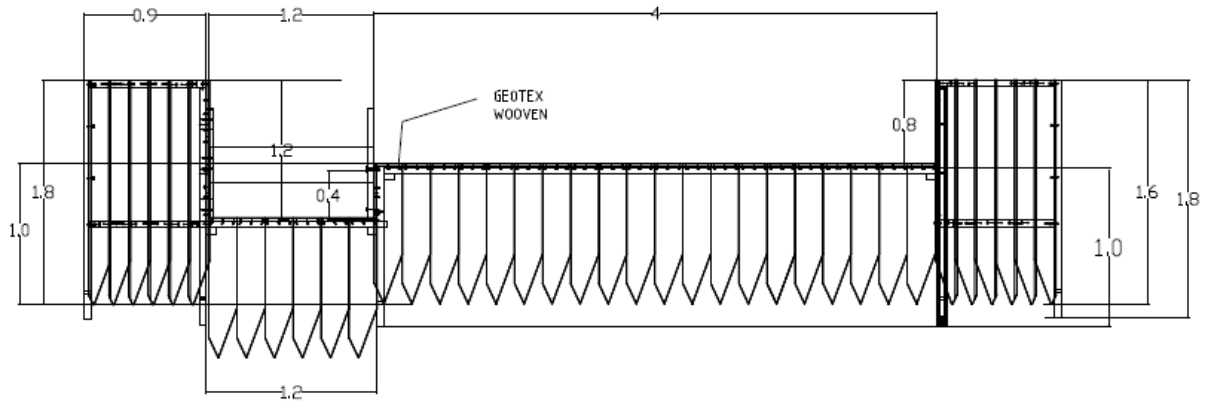


Source: JICA Survey Team

**Figure II-3.3-4 Image of Accommodation**

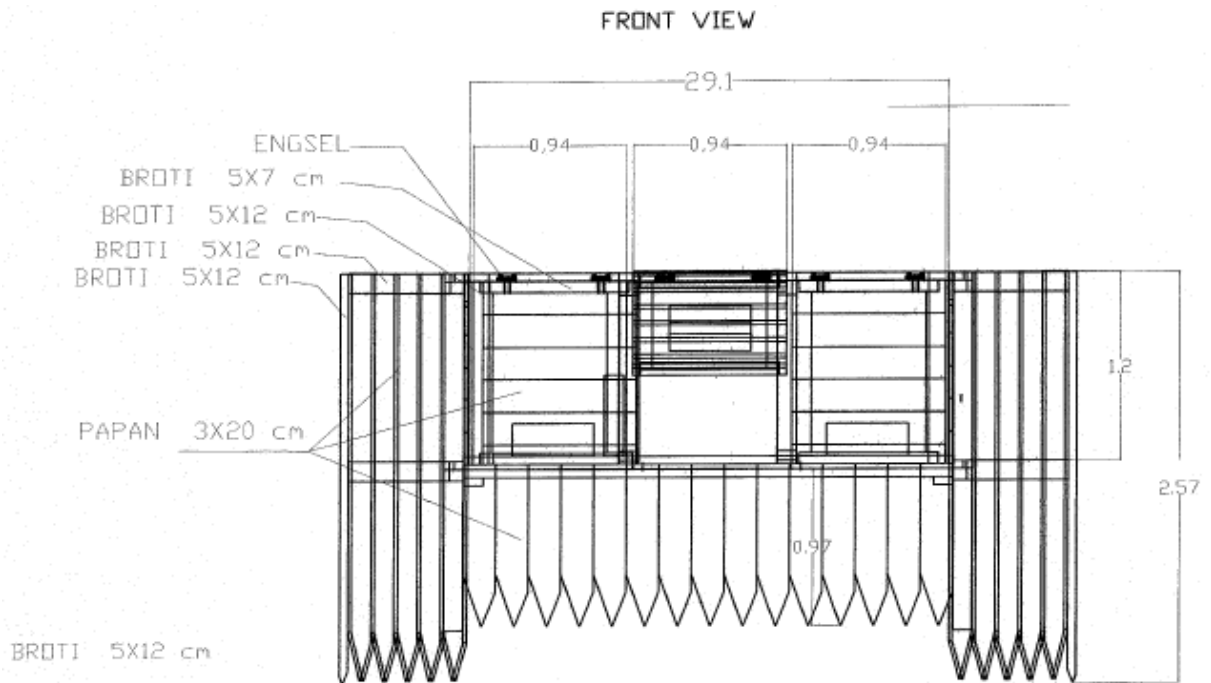






Source: JICA Survey Team

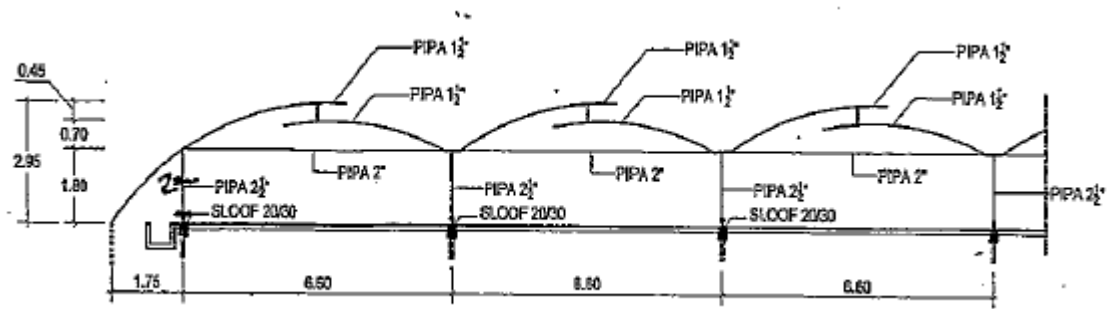
**Figure II-3.3-7 Standard design of Adjustable gate**



Source: JICA Survey Team

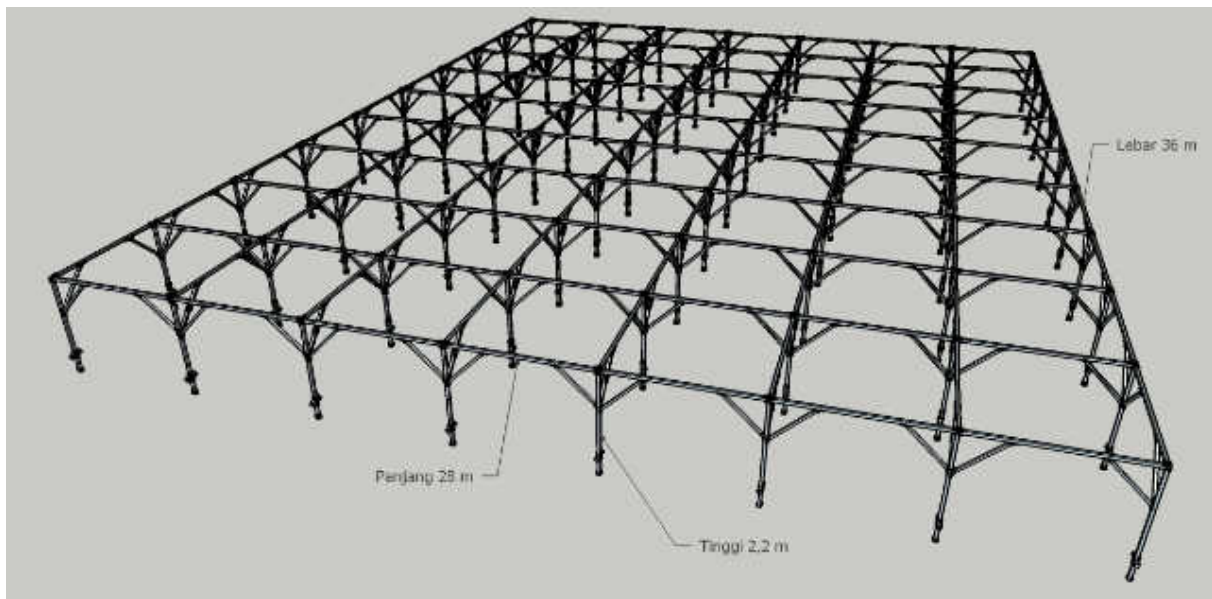
**Figure II-3.3-8 Standard Design of Flap Gate (Front View Drawing)**





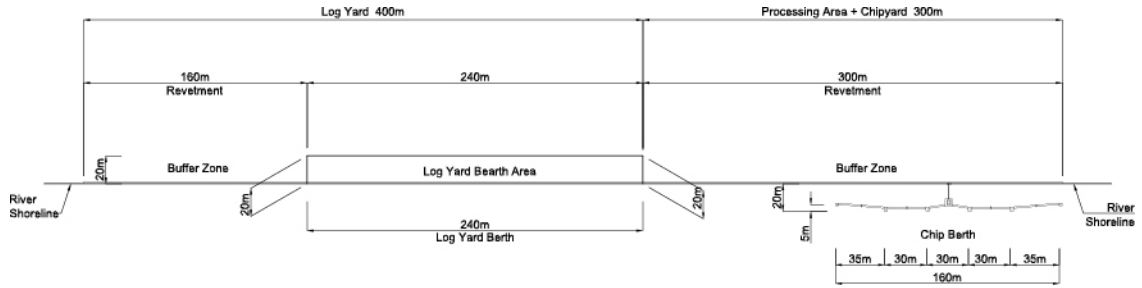
Source: JICA Survey Team

**Figure II-3.3-11 Standard Design of Greenhouse of Permanent Nursery**



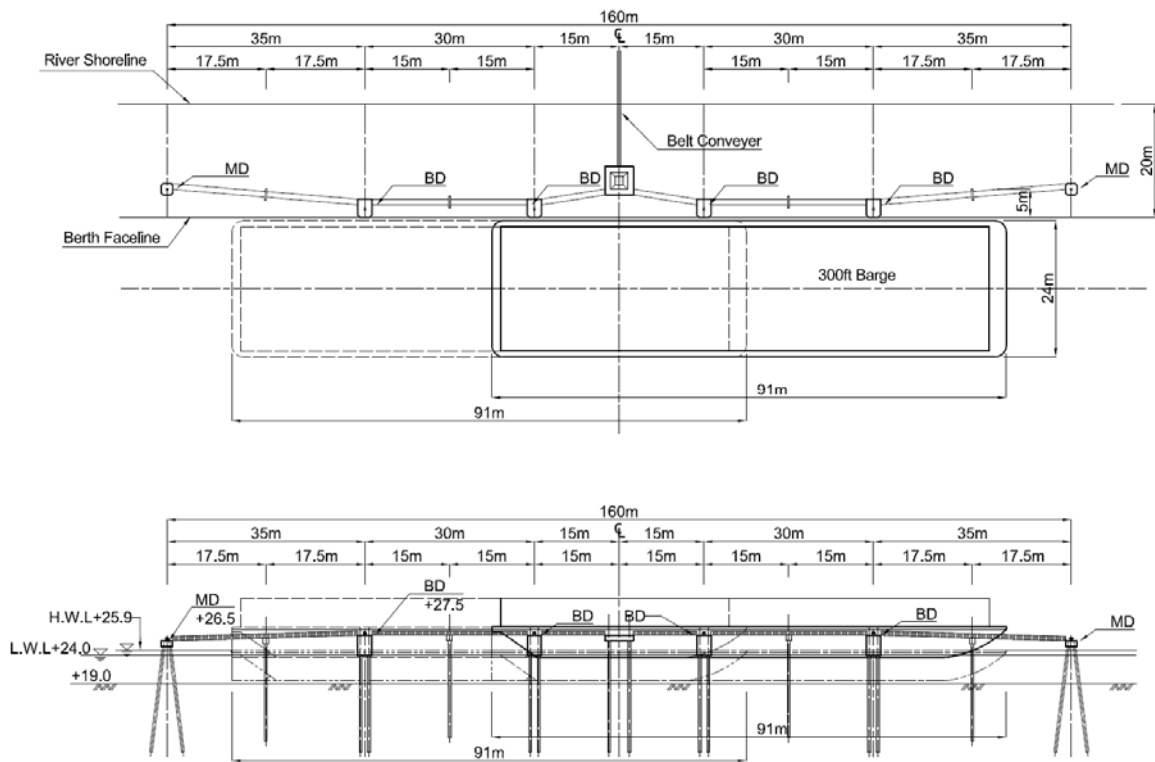
Source: JICA Survey Team

**Figure II-3.3-12 Woody Type of Greenhouse of Temporary Nursery**



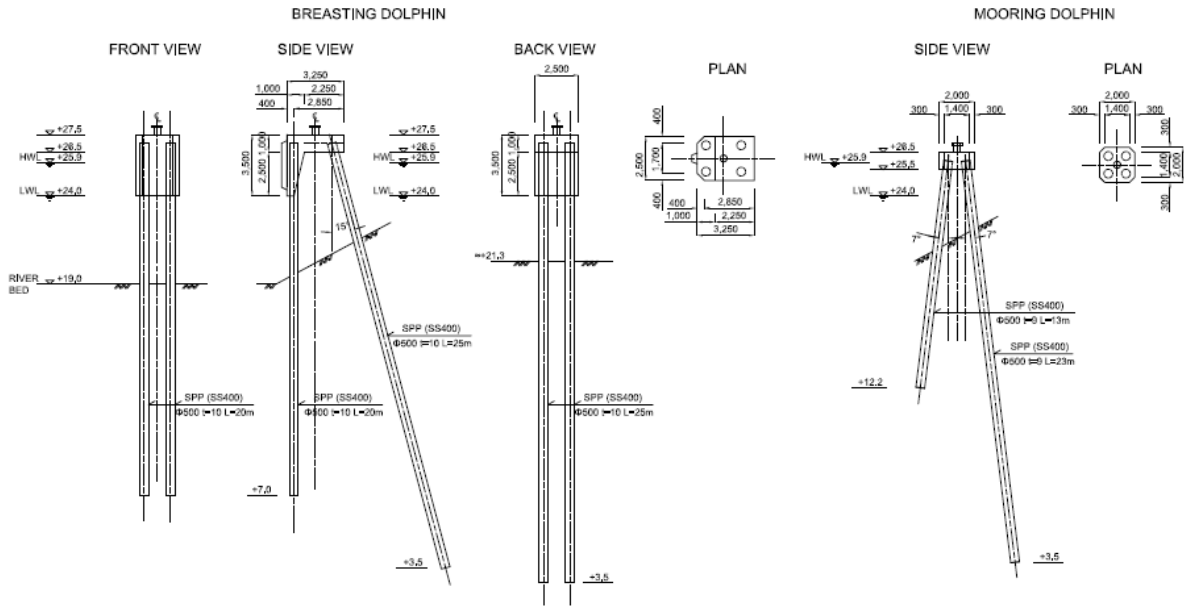
Source: JICA Survey Team

**Figure II-3.5-1 Port Facility Plan**



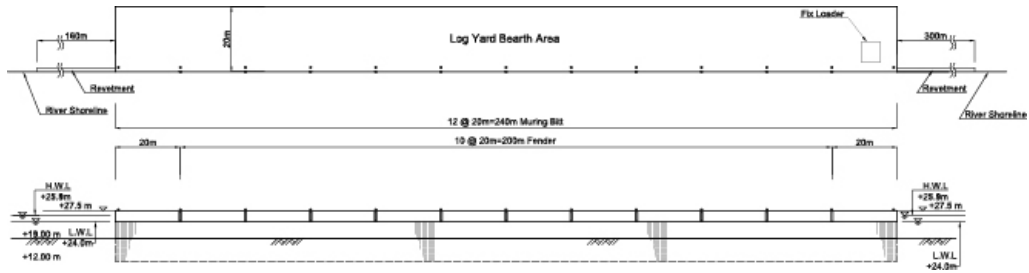
Source: JICA Survey Team

**Figure II-3.5-2 Plane and Front View of Port Facility**



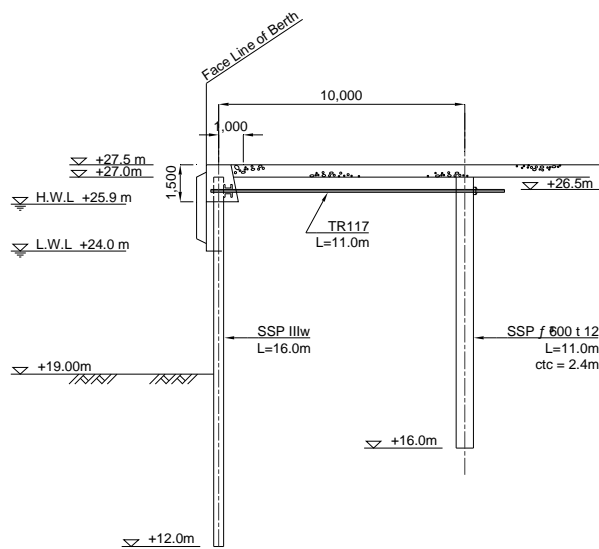
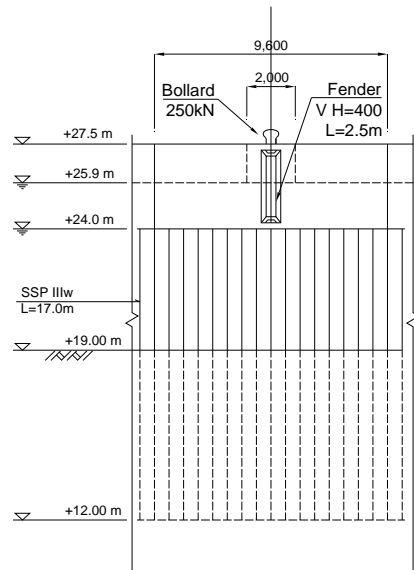
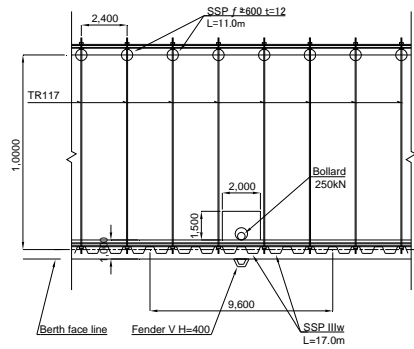
Source: JICA Survey Team

**Figure II-3.5-3 Structural Drawing of MD and BD**



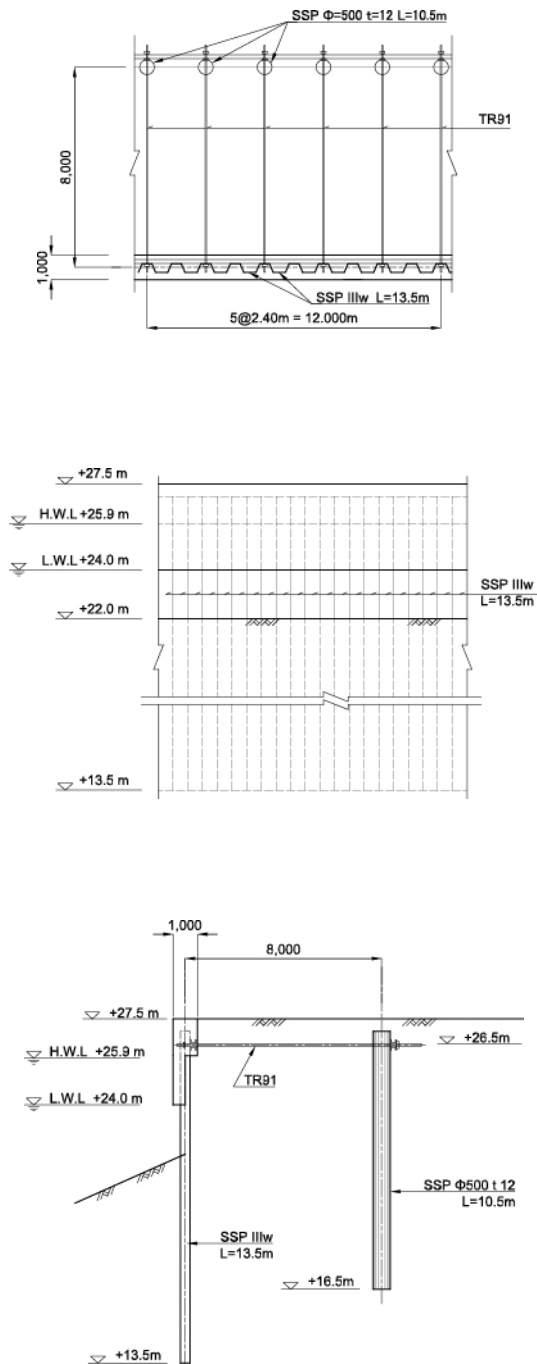
Source: JICA Survey Team

**Figure II-3.5-4 Plane and Front View of Log Yard Berth**



Source: JICA Survey Team

**Figure II-3.5-5 Structural Drawings of Log Yard Berth**



Source: JICA Survey Team

**Figure II-3.5-6 Structural Drawings of Revetment**