ACTION PLAN ON FOREST PLANTATION DEVELOPMENT (2022 - 2036)

SABAH FORESTRY DEPARTMENT

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(2022 - 2036)

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Sabah Forestry Department

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We are also grateful for the inputs from the Timber Association of Sabah (TAS), Sabah Timber Industries Association (STIA), and SFM Licensees during the preparation of this Action Plan.

Message by the
Right Honourable Chief Minister of Sabah

Assalamualaikum warrahmatullahi wabarakatuh, salam sejahtera dan salam Sabah Maju Jaya.

I am pleased that the Sabah Forestry Department has successfully formulated the Action Plan for the Sabah Forest Policy 2018 on Forest Plantation Development (2022 - 2036) which will be the blueprint for forest plantation development for the next 15 years. This is a strategic and decisive action to transform our forest plantation towards achieving sustainable land use for planted timber production. This action plan provides guidance in forest plantation development in accordance with the sustainable forest management principles, as outlined in the Sabah Maju Jaya Development Plan (2021- 2025) and the Sabah Forest Policy 2018.

One of the economic objectives of the State Government's policy is to reduce reliance on natural forests as the main source of income. The State Government has targeted to achieve 400,000 hectares of forest plantation by the year 2036, with a production capacity of between 6 million and 8 million cubic meters per year. The State Government aims to strike a balance between economics and conservation. While it aims to ensure adequate supply of raw material for the wood-based industries to remain competitive in the domestic and international markets, it remains committed to the conservation of its natural assets.

Since the start of conservation initiative in 2007, the State Government has achieved significant progress in forest conservation. More than 26% of the State's land area or about 1.9 million hectares, has been gazetted as Totally Protected Areas (TPAs). By 2025, the State Government will expand the TPAs to 30 per cent of Sabah's land mass. This in line with the State's Sabah Maju Jaya (SMJ) Plan, which has maintained 50% of Sabah's land mass under forest covers. We have increased forest covers to 64% of which 52% are gazetted as Forest Reserves, Parks and Wildlife Conservation Areas, and we have restored about 65,500 hectares of forest reserves.

The interventions proposed under this action plan are crucial to ensure the upstream and downstream forest industries remain economically viable and competitive. With strong fundamentals and proper controls in place, I am confident that the forest industries in Sabah will remain as a significant socio-economic sector and an important contributor to the state revenue.

Congratulations to the Sabah Forestry Department for spearheading the initiative to transform the forest plantation agenda.

Thank you.

DATUK SERI PANGLIMA HAJI HAJIJI HAJI NOOR
Chief Minister of Sabah

Foreword by the
Chief Conservator of Forests

Salam sejahtera dan
salam Sabah Maju Jaya.

The Action Plan for the Sabah Forest Policy 2018 on Forest Plantation Development (2022 - 2036) is a guiding document for the transformation of forest plantation development in Sabah. This action plan outlines the direction and way forward for effective and efficient management for the sustainability of forest plantations. By adopting and implementing the action plan, the forest plantation industry will be able to align their operation and long-term plans in line with the Sabah Maju Jaya Development Plan and Sabah Forest Policy 2018.

The State Government has allocated about 600,000 hectares of degraded forests for forest plantation development. However, due to the limitation of conservation attributes, only 400,000 hectares of the allocated areas are plantable. To date, a total of 160,000 hectares of forest plantations have been established by the SFM licensees. The balance area of about 240,000 hectares is expected to be fully planted by 2036, which can produce sustainable supply of planted timber of about 6 to 8 million cubic meters per annum.

Forest plantation development requires high capital investment. The cost of establishing a forest plantation is estimated at RM10,000.00 per hectare and an investment of RM2.4 billion or RM180 to RM400 million a year is needed to develop another 240,000 hectares of forest plantation by 2036. In this regard, both the federal and state governments have provided various incentives to the SFM Licensees to support forest plantation development. This includes soft loans provided by the federal government for developing forest plantations and incentives by the state government in terms of royalty deduction on planted timber for one rotation.

I am grateful for the advice and strong support by the Right Honourable Chief Minister to make this action plan materialised. I am also thankful to the Timber Association of Sabah, Sabah Timber Industries Association, and all the SFM Licensees for their invaluable input in the formulation of this action plan.

I congratulate my dedicated members of the Taskforce on the Forest Plantation Development Team led by Mr. Musa Salleh, Head of Sustainable Forest Management Division for their relentless efforts in formulating this action plan. Finally, this action plan, which is an important guidance in transforming both upstream and downstream forest industries, shall be a beacon of guidance to ensure the sustainability of the timber industries in Sabah.

Thank you.

DATUK FREDERICK KUGAN
Chief Conservator of Forests

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List of Abbreviations

AWP	Annual Work Plan
CptHP	Compartment Harvesting Plan
CPP	Compartment Planting Plan
CR	Compliance Report
EPD	Environment Protection Department
FMP	Forest Management Plan
FRC	Forest Research Centre
ha	hectare
ITP	Industrial Tree Plantation
JTK	Jabatan Tenaga Kerja Sabah (Sabah Labour Department)
L&S	Land and Survey Department
PDP	Plantation Development Plan
QR	Quarterly Report
R&D	Research and Development
SFD	Sabah Forestry Department
SFM	Sustainable Forest Management
SOP	Standard Operating Procedures
STIA	Sabah Timber Industries Association
SWD	Sabah Wildlife Department
TAS	Timber Association of Sabah
TLAS	Timber Legality Assurance System
WWF	World Wide Fund for Nature

Glossary

Annual Work Plan
An operational plan prepared by the Licensee describing activities such as road construction and maintenance, harvesting operation, forest plantation establishment, enrichment planting, silvicultural treatment, social forestry and forest protection to be conducted by the licensees during one calendar year. Annual Work Plan shall follow management prescriptions and schedule of implementation in the Forest Management Plan.

Annual rent
Annual fees for the licensed area.

Conservation attributes
It includes steep slopes (more than 25 degrees), riparian reserves, wildlife corridors and swampy areas.

Forest Management Plan
A document containing required information on how an area within the Commercial Forest Reserves (Class II) will be managed on an ecologically sustainable basis over the medium-term of not less than 10 years. The boundary of a Forest Management Plan shall be determined by the Chief Conservator of Forests and shall encompass an environmentally and economically sustainable unit capable of producing high-quality timber products over the long term. The boundary may include, but is not necessarily limited to the area covered by a SFM Licence. The area covered by a Forest Management Plan is zoned and further subdivided into compartments for planning and management purposes.

Forest plantation
Forest plantation means planted trees in forest areas designated for forest plantation development through the planting of mono or multiple native or introduced species that is intensively managed and has regular tree spacing, to produce sustainable planted timber.

Management plan
Management plans refer to a Forest Management Plan, a Plantation Development Programme, a Plantation Development Plan, an Annual Work Plan, a Compartment Harvesting Plan, and a Compartment Planting Plan.

Matured trees
Planted trees that reached the rotation cycle and ready to be harvested.

Plantable areas
A plantable area refers to forest areas designated for forest plantation development excluding riparian reserves, stream buffer zones, steep areas and areas excluded by the Chief Conservator of Forests (CCF).

PART 1

INTRODUCTION

Forest plantation development in Sabah is implemented in accordance with the Sustainable Forest Management (SFM) principles. The establishment of forest plantations is allowed in degraded forest areas within Commercial Forest Reserve (Class II) areas. About 600,000 ha of the degraded forests (gross area) within the SFM Licenced areas have been allocated for forest plantation development.

With declining production from natural forests, timber supply from forest plantations has become an important source for the wood-based industries. By establishing forest plantations at scale and managing it appropriately, the SFM Licensees can produce sufficient and sustainable planted timber. This can reduce pressure on the remaining natural forests for timber production and contribute towards forest conservation.

Taking into consideration of the various conservation attributes, it is estimated that out of the 600,000 ha allocated for the forest plantation development, only about 400,000 ha are available for planting. To date, a total of approximately 160,000 ha of forest plantation has been developed by SFM Licensees. Therefore, the intervention through this action plan will accelerate the scaling up of tree planting and the State Government's target to develop another 240,000 ha of plantable areas by 2036. It is projected that annual planting target of approximately 18,000 to 40,000 ha from 2022 to 2036 **(Table 1.1 and Figure 1.1).**

It is projected that about 6 to 8 million m3 of plantation logs can be produced annually once the annual allowable cut of 40,000 ha is achieved by 2036 **(Figure 1.2).** This will provide a continuous supply of planted timber for the viability and sustainability of the wood-based industry. A sustainable supply of planted timber will encourage more downstream and high-value added investments that are expected to contribute to the GDP an amount of about RM 11.5 billion.

In terms of employment, it is estimated that 40,000 skilled and semi-skilled jobs in upstream and downstream forest industries will be created predominantly for Sabahans by 2036.

This Action Plan is formulated in line with the Sabah Forest Policy 2018. There are 3 strategies which are related to forest plantation development in the policy, i.e.,to encourage and strengthen the development of forest plantations for safeguarding the sustainability of timber supply; optimising and improving the utilization of raw materials; and restructuring the wood-based industries based on comparative advantage.

The plan aims to strengthen forest plantation development and improve the associated value chain **(Figure 1.3).** It provides guidance to the Sabah Forestry Department and SFM Licensees to ensure successful implementation of forest plantation development. This action plan can be reviewed if there are changes or new development during the implementation period.

Table 1.1: Annual Planting Target for Forest Plantation Establishment

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Accumulated Planted Area	135,678	159,422	172,920	188,920	206,920	226,920	249,059	271,488	292,810	310,000	328,000	346,000	364,000	382,000	400,000	400,000	400,000	400,000	400,000
Replanting Target	409	498	5,000	7,000	10,000	15,000	17,861	17,431	18,109	22,000	22,000	22,000	22,000	22,000	22,000	40,000	40,000	40,000	40,000
New Planting Target	23,833	18,000	18,000	21,000	25,000	25,000	22,000	22,000	21,081	18,000	18,000	18,000	18,000	18,000	18,000	-	-	-	-
Harvesting Target	498	5,000	7,000	10,000	15,000	17,861	17,431	18,109	22,000	22,000	22,000	22,000	22,000	22,000	40,000	40,000	40,000	40,000	40,000
Available Area for Harvesting	75,931	89,607	91,546	91,485	87,786	81,125	69,683	56,901	40,015	23,035	25,277	21,775	22,775	28,775	41,775	41,775	41,636	41,067	40,257
Total Planting Target	**24,242**	**18,498**	**23,000**	**28,000**	**35,000**	**40,000**	**39,861**	**39,431**	**39,190**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**

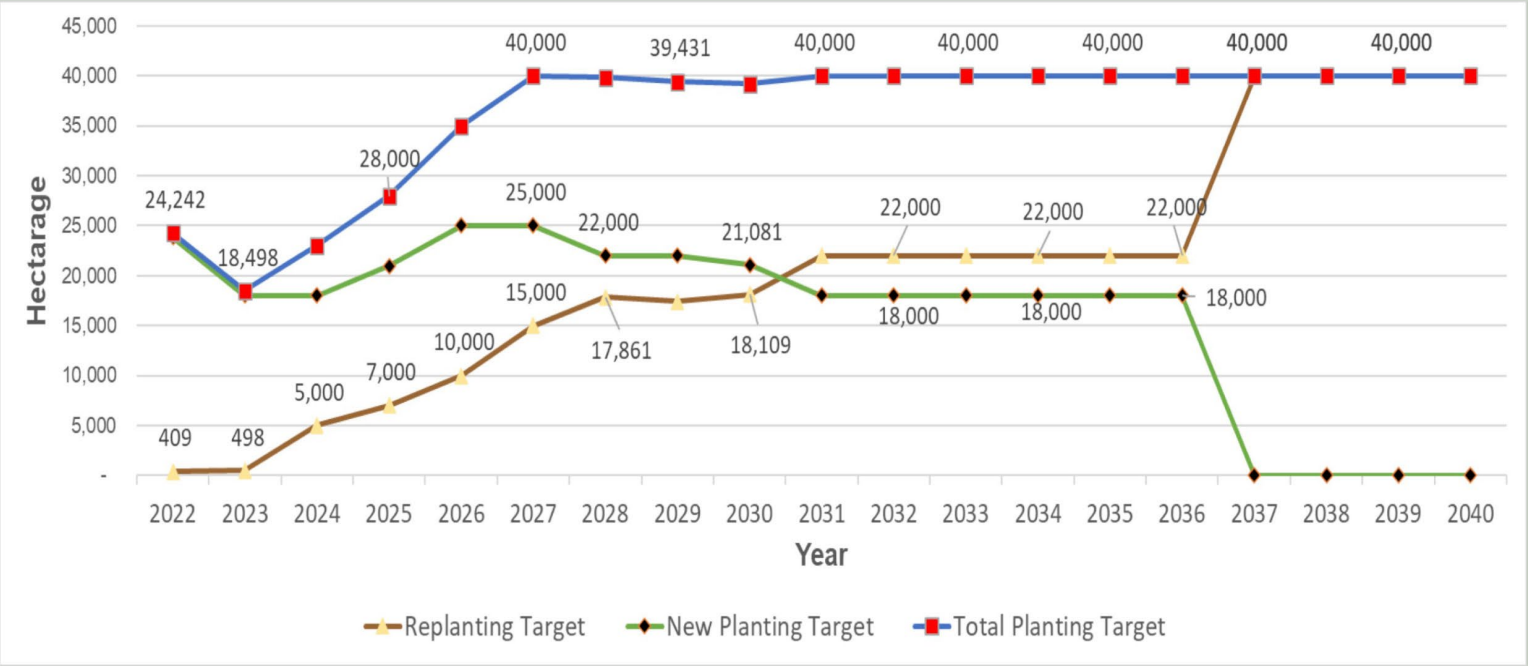

Figure 1.1: Annual Planting Target for Forest Plantation

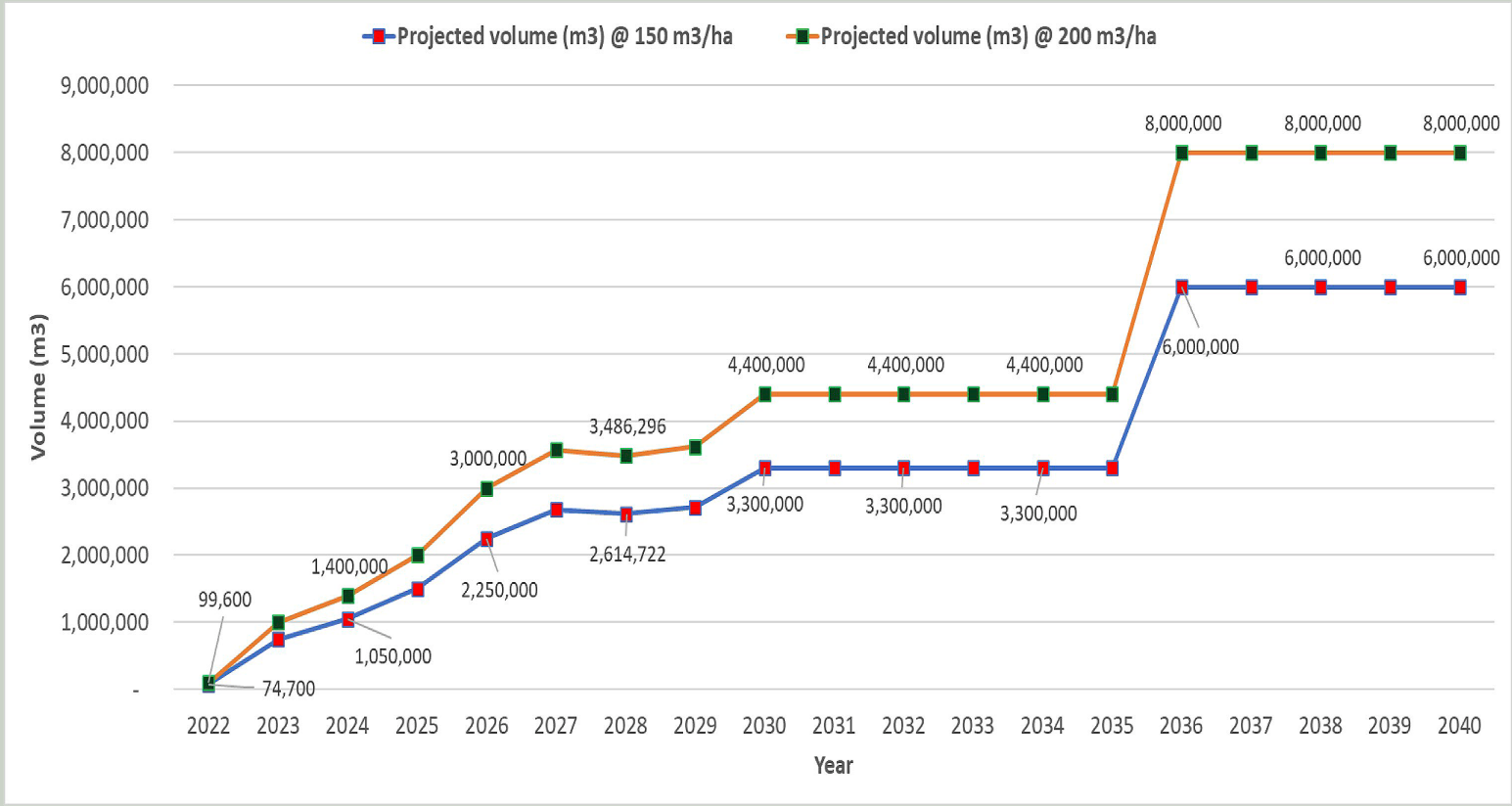

Figure 1.2: Projection of Annual Planted Timber Production from SFM Licenced Areas

Figure 1.3: Cycle of Forest Plantation Industry

PART 2

STRATEGY: ENCOURAGE AND STRENGTHEN THE DEVELOPMENT OF FOREST PLANTATIONS FOR SAFEGUARDING SUSTAINABILITY OF TIMBER SUPPLY

2.1 Allocate sufficient areas for forest plantation establishment

The State Government has set aside more or less 600,000 ha of degraded areas within production forest reserves as the threshold for forest plantation development **(Figure 2.1).** This effort will allocate sufficient areas for forest plantation development and at the same time reduce reliance on natural forests as the main sustainable source of timber to sustain the forest industries, and to promote conservation.

Based on past experiences, only about 60% to 70% of an allocated area is plantable, due to limitations on conservation attributes. Taking this into account, it is estimated that only about 400,000 ha of the threshold are available for planting.

Based on a 10-year rotation, about 40,000 ha is expected as harvestable annually by 2036 **(Figure 1.1).** Taking into account the yield per ha of about 150 m3 to 200 m3, approximately 6 to 8 million m3 of plantation logs can be produced annually by the SFM Licensees. Based on the installed capacity of wood-based industries of about 4 to 5 million m3 per year, the threshold set by the government for forest plantation development is considered sufficient to support forest industries.

Details of targeted actions and timelines are presented in **Table 2.1.**

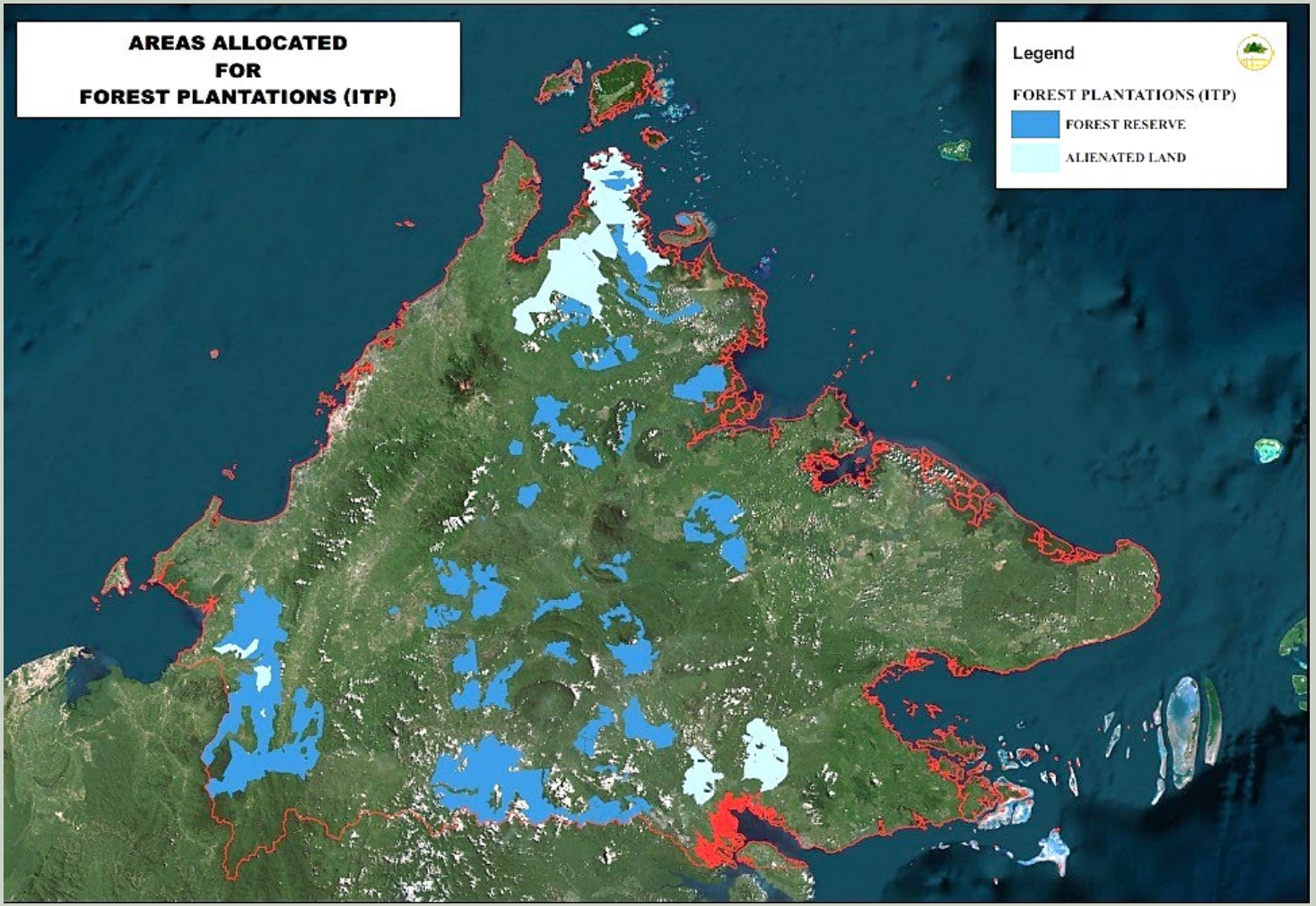

Figure 2.1: Areas Allocated for Forest Plantations in Sabah

Figure 2.2: *Eucalyptus pellita* Forest Plantation at Asian Forestry Company (Sabah) Sdn Bhd, Kota Marudu

Table 2.1: Action Plan for Allocating Sufficient Areas for Forest Plantation Establishment

Action	Targets	Responsibilities	Time Frame (2022 - 2036)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To assess and zone degraded forest areas in SFM licenced areas for forest plantation development.	(a) 600,000 ha gross areas zoned for forest plantation.	SFD															
(2) To map out allocated forest plantation areas at the landscape level.	(a) Map for 600,000 ha gross forest plantation areas prepared.	SFD															
(3) To estimate nett plantable area in SFM Licenced areas.	(a) 400,000 ha nett plantable areas estimated.	(a) SFD (b) SFM Licensees															
(4) To develop designated forest plantation area by SFM Licensees.	(a) 400,000 ha of forest plantation established by 2036.	SFM Licensees															
	(b) Annual average approximately 18,000 to 40,000 ha of planting from 2022 to 2036.																

Action	Targets	Responsibilities	Time Frame (2022 - 2036)														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(5) To monitor forest plantation development.	(a) Establishment of Steering Committee on Forest Plantation Development and Monitoring.	(a) SFD (Chair) (b) L&S (c) EPD (d) SWD (e) JTK Sabah (f) TAS (g) STIA (h) WWF															
	(b) Assessment report on Licensees' financial and human resource capacity prepared.	(a) SFD (b) SFM Licensees															
	(c) Online reporting system for QR and CR developed.	(a) SFD (b) SFM Licensees															
	(d) Online reporting system for QR and CR applied to monitor SFM Licensees' achievement in forest plantation development.	(a) SFD (b) SFM Licensees															

Action	Targets	Responsibilities	Time Frame (2022 - 2036)														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(6) To harvest planted trees in accordance with management prescriptions in the management plan.	(a) Compartment Harvesting Plan for Planted Timber prepared and submitted to SFD.	SFM Licensees															
	(b) Matured trees harvested according to the harvesting schedule in the management plan.	SFM Licensees															
(7) To replant harvested areas.	(a) The harvested area replanted in line with the replanting schedule as prescribed in the management plan.	SFM Licensees															
(8) To develop Web Database on Forest Plantation.	(a) Web Database on Forest Plantation developed.	(a) SFD (b) TAS (c) SFM Licensees															
	(b) Web Database on Forest Plantation applied for marketing.	(a) SFD (b) TAS (c) SFM Licensees															

2.2 Provide financial incentives and new innovative tax reliefs for forest plantation establishment

Forest plantations have a long gestation period and generally making it unattractive to financial institutions for providing financial assistance. Besides, high initial capital investment is required to establish forest plantations. Based on experiences, the cost of establishing a forest plantation **(Figure 2.2)** is estimated at about RM10,000.00 per ha. This means around RM 2.4 billion is required to establish another 240,000 ha of the plantable area by 2036, or RM180 to RM400 million per year. However, there are some financial incentives and tax reliefs provided by the government to support forest plantation development.

Details of targeted actions and timelines are presented in **Table 2.2.**

Figure 2.3: *Paraserianthes falcataria* (Batai) Seedlings at Usahawan Borneo Greenwood Sdn Bhd Nursery, Kalabakan

Table 2.2: Action Plan for Financial Incentives and Tax Reliefs for Forest Plantation Establishment

Action	Targets	Responsibilities	Time Frame (2022 - 2036)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To facilitate soft loan applications for Forest Plantation Development.	(a) Application of soft loan evaluated and letter of support prepared.	(a) SFD (b) SFM Licensees															
(2) To facilitate tax relief applications for Forest Plantation industry.	(a) Application of tax relief evaluated and letter of support prepared.	(a) SFD (b) SFM Licensees															
(3) To provide royalty deduction for planted timber.	(a) At least 50% deduction of royalty of planted timber for the first rotation.	SFD															
(4) To study other efficient method of royalty collection.	(a) Report on efficient method of royalty collection prepared.	(a) SFD (b) SFM Licensees															

2.3 Determine site suitability for various forest plantation species

Soil fulfils three essential requirements for tree growth i.e., supply of moisture, supply of nutrients, and provision of mechanical support. Nevertheless, different tree species grow best under specific site conditions.

Forest plantation species planted by the SFM Licensees are mostly fast-growing exotic species such as *Acacia mangium, Eucalyptus pellita* and *Paraserianthes falcataria* **(Figure 2.3).** There are also some fast-growing native species planted such as *Neolamarckia cadamba* and *Octomeles sumatrana.* In this regard, site suitability in terms of climate, soil type, and topography are important considerations to ensure success in forest plantation development (Lee, Y.F.*et. al*., 2008).

Details of targeted actions and timelines are presented in **Table 2.3.**

Figure 2.4: *Paraserianthes falcataria* (Batai) Planted at 300 m a.s.l in Empayar Kejora Sdn Bhd, Gunung Rara Forest Reserve

Table 2.3: Action Plan on Site Suitability for Forest Plantations Establishment

Action	Targets	Responsibilities	Time Frame (2022 - 2036)														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To develop site suitability index.	(a) Site suitability index available.	(a) SFD (b) UMS (c) SFM Licensees (d) Sabah Softwoods Berhad															
(2) To prepare technical guidelines for forest plantation development.	(a) Technical guidelines for forest plantation development available.																

2.4 Control pests and diseases in forest plantations

Pests and diseases can damage planted trees in all stages of development and affect the ability of forest plantations to meet their management objectives. The selected species are not known for many serious pest and disease problems in Sabah. However, gall rust disease caused by *Uromycladium tepperianum* has recently been observed in some *Paraserianthes falcataria* (Batai) plantations in Sabah (**Figure 2.4**). Ceratocystis is another example of such a disease which infected and caused a lot of damage to the Acacia plantation in Sabah. Although monocultures may be susceptible to disease outbreaks, the planting of mix species could buffer against threats from such problems because different species may have different levels of susceptibility or resistance. Constant and continuous pest and disease monitoring will have to be developed and it forms an integral part of forest plantation management.

Details of targeted actions and timelines are presented in **Table 2.4.**

Figure 2.5: *Paraserianthes falcataria* (Batai) Trees Infected by Gall Rust at Zillion Fortune Sdn Bhd, Serudong

Table 2.4: Action Plan on Pests and Diseases Control

Action	Targets	Responsibilities	Time Frame (2022 - 2036)														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To strengthen R&D for pests and diseases.	(a) Research on pests and diseases for planted timber intensified.	(a) SFD (b) SFM Licensees															
	(b) Research findings to mitigate and control pests and diseases applied.	SFM Licensees															
	(c) Revise existing guidelines on pests and diseases control to include possibility of using biological control.	SFD															
(2) To use certified planting materials.	(a) Guideline for certifying planting materials prepared.	(a) SFD (b) UMS (c) SFM Licensees (d) Sabah Softwoods Berhad															
	(b) Source of planting material certified by SFD (FRC).	(a) SFD (b) SFM Licensees															
	(c) SFM Licensees' nursery to be registered and certified.	(a) SFD (b) SFM Licensees															
(3) To improve efficiency on pests and diseases response.	(a) SOP on pests and diseases response prepared.	(a) SFD (b) SFM Licensees															
	(b) Integrated Pest Management (IPM) applied.	(a) SFD (b) SFM Licensees															

2.5 Improve technology for forest plantations establishment

The success of forest plantation establishment is largely depending on the efficiency and effectiveness of forest plantation management. These include: good planning by SFM Licensees; usage of appropriate technology in site preparation; good tree planting technique; proper maintenance of planted trees; proper nursery facilities; improved technology in producing planting material; improved technology in the harvesting of planted trees; and digital and online application in forest plantation management.

Details of targeted actions and timelines are presented in **Table 2.5.**

Figure 2.6: Nursery at Sapulut Forest Development Sdn Bhd, Tibow

Table 2.5: Action Plan on Improving Technology for Forest Plantation Establishment

Action	Targets	Responsibilities	Time Frame (2022 - 2036)														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To improve nursery facilities and management.	(a) Guideline for nursery establishment prepared.	(a) SFD (b) SFM Licensees															
	(b) The nursery establishment complied with SFD guidelines.	SFM Licensees															
	(c) Skilled workers on nursery practice and management appointed.	SFM Licensees															
(2) To improve method for producing planting material.	(a) Planting material propagation method diversified.	(a) SFD (b) SFM Licensees															
(3) To digitalize forest plantation management.	(a) Online system for FMP, PDP, Coupe Permit, AWP, CptHP and CPP application and approval developed.	(a) SFD (b) SFM Licensees															
	(b) Online system for FMP, PDP, Coupe Permit, AWP, CptHP and CPP application and approval applied.	(a) SFD (b) SFM Licensees															

2.6 Certify forest plantation areas with any internationally recognized certification scheme

The government aims to have all SFM Licenced areas certified under any internationally recognized forest certification scheme such as the Forest Stewardship Council (FSC) and MTCS-PEFC (Malaysian Timber Certification Scheme - Programme for the Endorsement of Forest Certification). Besides, the State Government has implemented Sabah TLAS (Timber Legality Assurance System) as a verification standard of legal timber for both upstream and downstream forest industries. Since forest certification involves independent auditing, it promotes transparency in managing the forest and can bring continuous improvement to forest management.

The total forest area certified in Sabah thus far is about 826,000 ha consisting of 741,000 ha of natural forests and 84,776 ha of forest plantations. As for forest plantations, about 38,023 ha are certified under the MTCS-PEFC and 46,753 ha under the FSC.

Taking into consideration the restrictions in certifying forest plantation areas under the MTCS-PEFC and FSC, with regard to cut-off dates 2010 and 1994 respectively, some plantation areas are not eligible to be certified under the schemes. Therefore, Sabah TLAS will be strengthened and used as an option for forest plantation certification.

Details of targeted actions and timelines are presented in **Table 2.6**.

Figure 2.7: *Acacia mangium* Plantation at Gerak Saga Sdn Bhd, Pitas

Table 2.6: Action Plan on Forest Plantation Certification

Action	Targets	Responsibilities	Time Frame (2022 - 2036)														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To improve the efficiency of forest plantation management.	(a) Skilled workers for forest plantation management appointed.	SFM Licensees															
	(b) Forest plantation establishment properly planned.																
	(c) Forest plantation established and managed in accordance with existing laws, rules, regulations, and procedures.																
	(d) Forest plantation established in compliance with management prescriptions in the management plan.																
	(e) Sabah TLAS standard complied.																
(2) To enforce mandatory forest certification for forest plantation areas.	(a) Jurisdictional forest plantation certification explored.	SFD															
	(b) Forest plantation areas certified.	(a) SFD (b) SFM Licensees															

2.7 Emphasize site-species matching

The success of forest plantations largely depends on the selection of the correct species. Determining which species to plant is a complex decision that is based on the purposes of the plantation in line with the Site Suitability Index and Technical Guidelines for Forest Plantation Development.

Details of targeted actions and timelines are presented in **Table 2.7.**

Figure 2.8: *Neolamarckia cadamba* (Laran) Planted at Sapulut Forest Development Sdn Bhd, Tibow

Table 2.7: Action Plan on Site-Species Matching

Action	Targets	Responsibilities	Time Frame (2022 - 2036)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To implement technical guidelines for forest plantation development.	(a) Selection of species based on the purpose of forest plantations in line with the site suitability index and the technical guidelines.	SFM Licensees															

2.8 Capacity building on forest plantation establishment

Capacity building involving SFD and SFM Licensees personnel are required in order to enhance their knowledge and skill on forest plantation particularly on the aspects of planning, technical and management. This is crucial to ensure effective and efficient forest plantation establishment. It involves collaboration with local universities and training institutions. The training programmes will include courses, on the job trainings and study tours.

Details of targeted actions and timelines are presented in **Table 2.8.**

Table 2.8: Action Plan on Capacity Building on Forest Plantation Establishment

Action	Targets	Responsibilities	Time Frame (2022 - 2036)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To provide training to SFD and SFM Licensees personnel.	(a) Training need analysis prepared.	(a) SFD (b) SFM Licensees															
	(b) Training on forest plantation establishment involving SFD and SFM Licensees personnel provided.																

PART 3

STRATEGY: OPTIMISING AND IMPROVING THE UTILISATION OF RAW MATERIALS

3.1 Engage vertical integration of the upstream and downstream wood-based industries

Generally, vertical integration and horizontal integration are business strategies aimed at reducing cost of production, creating greater efficiencies in the system and greater economies of scale. In vertical integration, a company has direct control of one or more stages in the production and has direct links to the source of raw material and hence will have direct influence in continuous reinvestments in resource development such as replanting and so on. Horizontal integration on the other hand, will not have a direct link to the resource but it is more to increase the size of operation of a company through mergers of existing mills to allow diversification of products to achieve economies of scale i.e. produce more revenue together as compared to competing independently. In other words, it is a consolidation of many firms in the same level of the value chain or production process. In the context of the wood-based industry, both can co-exist and it is up to the industry where to align themselves, depending on the business model that suits them best (Sabah Forestry Department, 2019).

Details of targeted actions and timelines are presented in **Table 3.1.**

Table 3.1: Action Plan on Vertical Integration of the Upstream and Downstream Wood-Based Industries

Action	Targets	Responsibilities	Time Frame (2022 - 2036)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To establish Steering Committee on vertical integration between upstream and downstream players.	(a) Steering Committee on vertical integration between upstream and downstream players established.	(a) SFD (Chair) (b) TAS (c) STIA (d) SFM Licensees															
	(b) Upstream and downstream industries strengthened and integrated.	(a) SFD (b) TAS (c) STIA (d) SFM Licensees (e) Downstream players															
	(c) Sustainable supply of logs for downstream industries.	SFM Licensees															

3.2 Reduce timber wastage in harvesting operations

Forest plantations are generally associated with shorter rotation and smaller trees, and therefore appropriate harvesting technology needs to be applied in order to maximize the volume of planted timber harvested and reduce timber wastage. This includes the usage of harvesters and adopting cable technology in the form of cable yarders.

Details of targeted actions and timelines are presented in **Table 3.2.**

Figure 3.1: Harvesting of planted trees at Gerak Saga Sdn Bhd, Pitas

Table 3.2: Action Plan on Reducing Timber Wastage in Harvesting Operations

Action	Targets	Responsibilities	Time Frame (2022 - 2036)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To commercialize timber wastage.	(a) End products using timber wastage diversified.	(a) SFM Licensees (b) Downstream players															
(2) To optimize wood utilization.	(a) New technologies for harvesting of planted trees explored.	SFM Licensees															
	(b) Tax relief on the usage of harvesting hi-tech machineries of planted timber in relation to Strategy 2.2.	(a) SFD (b) SFM Licensees															
	(c) New technologies for harvesting of planted trees applied.	SFM Licensees															
	(d) Skilled and trained workers for harvesting of planted trees employed.	SFM Licensees															
	(e) Processing of planted trees within the plantation area for producing semi-finished timber products allowed.	SFD															
	(f) Attractive royalty rate on salvage residues during site preparation formulated.	SFD															

3.3 Use improved and new technology in wood-based processing and products diversification

New engineered wood products such as CLT (Cross Laminated Timber), Prefabricated Modular Timber Construction and MPP (Mass Ply Panel) have a great potential to substitute the traditional wood building materials and this leads to a change in the processing equipment and technology. In this regard, new innovative technologies to produce new engineered wood products should be explored and applied.

Details of targeted actions and timelines are presented in **Table 3.3.**

Table 3.3: Action Plan on Usage of Improved and New Technology in Wood-Based Processing and Products Diversification

Action	Targets	Responsibilities	Time Frame (2022 - 2036)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To use new technology in processing of planted timber.	(a) New technology and appropriate machineries in processing of planted timber explored and utilized.	(a) STIA (b) Downstream players															
	(b) High value-added planted timber products produced.	(a) STIA (b) Downstream players															
	(c) Market of high value-added planted timber products diversified.	(a) STIA (b) Downstream players															
(2) To provide incentives to downstream industries for using new technology and machineries.	(a) Tax relief for using new technology and appropriate machineries for processing planted timber in relation to Strategy 2.2.	(a) SFD (b) Downstream players															

PART 4

STRATEGY: RESTRUCTURING THE WOOD-BASED INDUSTRIES BASED ON COMPARATIVE ADVANTAGE

The wood-based industry in Sabah is one of the important socio-economic sectors, in terms of contributing to the State revenue and providing employment. In this regard, the State has set a clear policy to further develop the wood-based industry towards producing more high value-added products as outlined in the Sabah Maju Jaya (SMJ) Development Plan (2021-2025) and the Sabah Forest Policy 2018. This is crucial to ensure the wood-based industries remain competitive based on comparative advantage, where they need to transform and move along the value chain through innovation and value-addition. However, innovation in the forest product sector must be based on market needs and must be driven through technological and design change in order to ensure long-term competitiveness (Ratnasingam *et* al., 2013).

The current wood-based industry is characterized by low diversification of products produced, low value-added products with a high number of mills including inactive mills faced with shortages of raw materials. The industry needs to be transformed towards a much leaner size, but more diversified and efficient with value-added timber products as the main priority by takinginto consideration the declining raw material, changing raw material namely timber from forest plantations, and possible opportunities for utilization of non-traditional materials that could complement raw material requirements of the wood-based industry in Sabah or through the production of new products such as wood-plastics or even the use of recycled wood-materials (Sabah Forestry Department, 2019).

4.1 Encourage horizontal integration of wood manufacturers towards manufacturing of high value-added products

The wood-based industries in Sabah remain dominated by primary processing activities namely the sawmilling and plywood sectors. Therefore, transformation or reinvention of the business in the wood-based industry needs to be done outside of the traditional way of doing business and also taking into account all other factors, including the need to embrace the concept of a new economy such as Industrial Revolution 4.0 (IR 4.0), which includes the automation and data exchange in manufacturing technologies, cyber-physical systems, the internet of things, cloud computing and cognitive computing.

In view of this, the horizontal integration through merging of existing mills can be done to allow diversification of products and achieve economies of scale in order to produce more revenue together compared to competing independently. In other words, it is a consolidation of many firms in the same level of the value chain or production process. (Sabah Forestry Department, 2019).

Details of targeted actions and timelines are presented in **Table 4.1.**

Table 4.1: Action Plan on Horizontal Integration of Wood Manufacturers towards Manufacturing of High Value-Added Products

Action	Targets	Responsibilities	Time Frame (2022 - 2036)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To establish a Steering Committee on horizontal integration between downstream players.	(a) Steering Committee on horizontal integration between downstream players established.	(a) SFD (Chair) (b) STIA (c) Downstream players															
(2) To strengthen existing industrial integrated timber complex.	(a) Road network for transportation of planted timber from forest plantation area to mills improved.	(a) SFD (b) TAS (c) STIA															
	(b) Road network for transportation of timber products from mills to port improved.	(a) SFD (b) STIA															
	(c) Reasonable electricity and water tariffs.	(a) SFD (b) STIA															

4.2 Encourage the use of green technology in wood-based industries

Energy plays an important role in growth of wood-based industries. Due to the of energy sources from fossil fuels in terms of energy cost, energy shortage, and environmental pollution, the usage of renewable energy such as solar, hydro, biofuel and biomass can be explored as an alternative option for wood-based industries.

The promotion of renewable energy is one of the possible ways to minimize the environmental impact of the wood manufacturing process. Besides, improved and innovative machinery types help reduce the wood waste and therefore reducing environmental impacts, while enhancing working efficiency in terms of time, energy and effort (Adhikari *et*.al., 2018).

Details of targeted actions and timelines are presented in **Table 4.2**.

Table 4.2: Action Plan to Encourage the Usage of Green Technology in Wood-Based Industries

Action	Targets	Responsibilities	Time Frame (2022 - 2036)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To encourage usage of alternative energy resources i.e. solar, hydro, biofuel and biomass.	(a) Renewable energy in processing planted timber used.	Downstream players															

4.3 Create unique branding for wood products produced in line with good forest governance

The unique branding of planted timber products provides a competitive advantage which can be achieved by concentrating on market niches, product differentiation, alternative channels of distribution or manufacturing processes and pricing structures.

Creating unique branding is important as part of the marketing strategy to position our wood products in the international market. In pursuance of this, since the Sabah TLAS verified timber products are recognized and well accepted in international markets such as Europe, Australia, USA, Japan and Korea, it can be strengthened towards developing Sabah unique branding for planted timber products.

Details of targeted actions and timelines are presented in **Table 4.3**.

Table 4.3: Action Plan on Unique Branding for Wood Products

Action	Targets	Responsibilities	Time Frame (2022 - 2036)														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) To strengthen Sabah TLAS by creating unique brand for planted timber products.	(a) Sabah TLAS certified planted timber products widely accepted in the international market.	(a) SFD (b) TAS (c) STIA (d) SFM Licensees (e) Downstream players															
(2) To position planted timber in domestic and international markets.	(a) Sabah TLAS branding for planted timber products developed.	(a) SFD (b) TAS (c) STIA (d) SFM Licensees (e) Downstream players															
	(b) Web-based marketing for planted timber established.	(a) SFD (b) TAS (c) STIA (d) SFM Licensees (e) Downstream players															
	(c) At least 50% of interior materials for public building are sourced from certified plantation timber.	(a) SFD (b) TAS (c) STIA															

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