SUMMARY OF THE STATE OF JOHOR FOREST MANAGEMENT PLAN FOR THE PERIOD BETWEEN 2006-2015

1.0 GENERAL

1.1 Plan Duration

The Forest Management Plan (FMP) covers all Permanent Reserved Forests (PRF) in the state of Johor in the form of Forest Management Unit also known as FMU for a duration of 10 years spanning from 2006 until 2015. The plan is constructed to achieve sustainable development in the forestry sector in accordance to the policy, strategy and aims of the forest management that fulfills the socio-economic, environment and biological diversity needs.

1.2 Administration and Legal Structure

1.2.1 Administration

The plan is structured according to the Sustainable Forest Management (SFM) philosophy that holds three key pillars namely; environmentally friendly, economically viable and socially acceptable.

In fulfilling this objective, the Johor State Forestry Department (JSFD) is divided into three main divisions such as:

(a) General Administration
(b) Forest Operations
(c) Forest Development

The General Administration division is responsible of all office administrative tasks as needed in any organisations. This includes all activities related to staff services, finance, correspondence and others.

The Forest Operations division covers all forestry legal enforcements, harvesting and timber related industry controls, forest revenue collection and all other tasks related to the outputs and production from the forests.

The Forest Development division takes care of programs related to the management, development and maintenance of forests' resources such as measurement and maintenance of external Permanent Reserved Forests' boundaries, forest inventory, societal forestry rehabilitation, forest plantation as well as establishment and maintenance of Virgin Jungle Reserves

1.2.2 Constitutional Provision

This FMP covers the Federal and State legal structure. It is in line with Article 74(2) of the Federal Constitution that states all land matters are within the jurisdiction of state governments. Under this Article, the state government is fully empowered to establish or use laws and regulations with regard to forests to administer and manage forestry matters of the said state.

1.2.3 Legal Provision

The National Forestry Enactment (Adoption) 1985 (NFE), Amendment 1993 is a law that gives responsibilities and power to the Johor State Department of Forestry (JSFD) to administer, maintain, manage and develop resources of the forests in sustainable manner. In addition, JSFD is also responsible of controlling the operational, development enforcement and monitoring of the timber based industries through the Wood Based Industries Enactment (WBIE) 1986

The preparation and implementation of the FMP is the responsibility of the Director under Section 4(b) of the National Forestry Enactment (Adoption) 1985, Amendment 1993 as follows:

"The Director shall cause to be prepared and implemented state forest management plans which shall prescribe the allowable cut either in terms of volume or area in accordance with the principle of sustained yield"

2.0 MANAGEMENT'S OBJECTIVE AND GOALS

2.1 Objective

The objective of this Management Plan is to provide a reference document that explains the administrative, management and development of forest resources in the State of Johor for the period between 2006 and 2015.

2.2 Goal and Strategies

2.2.1 Goal

The goal of this FMP is to achieve the objectives of the International Tropical Timber Organisation (ITTO 2000) and *Malaysian Criteria, Indicators and Standard of Performance* {MC&I [2002]} that cover all specifications set forth according to identified criteria, directions and activities. For that reason, the FMP's goals are prioritized in the following areas:

(a) Forest Resources Management

Permanent Reserved Forests, State Land Forest (SLF), Alienated Land Forest (ALF) and other forest resources are managed to ensure sustainable functions and services.

(b) Forest Resources Development

Forest resources are developed to increase the productivity of every hectare of the forest land.

(c) Forest Protection

Forests are ensured to be protected against physical and environmental abuse, pests as well as protection of the biological diversity.

(d) Social Needs

The forest land is developed to support social needs; for example, the Eco-Park (Forest Parks) was developed for recreational activities, urban forests to provide a fun and cool environment, educational forests to enhance knowledge on the environment and community forests to provide supply of forest fruits.

(e) Wood Based Industries

The growth of the Wood Based Industries are controlled and monitored to ensure that it goes in tandem with the forest production capacity. Besides that, value added use and technology transfer will also be promoted.

(f) Forestry Awareness and Publicity

The public will be given the awareness and knowledge enhancement especially in areas related to the importance of forests to our lives, management of forest resources through SFM Practices and increase of the number of the public involvement in forestry activities.

(g) Forest Research and Development

Maintenance, development, management, harvesting and use of forest resources will use superior and recent technology through coordination of forestry studies and implementation of the research outputs.

(h) Infrastucture and Logistics

A complete infrastructure and logistics will be established for an efficient FMP.

(i) Organizational Development

Organizational charts, trained human capital and financial allocation will be reviewed constantly and be assured of effectiveness.

2.2.2 Strategies

A sustainable development of the forestry sector can be achieved by stressing on the use of the natural resources for the prosperity of the people of Johor through the following methods:

(a) keep and manage forest areas to care for the climate and ensure ideal topography, adequate supply of clean water, well-maintained land nourishment, stable surrounding area and lower the effects of flood and erosion on riverbanks, plantation land and living area;

(b) ensure a sustainable production of all state forest resources at a realistic and economic rate for local use and export purposes;

(c) provide an adequate space of land for recreations, eco-tourism, research, biological diversity preservation and education to the public on forestry;

(d) provides sufficient infrastructure facilities and logistics, enhance organization's effectiveness, provide trained human capital and obtain enough financial allocation to ease the implementation of management and development of planned forest projects.

3.0 CURRENT STATUS

3.1 Forest Area

The total forested land (Permanent Reserved Forests, Forest Plantation and Proposed Permanent Reserved Forests) in the State of Johor as at 31 December, 2005 was 391,499.02 hectares, 20.62% of the total state land area of 1,898,629 hectares (JUPEM, 2005). Out of the total area, 340,940.87 hectares were PRF and 50,558.15 hectares were the Proposed Permanent Reserved Forest (PPRF) which was still in gazetting process of the Land and Minerals Office, Johor.

Forested land that falls under the State Park category occupies some 48,905.00 hectares, consists of Taman Negara Endau-Rompin, Johor and 536.10 hectares of Taman Negara Tanjung Piai. Besides that, a State Park that has been gazetted as Permanent Forest Reserve which is Gunung Ledang occupying an area of 8,675.20 hectares. PPRF that was approved by the Executive Council of Johor State Government Meetings and gazetted together with State Park [Pulau Kukup (647 ha)] and Dataran Lumpur (1,237 ha)] have a total land area of 1,884.00 hectares. Hence, the total forested land area of the State Park as at 31 December, 2005 was 59,999.30 hectares.

The forest area in State Land (SL) and Alienated Land are 67,656 hectares and 49,279 hectares, respectively.

The forest area in the State of Johor can also be classified according to the types of forests such as Natural Inland Forest (518,873.18 ha), Peat Swamp Forest (5,922.26 ha), Mangrove Forest (27,518.58 ha) and Mud Flat (6,044 ha).

3.2 Natural Environment

3.2.1 Climate

The State of Johor is located in the Equatorial Line circle as with the other states in Peninsular Malaysia. The climate and humidity is consistently high throughout the year with heavy rainfall.

Record shows that the state's average annual temperatures are relatively uniform. The average monthly temperature hovers around 26^{o} C to 28^{o} C and the lowest temperature recorded is recorded during rainy seasons.

Record also shown that the average yearly rainfall changes from year to year. The west coast area receives rainfall in the range between 2,000mm to 2,500mm while the east coast recorded a higher range. The areas that receive the highest amount of rainfall and recorded as the dampest areas are Endau and Pengerang with average rainfalls of more that 3,400mm a year.

The south-west winds occur during the months of May until September and the months of April and October are the transitional month for the monsoon season. The months of November until March are when the North-east Monsoon occurs.

In general, the state of Johor can be divided into two (2) Climate Zones; the Middle-East Zone and West Coast Zone. The division of zones is done based on the differences during the heavy rain and dry seasons for both areas.

Rainy seasons and heavy downpours occur in the Middle Eastern Zone in November, December and January, while the dry season is around June and July.

The West Coast Zone receives the highest amount of rainfalls in the months of October and November. The least amount of rainfall is recorded in the month of February.

3.2.2 Topography and Hydrology

More than half (83%) of the State of Johor's topography are of lowlands. According to the available statistics, about 83% of the state is considered as lowlands and only 17% of higher and steep terrain.

The west coast has low topography covering a large area that consists of mud flat or sea alluvium, spreading to the coastal area, inlands up to peat soil area. For a small area, especially at the river alluvium at the transitional terrace is the place where undulating land originated. The lowland that is developed in the state is an area with an undulating topography and is mainly in the central and north of this state. The range of mountains like Gunung Ledang, Gunung Bekok, Gunung Belumut, Gunung Pulai, Gunung Panti, Gunung Muntahak and others were the origin of steep land.

The central of the state of Johor has a range of mountains that acts as water catchments that flows to the west, south and east. The mountain range, a large tract of forest area from the north and stretches to the south, is also known as 'central forest spine'. On the west coast, main rivers flowing to the Straits of Malacca are Sungai Muar, Sungai Pontian and Sungai Batu Pahat. Rivers such as Sungai Pulai, Sungai Johor, Sungai Tebrau, Sungai Melayu, Sungai Perepat and Sungai Skudai flow towards the Straits of Tebrau, while rivers that flow to the east towards the South China Sea are Sungai Sedili Kecil, Sungai Sedili Besar, Sungai Mersing and Sungai Endau.

The area and type of forests in this state are highly influenced by the topography. However, most of the Peat Swamp Forest has disappeared, leaving small patches of island forest located at the central part of the state. In other places, there have been changes in the use of land such as for oil palms. Mangrove Forests occurs along coastal area and estuaries on the West Coast. On the southern part of the state, a lot of mangrove forests were developed for land development besides forestry. The mangrove forests on the east coast are located on estuaries such as Sungai Sedili Kecil, Sungai Sedili Besar, Sungai Mersing and Sungai Endau, while coastal and fresh swamp forests occur on the east coast of the state which is on the coastal area. The state's central and northern regions are where the dipterocarp hills and mountains originates, which is where hilly and steep slopes occur. The difference in land surface and types of forests, such as mangrove,

peat swamp and hilly forests influence the types of harvesting activities being carried out.

3.2.3 Geology and Soils

(a) Soil Group

The state of Johor has soil groups from the following main components:

(i) Sedentary soil from igneous rocks

(ii) Sedentary soil from sedimentation rocks

(iii) Soil from matured alluvium soil

(iv) Soil from “sub-recent alluvium”

(v) Soil from “recent alluvium”

(b) Series of Parent Soil

The parent soil in the state of Johor is divided into three (3) categories namely Alluvium Soil, Sedentary Soil and Urban and Mine Soil.

(c) Minerals

Studies show that most of the main minerals in the state of Johor are located in the Permanent Reserved Forests (PRFs). The minerals are generally categorized into three (3) such as the earth mineral, kaolin and silica. The location of the minerals in the PRF gives big impact to the management of permanent reserved forests as mining can give adverse implications to Annual Cutting Rationing and Sustainable Forest Management Practices.

(d) Forest Types

The forests in the state of Johor are part of Malaysian Tropical Rainforests that are one of the richest and most complex in the world. As a whole, these Tropical Rainforests can be divided into eight (8) main types of forests according to the classifications based on the height from sea level (Symington, 1943). The classifications are as follows:

(i) Mangrove Forest

(ii) Peat Swamp Forest

(iii) Coastal Forest

(iv) Lowland Dipterocarp Forest

(v) Hill Dipterocarp Forest

(vi) Upper Dipterocarp Forest

(vii) Oak Mountain Forest

(viii) Ericaceous Mountain Forest

(e) Fauna

The Tropical Rainforests in the state of Johor are rich with fauna. It is expected that more than 950 vertebrates and 2,080 invertebrates occupy the forests. The vertebrates consist of 200 mammals, 600 birds and 150 reptiles, showing diverse animal species.

(f) Special Features

The Tropical Rainforests in the state of Johor are also rich in natural resources that cover various kinds of living things, plants and topography. Its connection with human civilization has created a history and diverse cultures. This scenario provides avenue for education, research and tourism. Some of the attractions are as follows:

(i) Air Terjun Sungai Pelepah Kiri

Sungai Pelepah Kiri has natural and virgin waterfalls and has yet to develop. The waterfalls have three (3) levels and suitable for recreation for individuals or families.

(ii) Birds Sanctuary

The Panti FR is the habitat for most bird species and has become the main attraction for bird lovers not only to Johor and Malaysian people but also to tourists from Singapore.

(iii) Sungai Bantang Amenity Forest

Sungai Bantang Forest Park is among the forests hat received the highest number of tourists in the 8th Malaysia Plan. The forest has a picnic area, office and recreational area suited for family outings. The forest has also become the focus for government and private agencies to conduct activities such as the National Service Trainings, camping and jungle trekking.

(iv) Panti Amenity Forest

The Panti Amenity Forest has high valuable collections of flora and fauna. It has been recorded that the surrounding forest area contains endemic and endangered species such as the *Cryptoryne schoulzeei*, *Cryptoryne nurii* and palm species such as the *Pinanga pantiensis.*

(v) Virgin Jungle Reserves

The state of Johor has a lot of land categorized as Virgin Jungle Reserves. Among the largest and most attractive is situated at Compartment 74, Hutan Simpan Panti that covers an area of 802.10 hectares.

The area is occupied by a mountain which hasn't been fully explored, Gunung Mustahak.

(vi) *Genetic Resource Area* (GRA)

The Johor State Forestry Department with the assistance of the Forestry Department Headquarters, Peninsular Malaysia and Asean Forest Tree Seed Centre has conducted a GRA study in 30 compartments in Hulu Sedili Forest Reserve. The study was the first to be conducted in Malaysia and thus, it is expected that these areas need to be managed and further studies to be done.

3.3 State Forest Administration

Currently, the JSFD has four (4) forest administration districts, which are South Johor (Johor Bahru), Central Johor (Kluang), East Johor (Mersing) and North Johor (Segamat). Each district is divided into a few areas of land headed by Forest Rangers. Now, all forests in Johor are divided into 17 Renj and each renj covers a designated area for patrolling and conducting enforcement activities.

Provision under the Federal Constitution stated that there are two (2) organisations that are responsible in managing forest affairs, which are the State Government, conducted by the JSFD, and the Federal Government, conducted by the Forestry Department Headquarters, Peninsular Malaysia (FDPM). In terms of responsibilities, the FDPM is responsible in the following aspects:

(a) enact forest related policies;

(b) provide technical advice to State Forest Departments in the field of management and forest development;

(c) conduct macro and micro planning for forestry sector and timber related Industry; and

(d) Conduct forest operational studies, trainings and human resource management.

JSFD is responsible to administer and manage overall PRFs for the state of Johor as stated in the FMU. The responsibilities are detailed out and translated in this FMP as follows:

(a) advice the State Authority in administration of forest resources to generate optimum income;

(b) act as the policy implementation agency and enforcement of forestry laws; and

(c) Manage forest resources in line with Sustainable Forest Management (SFM) concepts.

4.0 ANNUAL ALLOWABLE CUT (AAC)

The Annual Allowable Cut (AAC) for the 9th Malaysia Plan (9MP) from 2006 until 2010 for the Johor State Forest Department is 2,250 hectares a year.

The main resource of timber logs supply throughout the FMP is from the natural forest areas, which are the PRFs, State Land Forest and the Alienated Land Forest. The AAC of PRF is 2,250 ha a year and the average production is expected to be 85 m^3/ha. While the area to be worked for the State Land Forest and Alienated Land Forest are expected to be 4,000 ha and 3,000 ha, respectively with an approximate average production of 21 m^3/ha.

5.0 MANAGEMENT'S PRESCRIPTION

5.1 Natural Forest Management

5.1.1 Forest Management Policy

In line with the requirements and provision under the National Forest Policy (NFP) 1978 (Amendment 1992), the NFP stresses the following to be done effectively:

(a) To dedicate as Permanent Forest Estate sufficient areas strategically located throughout the country, in accordance with the concept of rational landuse. The Permanent Forest Estate will be managed and classified under four major function;

(b) To manage the Permanent Forest Estate in order to maximize social, economic and environmental benefits for the nation and its people in accordance with thee principles og sustainable management;

(c) To implement a planned programme of forest development through forest regeneration and rehabilitation operations in accordance with appropriate silvicultural practices;

(d) To promote efficient harvesting and utilization within the production forest for maximum economic benefits from all forms of forest produce and to stimulate the development of appropriate forest industries commensurate with the resource flow and to create employment opportunities;

(e) To promote a planned development of forest industries towards the production of more value-added finished and semi-finished products for local consumption and export;

(f) To encourage an aggressive bumiputra participantion in the field of wood-based industry in compliance with the government policy;

(g) To establishe forest plantations of indigenous and exotic species to supplement timber supply from the natural forest;

(h) To promote active local community involvement in various contracts of forestry development projects and to maintain their involvement in agro-forestry programmes;

(i) To increase the production of non-wood forest products through scientific and sustainable management practices to supplement local demands and the requirements of related industries;

(j) To undertake and support a comprehensive programme of forestry training at all levels in the public and private sectors in order to ensure adequate supply of trained manpower to meet the requirements of forestry and wood-based industries;

(k) To encourage private investment in forest development therough the establiehment of forest plantation on private lands

(l) To undertake and support intensive research programmes in forestry and forest products aimed at enhancing maximum benefits from the forest;

(m) To promote education in forestry and undertake publicity and extension services in order to generate better understanding among the community on the multiple values of forests;

(n) To provide for the preservation of biological diversity and the conservation of areas with unique species of the flora and fauna;

(o) To develop a comprehensive programme inn community forestry to cater for the needs of the rural and urban communities;

(p) To set aside specific areas for the purpose of forestry education and other scientific studies; and

(q) To foster closer interntional co-operation in forestry in order to benefit from the transfer of technology and exchange of scientific information.

5.1.2 Programmes, Projects and Activities

The abovementioned goals, strategies and policy will be realized through the following programs, projects and activities:

(a) Forest Resource Management

The sustainable forest management is practiced through various forest management methods which were structured and proven to produce a sustained forest services with minimal impact to the environment.

The components of the projects involved in the management of forest resources are as follows:-

(i) Forest Boundaries

- Measurement and Marking of Forest Reserves' Boundaries
- Maintenance of Forest Reserves' Boundaries

(ii) Sustainable Management

This program involves activities such as Pre-Felling Forest Inventory, Tree Marking and Residual Stand Monitoring.

- Pre-Felling Forest Inventory
- Tree Marking
- Residual Stand Monitoring

(iii) Physical Control of Forest Boundaries

- o Building of Forest Border Guard Houses
- o Gating of Risky Reserved Forest Area
- o Strip Planting on Forest Boundaries
- o Application of Bar/Chip on Bordering Trees/Tree Mapping
- o Remote Sensing Networking

(iv) Data and Information of Forest Resources

- Local Volume Table
- Identification of New Forests Reserve
- Construct Forest Boundaries' Billboards

(v) Management of Forest Areas for Specific Purposes

- o Management of Forest's swampy/endemic/threatened areas
- o Management of Forests Near Development Projects

(vi) Operational Studies

- Studies of Mangrove Forest Harvesting (Sky-Yarding)
- Studies of new forest resources

(b) Development of Forest Resources

The implementation of this program is an effort towards ensuring a sustained production of timber. It is aimed at developing forests through rehabilitation activities. The activities are expected to increase productivity, species composition, timber quality and optimum growth to residual stand after the harvest.

The implementation of the program is to achieve the following objectives:-

(i) To ensure future production of timber and other forests products, conserve and increase the productivity of forest area through silviculture treatment.

(ii) Retain and enhance the wellbeing and safety of the forests through activities such as protection, preservation before and after forest burning, as well as forests' disease and forest insect attacks.

(iii) Ensure the sufficient supply of timbers for the local use through forest plantation activities.

(iv) Encourage villagers' involvement in forest related actvities that are beneficial besides increasing the supply of forest resources.

This program is a project for silviculture and protection that covers the following activities:-

(i) Silviculture and protection that consist of:

- Post-felling forest inventory survey
- Cutting of root climbers
- Commercial Trees
- Treatment of Commercial Trees
- Mangrove planting
- Treatment of Mangrove trees
- Supply of seedlings

(ii) Flying squads for:

- Forest Burning; and
- Insects and Disease Infection.

(iii) Establishment of Forest Plantations

(vi) Plantation Study Plots

(vii) Community Forests

(viii) Natural Forest Study Plots (R&D)

(c) Forest and Eco-Tourism Services

In the effort of making the State of Johor a developed state in 2010, the tourism sector has been identified by the State Government as one of the main industries in the area. Among the tourists attraction are natural envrionment and natural characteristics of the location with various types of flora and fauna, unique topography, freshness and cleanliness of the air as well as clearness of the forest water. In this context, the JSFD has drafted a few short term and long term strategies and plans to develop the existing forest parks. Development of reserved forest areas that have potential to be converted to new forest parks are also considered. The Department is confident that proper planning and effective implementation backed by adequate funding, the State of Johor will be the country's main eco-tourism destination.

The development of forest parks has a few objectives: Among the objectives are as follows:-

(i) To provide recreational facilities to local residents as well as foreign tourists at all ages and standards of living;

(ii) To provide suitable basic facilities for recreational activities;

(iii) To create a natural environment atmostmosphere for outdoor activities;

(iv) To harmonise the development effort with the environment;

(v) To increase the state revenue indirectly through tourism activities in the forest parks to be developed; and

(vi) To enhance promotion of the forest parks through electronic and mass media with the assistance of state and federal tourism agencies.

(d) Infrastructures and Logistics

This project is a support to management and development projects of the JSFD that emphasizes and gives high priority to the development of infrastructures such as access roads to the reserved forests, maintenance of office buildings, Department staff quarters and vehicles needs.

Forest roads, sewerage and bridges are the connection facilities for management, development, maintenance, harvesting and forest enforcement activities.

Office buildings and housing facilities are also considered as a support to the planned forest management and development projects. These projects plan for the upgrading, refurbishment and building of new quarters and officers.

In general, the job scope includes strengthening of damaged structures, external and internal paint job, electrical wiring, street lamp, housing lights, installation of door and window grills, installation of awnings, replacement of glass windows, repair of water piping, repair of gates, installation of floor tiles, and treatment for termites and bats. The planned refurbishment of the quarters and officers will be done at buildings which have been built before independence and not in good condition. The cost of maintaining these buildings is very high and increase from year to year.

Vehicles and motorboat facilities are highly sought because of the location that is far from the offices and town centre. Hardy vehilcles such as the four-wheel drives that can climb high lands and cross small rivers are needed as the roads used are old timber logging roads that are not smooth, with lots of holes and difficult to manouver.

(e) Excellents in the Forestry Sector

The forest areas of the State of Johor are managed to support the state's socio-economic needs. Besides that, importance of the environment, protection, live diversity and other forest services that are becoming more important are being stressed. Thus, the programs are planned to be implemented to enhance the JSFD's ability to manage forest resources by establishing the Forest Centre of Excellence in the State of Johor, in line with the aspirations to provide sustainable management of forest resources for future generations.

This program consists of four (4) projects, such as:-

(i) Forest Centre of Excellence;

(ii) *Compendium of Johore Flora*;

(iii) Human Resource Development; and

(iv) Transportation

The planned projects to be implemented in the FMP include the following aspects:-

(i) Resources and management;

(ii) Conservation and silviculture;

(iii) Forest services and eco-tourism;

(iv) Technology, information and communication (ICT);

(v) Human Resource Development;

(vi) Harvesting and use of forests;

(vii) Forest and wood based industry publicity;

(viii) Infrastructures, facilities and transportation;

(ix) Wood based industries; and

(x) Documentation and presentation.

(f) Conservation of Resources

The forest areas in Peninsular Malaysia is an eco-system that is unique and complex in the world. Thus, enhancement of the system and neccesary forest management practices need to be implemented to ensure the state forest resources can be managed in good manner and optimized to maximize the social, economic and environmental benefits.

This program is aimed at enhancing the ability of the JSFD in achieving its objective in sustainable management of its forests. The program will comprise of forest projects and studies to ensure sustainable production of timber, sustaining and protection of various living things, sustainable harvesting of genetic resources, ecology, climate, bio-technology and consistent clean water supply as well as environmental balance.

The components of projects in Forest Management are as follows:-

(i) Forest Protection Area Network

(ii) Hydrology and Water Catchment Forest

(iii) 'Corner Stone Conservation'

(iv) Scientific Expedition

(v) Forest Bio-technology

(vi) Environmental Impact Study

These programs/projects are expected to be able to identify the extinction and forest diversity in the state and provide follow up plan of actions to ensure the protection and conservation of the identified areas. In addition, the programs/projects can enhance the used of various resources for the benefit of the bio-technology based industry.

Conservation of forest resources scinetifically can give a clearer picture and direction in managing sensitive areas. Thus, the resources available in the areas especially those that have less potential today can be benefited by future generations.

(g) ICT, Publicity and Forestry Extension

(i) ICT, Forestry Publicity

IT development and k-forest projects are conducted to assist JSFD to enhance its quality and services on forest information. Through this project, forestry people, public, private sectors and project practitioner related to forests will receive updated information on forestry at the click of a button. These projects will create an integrated data networking of equipment procurement (hardwares and softwares) and application development information related to forestry throughout the state of Johor and connected to the information system of the FDPM.

The ICT equipment requirements are needed to ensure that all JSFD infrastructures are complete an up-to-date to support future needs. This is in line with the government's suggestion for all government agencies to provide stable and consistent communication means for the implementation of various applications imposed by the federal agencies such as the electronic government and FDPM's own application systems. It will also ease electronic communications among FDPM's staff throughout Malaysia.

The Forestry Department is also responsible in disseminating information on forestry to the local community, school children, associations and relevant agencies. The effort includes printing of brochures, magazines, preparation of video clips, participation in exhibitions, organizing motivational activities and talks to the target groups.

(ii) Extension and Publicity

- Introduction and dissemination of information on sustainable forest management as practiced by the Department, as well as the roles of forest and forestry sector to the local community and local and foreign agencies to create awareness on the importance of forests;

- Increase public awareness on the roles, importance of plants and forests in maintaining and improved the standard and environmental stability; and

- Increase knowledge and educational, social, cultural and aesthetic values in aspects related to the nation's resource plants.

(h) Quality of Seeds and Planting Materials

The Forestry Department has established forest nurseries to fulfill the needs of seeds for the Forest Development Project.

Most of the tropical forest seeds of recalcitrant type have short life cycle and are not tolerant to extremely low temperature (below 10ºC) and high reduction of water content. This condition causes new seeds to be damaged and cannot be kept long. The condition also reduces seeds potentials and affects the storage ability of the seeds.

In addition, flower and fruit seasons are also not consistent. The cycle from one season to the next occurs in a period of 3 to 6 years. Thus, phenology study is needed to monitor the flowering time for local plants to ensure sufficient supply of seedlings every year and the needs for proper handling and grading of seeds and other plant materials.

The Forestry Department also faces problems in handling and grading every flowering and fruiting seasons (mass fruiting). Limited nursery area and workers do not allow the above activities to be conducted in a short period. Hence, it is a need to develop a networking system between the nursery and handling system that can lengthen the storage time of the seedlings and plant materials.

(i) Operations and Enforcements

In general, operations and enforcements are meant to prevent and eliminate forest offenses be it inside or outside the compound of the PRFs. Operations and enforcements are important to ensure the aims of sustainable forest resource management can be implemented effectively. The operations and enforcement activities include logging licensing, harvesting of forest produce as well as procedure to detect offenses, arrest, seizure, investigation and prosecution.

In particular, these activities are aimed to enforce the National Forestry Act 1984 (NFA 1984), Forest Rules (FR), Wood Based Industry Enactment (WBIE) and WBI Rules.

Currently, the procedure to award a timber logging area in the State of Johor is as follows:

- Tender;
- Sawmill Scheme (Bumiputra only);
- State Land Approval;
- Alienated Land, Mining Land and Reserve land.

(j) Wood Based Industry

The objective of the Wood Based Industry is to provide a balance between main processes and the total amount of raw materials that can be supplied. This balance can be achieved by encouraging the enhancement of main processing efficiency without increasing the use of raw materials. However, the downstream processes to produce value added products should also be given priority to enhance the efficiency in processing and diversifying final products, in line with the market needs. If this situation can be created, the pressure on natural forests can be reduced. The processing technology should also suit the needs of processing smaller diameter logs especially the ones from the plantation areas.

Besides that, the use and processing of non-timber forest products will also be increased and encouraged.

5.2 Management of Forest Plantations

This FMP only provide general guidelines with regards to forest plantations. Detailed information is available in each Forest Plantation management plan.

5.3 Management of Non-Timber Forest Produces

The aim of the Management of Non-Timber Forest Produces is to diversify the resources obtained from the PRFs and the main concentration in these PRFs is Amenity Forest and Bamboo Trees only.

5.3.1 Amenity Forest

The management of non-timber forest products (services) is focused within amenity forest by improving the basic facilities for visitors' comfort.

Besides that, a series of scientific expedition have been planned to be implemented in the PRF to collect information on biological diversity available in the production forests or in the protection forests. Harvesting of non-timber forest produces will be done through issuance of minor licenses and other approved methods.

5.3.2 Bamboo Trees

Two types of bamboo trees have been selected, the *Dendrocalamnus asper* and *Bambusa vulgaris.* Other types can also be considered according to current needs, such as the *Schizotachyum brachycladum* (buluh lemang). The suitable area for bamboo trees are open area, good drainage, porous sandy soil up to clay and pH in the range of 5.0 to 6.5. The planting methods will follow the Guidelines of Bamboo Planting issued by the Forestry Department Headquarters, Peninsular Malaysia (FDPM).

6.0 IMPLEMENTATION

6.1 Schedule

The FMP covers a period of 10 years between 2006 and 2015. For the production of timber, it is expected that annual production is not more than 2,250 ha. In addition, the volume of timbers taken out from any area will be controlled to ensure the damage on the residual stand is minimized and within the allowable level.

6.2 Compliance Against MC&I [2002]

6.2.1 Objective and Approaches

The objective of managing natural forest resources is to security tenure of PRF and plant stocks through the use or practice of scientific, practical, effective and efficient forest management system. It is achieved through maintenance and addition of PRF areas, classification of PRF and harvesting according to SMS and other methods in accordance to forest classifications.

On-site implementation will be conducted according to the criteria, guidelines and activities available in the *Objective of ITTO Year 2000*. For the State of Johor, the management focuses on PRF and PPRF only. Areas outside of the PRF and PPRF will be handled according to current needs and will follow the resolutions made by the National Forestry Council and other decisions especially on the production forest produces.

In general, there are two (2) categories of forests in the PRF, which are the Inland Forest and Mangrove Forest. Inland Forests consists of Lowland Forest, Hill Forest, Mountainous Forest, Coastal Forest, Forest Plantations and Peat Swamp Forest.

As at the end of 2005, there were 317,176.03 ha of inland forest in the PRFs in the State of Johor. From that total, 35,223.00 ha is forest plantation located in Ulu Sedili forest Reserve and Ulu Sedili Tambahan Forest Reserve. The whole area of the forest plantation is called Ulu Sedili Forest Plantation and leased to the Yayasan Pelajaran Johor. All operations of felling and replanting are given as concession by the government to a company appointed by the Yayasan Pelajaran Johor and a subsidiary of Syarikat Pembinaan Limbongan Berhad, Aramijaya Sdn. Bhd. As at the end of 2005,

only 400.00 ha were developed as forest plantation land in comparison to the total area of 35,223.00 ha.

As for the Peat Swamp Forest, as at the end of 2005, the state of Johor has a total of 3,795.84 ha in the PRF area. All of the Peat Swamp Forests are located in the Air Hitam Utara PRF under the administration of Northern Johor forest District.

Mangrove Forests are more focused towards the southern part of the state and located along the coastal line from Muar to Mersing on the east. As at the end of 2005, the total area for the mangrove forest was 19,475.48 ha within the PRF. This type of forests is managed systematically with rotation age of 20 years and implemented as clear felling and replanting with mangrove species.

Inland Forests, besides Forest Plantations and Peat Swamp Forests, located in the PRF classified as Production Forest for log production are managed using the SMS system. The approach used under the SMS is cutting regiment derives according to data obtained from the Pre-Felling Forest Inventory. This system was structured to guarantee good management of forest resources through Sustainability Forest Management Practices at a minimum damage and rehabilitation cost and giving optimum economic returns.

6.2.2 Sustaining and Addition of PRF Areas

The extent of PRF of 391,499.02 ha should be sustained in the effort to ensure that the Sustainable Forest Management Practice meet its objectives, which are to produce products and services as identified especially in the production of timber and new resources such as water catchments areas, herbs, biological diversity and eco-tourism. With the space area, PRF occupies 20.47% of the state of Johor's total land area. Continued efforts and initiatives must be done from time to time to ensure sustaining of PRF extent, replacement of excision of PRF land and addition of new forest areas. Among the programs that will be conducted are as follows:-

a. Sustaining of Permanent Reserved Forests

The JSFD always put its effort to give awareness and explanation on the importance of retaining adequate PRF space area and ensure all parties, either the local authority, government servants or the public to understand the federal government's policies and adoption of all forestry related issues by the state government.

Thus, a series of talks, meeting and others have been planned to be conducted periodically from time to time. Throughout this FMP, talks will be given to the State Government's Council Members, Head of Departments/Related Agencies relating to the status of PRFs in the state of Johor every three years or as required. At the district level, talks have been planned to be given to District Officers and District Land Officers, either in special meetings or during the District Development Meetings.

b. Survey and Marking of External Boundaries of Permanent Reserved Forests

Rule 9, Forest Rules 1986 stated that upon the publication of the notification in the Gazette referred in paragraph (d) of Rule 8, the Director shall with all speed shall initiate demarcation of the external boundaries of the land so constituted as permanent reserved forest and be responsible for the overall control and supervision of the permanent reserved forest in accordance with the Act.

Works on survey and later on marking of the external boundaries using "boundary mark" is done using licensed surveyor. A marked boundary will be cleared and cleaned at a width of two (2) meters from all plants except trees that are 15cm or more in diameter by Department's staff or an appointed contractor. The trees on boundary line will be painted with three (3) red bands, at a distance of 20 meter from each other. Besides, PRF signboards will also be posted on the trees along the external boundaries at a distance of not more than 100 meters.

(c) Survey and Marking of Compartment's Boundaries

Compartment's boundaries must be measured and marked on site. The measurement and marking works should be done in the PRF area that has been measured and marked with external boundaries, The measurement of boundaries are done during marking of trees for license harvesting is conducted. Trees on the boundary line will be painted with two (2) red bands at a distance of 20 meters between each other by the Department's staff. The marked boundaries will then be cleared at a width of two (2) meters from all plants except trees that are 15cm or more in diameter . The tasks is done by Department's staff together with the prospective license holder during the confirmation of licensed boundaries, Compartment's pole will be placed at a distance of 40 meters between each other along the boundary lines.

(d) Maintenance of Permanent Reserved Forests' External Boundaries

PRF's external boundaries are maintained every five (5) years to ensure sign and boundary line are always clear and can be detected easily. Maintenance work to be done include cleaning of boundary trails, repainting of marking on trees and replacement of lost, shabby or damaged boundary signs.

(e) Maintenance of Compartment's Boundaries

Compartment's Boundaries are maintained during rehabilitation of forest is conducted on the said compartment. Boundary lines will be remarked so that they are clear and can be detected easily. Maintenance work to be done include cleaning of boundary trails, repainting of marking on trees and replacement of lost, damaged or shabby boundary poles.

6.2.3 Yield Regulations

The implementation of harvesting under the SMS stresses on a 30-year rotation that considers economic and sustainable production besides sustaining balance in the ecology and environment. Sequences of activities to be implemented are as follows.

(a) Determination of Annual Allowable Cut

The warrantees of forest resource production from PRF as timber logging production in forest classified under the Sustainable Timber Production is controlled through AAC. The area of AAC for Inland Forest has changed from 9,630 ha for the period between 1986 and 1996 to 4,540 ha for the period between 1991 and1995 and to a total of 2,705 ha for the period between 1996 and 2005.

6.2.4 Preparation of Environmental Impact Assessment Report

A macro impact study of the effect on the environment will be conducted. The objective of the study is to identify mitigation measures to reduce damages to residual stand. Among the parameters considered are:-

(a) Impact potential on abiotic and biotic components

(i) Abiotic Impact

- Micro Climate Change
- Soil Fertility and Compacted
- Soil Erosion and sedimentation
- Hydrology
- Water Quality
- Air Quality
- Noise Pollution

(ii) Biotic Impact

- Flora diversity
- Fauna diversity
- Damages of Residual stand
- Culture and Social

(b) Mitigation Measures

The objective of having the environmental impact assessment is to provide a choice and carry out mitigation measures to reduce impacts caused by activities conducted. The mitigation measures that can be implemented in forestry activities are as follows:-

(i) Soil Fertility and Compacted

(ii) Soil Erosion and Sedimentation

(iii) Hydrology

(iv) Water Quality

(v) Flora Diversity

(vi) Fauna Diversity

(c) Forest Stand

(d) Water Quality

(e) Noise Pollution

(f) Culture and Social

6.2.5 Pre-Felling Forest Inventory

The survey of Pre-F inventory needs to be done within the stipulated area for harvesting according to the AAC. The aim is to get accurate and updated information on tree stocks at the location and used to determine future planning and implementation according to sustainability forest management practices that

stressed on three main aspects namely; *"economically viable, environmentally friendly and socially acceptable".* The procedure on Pre-F Survey can be referred from the Guidelines on Field Manual on Pre-Felling Forest Inventory and standards as stated in the MS ISO issued by the FDPM.

6.2.6 Determination of Cutting Limit

The minimum cutting limit of tree for the Dipterocarp and non-Dipterocarp species are 50 cm dbh and 45 cm dbh, respectively. The difference between the two should not less than 5 cm at any selected cutting regime. The minimum cutting limit for Chengal is at 65 cm dbh. The minimum number of residual stand at the size of more than 30 cm dbh should be at least 32 trees per hectare and consists of same or more percentage of the Dipterocarp species as compared to the residual stand. Minimum production limit is 30 cm^3 per hectare and the maximum production limit is 85 m^3.

6.2.7 Tree Marking

Tree marking as timber tagging is conducted after the determination of the approved cutting limit. Analysis of the information gathered from the marked trees will reflect the approximate logs volume that can be taken out form the location. Information on tree markings from the licence area will be used as reference by the Range Officers and Forest Checking Station (BPH) for the purpose of moving and transportation out of the logs. During the FMP, a total of 22,500 ha of land in the PRF area are planned for timber tagging.

6.2.8 Harvesting Operations

(a) Harvesting System

The conventional harvesting system used is ground skidding. After the boundaries have been marked and confirmed, Forest Harvesting Plan (FHP) according to section of the EPN need to be prepared by the licensee.

This plan gives information on main road layouts and skid trails, location of the main log yard and temporary log yard, posts, equipment used, harvesting cost, timber market and mitigation measures that needs to be carried out. License will only be issued after the JSFD received and agrees with the plan.

The first harvesting activity is to develop main road and skid roads according to the specifications before tree felling is carried out. The marked trees will be cut, normally with the use of chain saw, towards a predetermined direction. The trees will be then be cut into long timber logs and pulled with a bulldozer through a tow-path to temporary log yard. They will then be cut into short logs according to the desired sizes and will be tagged from the original trees, before being transported by "*san tai wong*" lorries to the main log yard. From the main log yard, the logs will be transferred out to processing factories using trailers.

Upon expiry of the license and harvesting is done, the JSFD will conduct an inspection to conclude a Final Report, license cancellation, penalty and security deposit refund.

(b) Harvesting Area

The harvesting area of PRF and compartments by year during the FMP period is discuss in Table 5.22. In general, the allowable cut is not more that 2,250 ha/year or not more than 22,500 ha in average for a duration of 10 years.

(c) Enforcement

The opening of an area for harvesting is according to compartments and management blocks through issuance of relevant licenses and permits imposed by the EPN. Each license issued contains conditions as stated in the EPN. Besides that, conditions on licenses also include important matters that need to be complied. Among the guides are:-

(i) Guidelines to Forest Harvesting;

(ii) Guidelines for forest Harvesting in Hill Forest;

(iii) Guidelines for Logging in Water Catchments Forest;

(iv) EIA Guidelines for Forest Harvesting;

(v) Guidelines to Tree Marking using Timber Tagging; and

(vi) Guidelines to Marking of Mother Trees.

The enforcement of the conditions as required in the license is done through site inspections to ensure logging activities are done in accordance to the law.

6.2.9 Silviculture Operations

The objective of silviculture operations is to rehabilitate and enrich the harvested or depleted stocks through scientific and effective silviculture practices. This objective is expected to succeed with the implementation of forest resource development projects such as forest rehabilitation.

(a) Rehabilitation of Natural Forests

(i) Post-Felling Forest Inventory

After two (2) to five (5) years of harvesting, Post-F inventory is planned to gather information on residual stand stocks in order for proper silviculture treatment can be adopted to rehabilitate the area. In addition, the Post-F 1 inventory will be done between eight (8) to ten (10) years following harvesting to determine the rehabilitation status or further treatment prescription. By looking at the rate of damage of 30% in the respective areas, it is expected that an area of 675 ha/year from the annual allowable cut (AAC) need to undergo the Post-F inventory. The Post-F 1 inventory procedures are explained in the Guidelines to Field Manual on Post-Felling Forest Inventory and standards mentioned in the MS ISO.

(ii) Silviculture Treatment

Silviculture Treatment (T) is conducted in a period of three (3) to five (5) years after cutting. Treatment options are either GCL/CL and/or TM. First advanced treatment (T1), if needed, will be done if the identified area is declared as regenerated. The type of treatment would be GCL/CL.

(iii) Tree Girdling and Cutting of Lianas/Climbers

For an area with adequate residual stand tree stocks, the treatment options are as follows:-

- GCL, in cases where bad or deformed trees shading or competing with preferred younger tree and with many lianas/climbers that interfere with the growth of commercial trees.

- CL, in cases where a lot of lianas/climber is interfering with the growth of marketable trees and the number of bad and deformed trees that are competing with the preferred younger tree is not significant.

Tree girdling is done to gradually open up the shades of the younger trees and help assist to reduce the competition to the growth of the residual stand for a better growth. The allowed herbicides should only contain *Tricopyr*, *Butoxy Ethyl Ester or Metsulfuron Methyl* active ingredients. Cutting of climber is done to release the residual stand from external interference on the growth of the PCT.

(iv) Enrichment Planting

Rehabilitation using enrichment planting (EP) is done in areas with limited residual stand stocks and lack of natural seedlings. This activity will also be done in an open area such as abandon log yard or skid trails and damaged areas due to natural disasters.

The basis of species selection is its marketability and fast growing such as Meranti tembaga, Meranti temak nipis, Meranti sarang punai, Meranti rambai daun, Kapur, Jelutong and other species. Priority is given to the original species of the area according to tree marking records and/or Production Control Book during harvesting. Approximately, the needed area for TM is around 225 ha or 10% of the area loss after logging according to AAC.

(v) Treatment of Enrichment Planting

The area with Enrichment Planting needs to be treated according to a predetermined sequence to ensure on-site success.

(vi) Nurseries

- Existing Nurseries

  Nurseries have been established in a few locations to provide seedlings for the purpose of forest development such as Enrichment Planting, Open Areas, Community Forests, Urban Forests, Rattan Plantations and others.

- Establishment of Central Nursery

It is planned that the Forest Plantation Nursery will be upgraded into Central Nursery to supply seedlings for all forest development projects in the State of Johor. The upgrading of infrastructures and capacity are expected to be intensified from time to time.

6.2.10 Management of Forest Plantations

(a) Forest Plantation within PRF

(i) Objective

The establishment of Plantation Forests in the State of Johor is aimed to compensate the demand of timbers from the PRFs. JSFD is responsible to monitor and enforce the laws and regulations.

(ii) Yield Regulations

The private sectors need to submit the Plantation Forest Management Plan, Reforestation Plan, Forest Harvesting Plan and other needs from time to time as directed by the JSFD.

(iii) Harvesting Operations

During the FMP, forest plantation operations are conducted by private sectors.

(iv) Silviculture Operations

During the FMP, plantation silviculture operations are conducted by private sectors.

(b) Forest Plantations outside PRF

(i) Objective

The establishment of Forest Plantations outside PRF in the State of Johor is aimed at producing timbers to compensate the demand of timbers from PRF and Forest Plantations within the PRF boundaries. JSFD is responsible to provide advice, monitor and enforce laws and regulations.

(ii) Yield Regulations

The private sectors need to submit the Plantation Forest Management Plan, Reforestation Plan, Forest Harvesting Plan and other needs from time to time as directed by the JSFD.

(iii) Harvesting Operations

During the FMP, forest plantation operations are conducted by private sectors.

(iv) Silviculture Operations

During the FMP period, plantation silviculture operations are done by private sectors.

6.2.11 Protection

(a) Forest Protection

(i) Objective

To ensure permanent and sustainable state forest reserves from physical and biological attacks.

(ii) Physical Protection

PRFs need to be fully protected from physical abuse by man, pests and environmental disturbance to ensure PRF and its productivity is sustained. For this purpose, the surveillance visit needs to be conducted in all PRFs. Activities under the project are as follows:

- Control Against Abuse by Man

PRFs need to be fully protected from physical abuse as most of the PRFs are located near to town, settlement and agriculture areas. It is therefore open to abuse by man to take out forest produce and land encroachment, plantation and livestock breeding without permission.

PRFs can only be identified by having proper and clear boundaries. Actions need to be planned and scheduled to ensure all outside boundaries of PRFs are clear and identifiable.

JSFD also has the allocation by law to control physical abuse on PRFs. According to section 45 of the EPN, all PRFs are closed forests except declared as open forests. Closed forest areas are fully prohibited for entry and trespassers can be charged under the provisions in the said Enactment. However, there is a provision that allows the public to enter into PRFs without prior permission in areas declared as open forests, such as the forest parks and education parks.

- Prevention and Control of Fire

Interference in the form of burning in natural forest areas seldom occur as the country does not have any long draught season. However, plantation forests have a high tendency to burn as the ground has highly flammable

substances. In order to face the possibility of plantation forest burning, a fire control unit has been established in Ulu Sedili Forest Plantation. To complement the forest fire control, a control tower was built on the plantation's highest ground. Besides forest plantations, open forests also have high risks of forest burning. Usually, burning in open forests is caused by human activities such as bonfires and uncontrolled throwing of cigarette buds.

- Prevention and Control of Pests

Forest areas need to be protected so as not to be damaged by pests or tree diseases. In natural forests, insects and tress diseases are not obvious and seldom reported to damage tree growth. This is because naturally, there is a natural balance and forest ecosystem. However, forest plantations which are more monoculture in nature are highly exposed to disease and pest attack. Supervision and immediate treatment must be done. The responsibility is given to a Unit which will be established in the Ulu Sedili Forest Plantation. The method of treatment and response will depend on the current expertise. For that reason, relevant staff will be trained from time to time.

(b) Conservation of Biological Diversity

The understanding and knowledge on biological diversity are among the basics of an excellent forest resource management. Through the understanding, forest resource management can ensure sustainable supply of species and eco-system. Besides that, efforts can be generated to permanently prevent extinction of any particular species or destruction of the eco-system.

Hence, biological diversity management during the FMP period is aimed to collate and gathering complete information on the flora and fauna genetical sources within

the PRF area, especially in forest parks and Virgin Jungle Reserve (VJR). This information will be used to determine the management of an area for the purpose of biological diversity conservation. Within the FMP period, in-situ and ex-situ conservation will be conducted.

(i) In-situ Conservation

The purpose of an in-situ conservation is to protect plants and wildlife in its natural habitats. In this context, JSFD has established a Virgin Jungle Reserves and *Genetic Resource Areas (GRA)*

- Virgin Jungle Reserve (VJR).

VJR is a permanent natural resources reserve for the conservation of genetic resources, study of general ecology, botany and biodiversity. VJR can also be used as sample plots of natural forests for comparison with logged and silviculture treated areas.

The area selection is depending upon a few factors such as the level and condition of the said land, its extent and logistic.

- Genetic Resource Area (GRA)

The establishment of this area in Ulu Sedili Forest Reserve is to save endangered genetic resource species such as Chengal, Kapur, Balau kumus, Kempas, Meranti seraya, Meranti sengkawang merah, Jelutong and Mersawa by creating a genetic bank in selected forest area. It is used to acquire seeds, seedlings and tree cuttings for further reproduction. This project is a joint collaborative study between JSFD, FDPM and UPM, funded by AFTSC.

- Survey on Flora and Fauna

Survey on flora and fauna is organised within the PRF area, amenity forest and throughout PRF to explore the diversity of its flora and fauna.

(ii) Ex-situ Conservation

EX-situ conservation involves domestication of species outside the natural habitat such as in botanical parks, zoo, genetic banks and rehabilitation centre. Currently, there is a sampling plot with endangered species which is Chengal and Balau with a space area of five (5) ha in Compartment 130 PRF Labis, north of Johor. This plot was developed in 1995. Within the FMP period, ex-situ conservation is continued focusing on establishment and maintenance of tropical palm parks, medicinal plant parks, forest orchards and sampling plots for endangered species.

6.3 Management of Water Catchments Forests (Protection of land and Water)

6.3.1 Objective

The management objective of the water catchments forest within the PRF area is to inform that the JSFD is in the process of identifying and dividing the area into various classes which are Class A, B and C so as to ensure harvesting of timbers is in controlled manner and in accordance to the Guidelines impose and at the same time allowing forests in PRF can function in providing raw water supply.

6.3.2 Background

The supply of water is a basic need that is enjoyed by everybody in the country. The government has spent millions of ringgit to develop the water supply infrastructure. However, the development in surrounding areas has affected the water resource.

Water catchments forest is the most important in water supply. The main use of water is for domestic, agriculture planning drainage, industrialization, agriculture drainage plan, and generation of electricity of are 12% a year, and expected to increase. The rate of the current water demand of up to 12% will also be expected. However, the country has yet to face serious water supply, meeting demand for water, but the supply is consistent. The demand for water is still serious, but the demand for water could generate problems in the future.

6.3.3 Definition and Classification of Water Catchments Forest

In general, water catchments forest can be defined as a slope area that can divide water catchments area into a few catchments towards a specific direction. The water catchments forest receives rain water flowing directly or absorbed and flows towards a direction through rivers.

The above definition shows that all Permanent Reserved Forests can be considered as water catchments forest. The PRFs can be divided into two (2) main categories; Production Forest and Protection Forest. In general, harvesting activities are not allowed in the Protection Forests, while in the Production Forests, controlled harvesting is allowed.

For the purpose of this FMP, all water catchments forest in the PRFs that serve as water supplies for human use are divided into three (3) classes, which are:

(a) Class A: Water catchments forest that is the source of treated raw water treated by a conventional water plant, normally available from the rivers.

(b) Class B: Water catchments forest that is the source of treated raw water treated by a sub-conventional water plant in terms of its design and treatment capacity. This includes plants that supply water directly without treatment except for germicidal, normally available from the upstream.

(c) Class C: Water catchments forest that supplies raw water from the dam directly to the supply pipes, normally comes from protected forest area.

From the classifications, logging is not allowed in water catchments forests under Classifications B and C, while controlled logging is allowed in areas classified under A. However, control mechanisms such as buffer zones at least 20 meters to each side of the rivers must be implemented. Tree felling is not allowed within the designated zones.

Even though the water catchments forests are classified by the methods of water treatment processes, the importance of forest functions and water supplies throughout the year can not be ignored, Forests have a few functions that have implications on hydrology such as:-

(a) Forested land can reduce surface flow rate and will increase water absorption rate;

(b) Forested land can increase retention time rate;

(c) Forested land can influence the river flow rate; and

(d) Forested land can control and function as flood control area.

In general, forested land can supply sustainable clean and quality water either in rainy or drought seasons if the forests are kept maintained.

6.3.4 Extent of Water Catchments Forests (WCF) Within PRF

The Johor State Forest Department has identified an area of 83,344.80 ha in the PRF as water catchments forest. Out of the total WCF, 3,554 ha (Seluyut FR) is located in a Protection Forest where felling is not allowed.

The balance of 79,790.80 ha is located in the Production Forest category for sustainable timber harvesting. According to the classification for the purpose of human usage, only Class A can be logged.

Thus, action must be taken to identify and divide the water catchments forests into Class A, B and C so that it can be managed more systematically. Timber harvesting activities in Class A area should be subjected to a strict control, as stated in the guidelines issued by the Forestry Department Headquarters, Peninsular Malaysia (FDPM). Additional control conditions such as limiting the

use of heavy machineries and "*San Tai Wong*", number of workers, logging prohibition during rainy season and determination of dry days before continuation of activities have to be identified in the logging license conditions.

6.3.5 Impacts of Timber Harvesting from Water Catchments Forests within PRF

All land development activities in forested land including timber harvesting activities will cause environmental interference. The interference includes its impacts to forest hydrology especially land erosion, water source impurities, sedimentation and flood. Studies showed that timber harvesting can cause sedimentation, increase in river flows and land erosion at an acceptable level in the first year. The situation is expected to recover in the next 3-5 years after harvesting has taken place. However, the impacts of timber harvesting towards hydrology can be minimized through controlled timber harvesting. Thus, it is important for the Forest Protection to be gazetted as water catchments forest where timber harvesting cannot be allowed while in the production Forests, timber harvesting can be allowed under control according to the conditions set forth in the existing guidelines to ensure any environmental damage can be minimized. In addition, any development that involves the forested land should also consider the area's function as a water catchments forests are sensitive to any types of disturbances. This is important as the water catchments forests that are considered critical in supplying clean water to the community can be maintained. For damaged, trespassed or encroachment into water catchments forests, actions must be taken to rehabilitate the areas with suitable species.

6.4 High Conservation Value Forests (HCVFs)

6.4.1 Objective

To conserve forest areas that classified as high conservation values.

6.4.2 Features of HCVF

(a) Forest area that contains highly valuable specific biological diversity (e.g.: endemic in nature, endangered species, protected species) globally,

regionally or nationally; and/or forests with large landscape that contains a management unit, where most or all of the population can live independently and found in their natural forms based on the large quantity;

(b) Forest area that has rare, endangered or risky ecosystems;

(c) Forest area that provides basic facilities in critical situation (e.g.: water catchments area protection, land erosion control);

(d) Forest area that supplies basic local community needs (e.g.: livelihood, health) and/or local cultural identity (cultural area, ecology, high economic or religious value as identified with the help of local community).

6.4.3 Management

There are three (3) categories has been identified as High Conservation Value Forests (HCVFs).

(a) Water Catchments Forests

A total area of 83,344.80 ha has been identified as Water Catchments Forests. The details are provided in 5.2.5

(b) Peat Swamp Forests

Four (4) PRFs are identified as Peat Swamp Forests and the areas are as follows:

(i) Air Hitam – 718.30 Ha

(ii) Air Hitam Utara – 3,795.84 Ha

(iii) Air Hitam Utara Tambahan – 493.52 Ha

(iv) Jorak - 421.28 Ha

(c) Endemic Species

(i) *Shorea Inappendiculata*

(ii*) Shorea Peltata*

These species are of endemic and endangered dipterocarpa in the Peninsular Malaysia.

The Inappendiculata species are also part of Borneo species available in the north east of Johor. The species can be differentiated from *Shorea lumutensis* through the coarse and short haired twigs, and 28-34 stems. The species has probably extinct in the Peninsular Malaysia. *Shorea Peltata, or locally known as* Meranti Telepok, is a species found in the south-east of Peninsular Malaysia (north-east of Johor), east of Sumatera and West of Borneo. The small size species is available in the well-drained lowland area or on low hills in mixed dipterocarp forests.

In a monitoring exercise by the Johor State Forestry Department, *Shorea inappendiculata* was found in Compartment 1, Mersing Forest Reserve in 1957. The *Shorea Peltata* was found in Compartment 2, Mersing Forest Reserve, Johor in 1939 and 1957.

Dipterocarpus tempehes population found in the Labis Forest Reserve was a new record for the Peninsular Malaysia. Knowing the species population is very important to determine that the species is still exist/not extinct and conservation activities can be done.

6.5 Needs of the Society

Besides fulfilling the state's economic needs, the forestry sector also plays an important role in provideng services to the society. During the FMP period, special attention is given to generate healthier, fresh and prosperous loifestyle to the people of the state through recreational space as well as comfortable and fresh enviornment. In addition, in the effort to create knowledgeable society, particularly in the field of forestry and ecology, during the FMP, JSFD will assist in providing educational supports through natural environment. Details of the proposed projects and activities to attain the above needs are as follows:-

6.5.1 Amenity Forest

(a) Objective

The objective of establishing amenity forest is to provide a network of forests in all civil administration districts for the purpose of educating the public on natural environment in the effort to increase awareness and knowledge on the importance of forests to human being. Amenity forests is managed and administered according to the master plan.

(b) Development Concept

Amenity Forest will be developed in accordance to the Sustainable Forest Management Practices concept where the approach will be from the perspective of recreation, education and conservation.

(c) Theme

All amenity forests have their own themes in line with the type of natural topography and resources available in that particular area. All types of development will be managed in line with the chosen themes. Each amenity forests will have different theme but complements each other, such as "*Your Recreational Destination", "Natural Environmental Education", "Tropical Palm Park", etc.*

(d) Name of Area

All areas developed as amenity forests will use a pre-fix of **"HUTAN LIPUR…."** followed by the selected local name. The name in English will use a suffix of "….**AMENITY FOREST"**. The objective of having such names is to introduce an identity to the natural educational destinations managed in the PRF.

(e) Preparation of a Master Plan

All areas planned for development will be provided with a development master plan. The development activities will be based on the master plan and its ammendments according to current needs.

(f) Development of Infrastructure Facilities

Building structures and recreational facilities are provided and designed towards the needs of specific identified activities taking into consideration the safety of the users. Facilities in the form of buildings cannot be more than two (2) storeys or built on a hillside of more than 20% steep. The building materials must be suited to the forest landscapes. All amenity forests will have adequate basic facilities, especially the access roads, parking area, resting hut, pedestrian lane, toilets, prayer room, changing rooms and dustbins.

(g) Sewerage and Waste Disposal

Sewerage system for disposal, sludge treatment and sewage treatment must be conducted at a distance of 200 meters from water source. Waste disposal areas must not be less than two (2) km from amenity forests where wastes are not burnt but buried. The use of latest technology such as the efficient microorganisms must be used to expedite waste decomposition and maintenance cost effective of amenity forest.

(h) Dangerous Trees

Trees classified as dangerous to the visitors of the amenity forest must be marked, listed, examined and treated from time to time especially in high traffic areas.

(i) Opening of an Area and Tree Felling

Tree felling and land works for the development of basic facilities must be done at the minimum level. Cleared area should be rehabilitated with grasses or trees.

(j) Information Centre

The Information Centre is provided with the latest information on the amenity forest in a form of brochures and exhibits. The number of brochures should be sufficient for the use of visitors and its distribution can be free of charge or chargeable. A souvenir and publication corner can also be located at the centre. Besides that, video clips on amenity forest and other forestry information will be aired and visits headed by a Forest Officer will be organized to group visitors daily or as scheduled.

(k) Camping and Related Activities

Camping areas in the amenity forest are built of concrete and sand or wood platforms connected to each other with pedestrian walk to reduce damages to the habitat. The camp site allows only for ready made tent to be used. Visitors are not allowed to cut trees for seedlings to make camps. Various types of huts are built for the comfort of visitors especially for those who do not have camps.

All camping sites will be provided with freshwater supply, kitchen facilities, barbecue pits, *amphitheatres as well as toilets and restroom facilities.*

(l) Safety

For the purpose of visitors' safety, warning and no-entry signage are placed on dangerous sites such as steep hill slopes, rapids, slippery areas, etc.

All amenity forests should have warning signs as follows:

"The safety of visitors and their valuables while at this amenity forest are the individuals' own responsibility. The Johor State Forestry Department will not be held responsible for any accident and results of it or damages and lost of valuables"

JSFD staff will be supplied with first aid kits to give early assistance in the event of any emergency. Fixed line and

radio (ATUR) telephone facilities are provided in relevant offices.

Adequate funding allocation is an important factor to manage, develop, maintain existing amenity forest as well as develop three (3) newly proposed amenity forests such as Gunung Pulai, Mangrove Forest Park and Coastal Forest Park. Basic facilities need to be enhanced for the welfare and comfort of the visitors.

The department has proposed to develop another three (3) new amenity forests, such as Hutan Lipur Gunung Pulai 2, Kulai to replace the Gunung Pulai Amenity Forest, which has been closed for visitors. Two other proposals for the forest parks are of mangrove and coastal concepts.

(m) Maintenance of Amenity Forests

Maintenance should be planned to be implemented by the Department or offered to private agencies. All maintenance activities are planned according to scheduled daily, weekly, monthly or yearly activities. The activities are as follows:

(i) daily maintenance activities include waste collection, toilet cleaning and general sanitary care;

(ii) weekly maintenance activities include landscape maintenance, security checks on trees and facilities provided, waste disposal etc;

(iii) monthly maintenance activities include grass cutting, trimming and trim ornamental trees; and

(iv) Yearly maintenance activities include repair works, repainting of infrastructures and other.

(n) Visitors' Survey

In obtaining feedbacks from the visitors regarding the services as well as facilities offered, customer surveys are held in all forest parks biennially. Information of all visitors

will also be recorded daily and monthly reports are produced. Results of the survey analysis will be used for the improvement of services and facilities. In addition, the data will also able to give a clearer picture on the popularity of each area under study, capacity, relationship with degradation of habitat quality and quantitative value of services. Thus, with proper planning, the services rendered will be more efficient and visitor-friendly.

(o) Publications and Video Clips

Video clipping is part of the methods adopted by JSFD to promote forest parks to the Malaysian people as well as the tourists. The clips contain detailed explanation on forest parks uniqueness and attractions, the services and facilities offered. The video clips are shown as per schedule in all Information Centers located in the Amenity Forests and distributed to all District Forest Office, Forestry Department Headquarters, Peninsular Malaysia and other related agencies.

(p) Publication and Distribution of Brochures

General and specific brochures will be updated and upgraded for better presentation. These brochures will contain updated basic information on amenity forest parks and new activities available in the parks according to current needs. Forest park information centers will act as distribution centers for distribution of brochures besides the state forestry offices, District Forest Office and other places which will be determined later.

6.5.2 Urban Forests

(a) Objective

The objective of urban forests is to create a refreshing, invigorated and comfortable atmosphere in settlement, town and industrial areas through the various activities.

(b) Preparation of Landscape Plan

During the FMP period, urban forestry activities will be focused at adding greens to school compounds throughout the state. Priority will be given at forest district levels where each district will be required to choose suitable schools for the implementation. JSFD staff will prepare and implement the plan with the assistance of the selected schools. In carrying out the plan, JSFD will only supply seedlings for free. Other than that, if there is any requests from other schools, JSFD will provide services in the preparation and implementation of the landscape plan.

(c) Supply of Seeds

Seedling for the purpose of adding greens to settlement, urban, industrial and school areas will be provided for free. The seedlings will be prepared in the nursery at Hulu Sedili Forest Plantation.

(d) Demonstration of Planting and Landscape Maintenance

Proper seedlings planting techniques and landscape maintenance are very crucial in ensuring the success in establishing urban forests. Thus, JSFD will conduct demonstration on planting and landscape maintenance to interested parties as required. Announcement of these services will be done by the Department from time to time.

Based on the demand received at the moment, the demonstration is planned to be carried out quarterly.

6.5.3 Education Forests

(a) Establishment of Education Forests Parks

The objective of establishing education forest parks is to provide a network of forests in all forest districts for the purpose of educating the public on natural environment in the effort to increase awareness and knowledge on the importance of forests to human lives. In the planning and implementation of education forest parks, the various guidelines will be used.

(b) Development Concept

Forest development is in accordance to the sustainable forest management practice concept where the approach will be from the perspective of education and conservation.

(c) Theme

All education forest parks have their own themes in line with the type of natural topography and resources available in that particular area. All types of educational approach will be managed in line with the chosen themes. Each park will have different theme but complements each other, such as " *Lowland Dipterocarp Forests", Peat Swamp Forest Eco-system", etc.*

(d) Name of Area

All areas developed as educational forests will use a pre-fix of **"HUTAN PELAJARAN…."** followed by the selected local name. The name in English will use a suffix of "….**EDUCATION FOREST PARK"**. The objective of having such names is to introduce an identity to the natural educational destinations managed in the PRF.

(e) Preparation of a Master Plan

All areas planned for development will be provided with a development master plan. Development activities will be implemented according the master plan.

(f) Development of Infrastructure Facilities

The facilities provided focus on the education and learning environment with the forest eco-system as background. All forests will be provided with basic facilities such as access roads, parking space, interpretation trails, direction plans, resting posts and dustbins.

(g) Dangerous Plants

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Plants categorized as dangerous according to classifications must be marked, listed, examined and treated accordingly especially in the areas of public attraction.

(h) Safety

For the purpose of visitors' safety, warning and no-entry signage are placed on dangerous sites such as steep hill slopes, rapids, slippery areas, etc.

All education forest parks should have warning signs as follows:

"The safety of visitors and their valuables while at this education forest park are the individuals' own responsibility. The Johor State Forest Department will not be held responsible for any accident and results of it or damages and lost of valuables"

(i) Visits

JSFD will organize visits by students, National Services participant, etc.

(j) Maintenance of Education Forest Parks

Maintenance of Education Forest Parks needs to be planned. The implementation can be done either by the JSFD or through privatization exercise. All maintenance activities are planned according to periodic activities and daily, weekly, monthly or early maintenance. The activities are as follows:

(i) daily maintenance activities include waste collection, toilet cleaning and general sanitary care;

(ii) weekly maintenance activities include landscape maintenance, security checks on trees and facilities provided, waste disposal etc;

(iii) monthly maintenance activities include grass cutting, trimming and trim ornamental trees; and

(iv) Yearly maintenance activities include repair works, repainting of infrastructures and other.

(k) Visitors' Survey

The survey is done to obtain feedbacks from the visitors regarding the services as well as facilities offered, customer surveys are held in all education forest parks. Results of the survey analysis will be used for the improvement of services and facilities. In addition, the data will also able to give a clearer picture on the popularity of each area under study, capacity, and relationship with degradation of habitat quality and quantitative value of services. Thus, actions can be taken to ensure sustainable development in the area.

(l) Publications and Distribution of Brochures

Brochures are a type of media that will be used to disseminate information and introduce educational forest parks to the local community and foreign tourists. These brochures will contain updated basic information on education forest parks and general information on unique characteristics of a specific area. Forest park information centers will act as distribution centers for distribution of brochures besides the District Forest Office, Rangers' Offices and forests parks.

6.5.4 Community Forests

(a) Establishment of Community Forests

Community Forests are established in poor forest areas within the PRFs near village areas. The areas are planted with fruit trees that can also produce timbers. The villagers can benefit through collection of fruits during fruiting seasons. The types of trees planned to be planted during the FMP period are durian and petai.

(b) Community Forest Treatment

The treatment to be implemented is according to the sequence used in enrichment planting treatment for the success of this activity.

(c) Harvesting

Petai and durians are expected to start fruiting between the seventh and the tenth year after planting. The production of fruits will continue until the trees have reached the size of timbers and ready for logging at the age of 50 years.

6.5.5 Forestry Extension and Publicity

(a) Objective

The objective of forestry extension and publicity can be attained by ensuring the society knows the function, responsibilities and activities of the JSFD in keeping, managing and maintaining forest lands. It also guarantees that the function and contribution of the forest towards community livelihood can be appreciated. The awareness can increase public's involvements in forestry activities especially in enrichment planting. During the FMP period, the projects to be implemented are forestry extension and publicity.

(b) Forestry Extension

Forestry Extension involves transfer of information and explanation on advisory services regarding tree planting, its maintenance and organising field trips to those directly involved in plantation of forest trees either in the alienated land or state land. In addition, JSFD will also assist planters or plantation owners to source out seedlings. The activities that will be organised are:-

- Advisory Services on Tree Plantation and Maintenance.

- Advisory services on tree plantation and maintenance will be offered to private sectors and the public who are interested to be involved in commercial forest tree plantation. The advisory services spans from the preparation of planting land, plants and treatment up until harvesting. This is important to ensure profitable returns and par with other types of investments. The advisory services will be rendered in the form of groups or individual based on demand and current needs. However, JSFD has planned to conduct advisory services once every quarter.

(b) Supply of Seedlings

JSFD has always encouraged eatblishment of plantation forests out of assigned lands. Among the assistance to be rendered are supply of quality seedlings in the form of subsidy or at a reasonable price. It is forecasted that the number of seedlings needed throughout the FMP period is an average of 50,000 trees per year.

(c) Educational Visit

The educational visit is aimed at giving exposure to participants on a few techniques or latest and best practices in planting and maintenance. The visit will be organized by the JSFD locally and internationally. This kind of visit is expected to be organized once or twice a year.

(d) Forestry Publicity

Forestry Publicity is aimed at disseminating information on the roles, responsibility, activities and latest updates on forestry sector to the public. During the FMP period, publicity of forestry activities which will be carried out are through distribution of brochures, video presentation, talks, forums, dialogues, exhibitions, quizzes, competitions on forestry, environmental enthusiasts, recreations and scientific expeditions.

(e) Paper Publication

The JSFD plans to provide publication materials that contain written information on the roles and responsibility of JSFD, the Department's activities and latest information on the forestry sector. The written publication will be distributed to the public through the District Forest Offices and others. Throughout the FMP period, it is expected that a total 200 pieces of publications will be issued per year.

(f) Video Publication

Video Publication provides the latest information in the form of audio-visual. It will be distributed to the public for viewing. All programs conducted by JSFD will be included in the video broadcasts and suited to the current needs. There will be two (2) video clips during the period of FMP.

(g) Talks

Talks will be organized from time to time with the objective of providing a channel to disseminate latest information on forestry sector to the public, especially to students, National Service participants, loggers and timber based industry players. During the FMP period, there will be 5 talks per year.

(h) Exhibitions, Quizzes and Competitions Related to Forestry

Exhibitions, quizzes and competitions related to forestry are planned for the purpose of enhancing networks and close relationship with local community. Among the competitions to be held are orienteering, drawing, photography, green runs and extreme cycling. Throughout the plan, there will be a total of 38 exhibitions, quizzes and competitions to be conducted.

6.6 Forest Expeditions

Expeditions related to forests are carried out to gather information and allow our young generations and youth to explore and appreciate nature's secrets. These expeditions involve activities such as mount climbing, jungle trekking, river trekking and camping. The planned activities will be conducted once a year.

6.7 Research and Development

6.7.1 Investigation and Assessment on the Needs of Forest Research and Development

Tropical Rainforest in Malaysia is a unique and complex ecosystem. There are still a lot of information not known to us such as the impact of human activities towards the ecosystem components particularly the flora, fauna, ground, water and the mechanisms to reduce the impacts. The needs to gather such information especially in the field of forest development management is getting more crucial with the depletion of forest resources and an increase of demand of such resources.

6.7.2 Identification of Research and Development (R&D) Scope

Throughout the FMP period, focus will be made on rehabilitation of trees after harvesting and plant growth under forest plantation schemes. The JSFD approach to R&D is through operational studies which allow information gathered for in-situ direct applications. The study involves growth, ingrowths' rate, mortality rate and reactions of residual stand towards different harvesting intensity. The operational study will be held in collaboration with the FDPM and other agencies and departments.

6.7.3 Studies Conducted

(a) Collaborative Studies with the FDPM

(i) Establishment of Growth and Yield Plots Study

The objective of the Growth and Yield Study Plots is to study the growth capability of natural seedlings and its potential of producing timber supplies after logging, taking into consideration the rate of increase in

diameter growth, basal area, volume and mortality rate. In addition, the plots could determine various options of cutting limits on trees and natural seedlings. The extent of each plot is 1 ha. The Criteria of the study area are as follows:-

- 10 years Post-F
- 11-20 years Post-F
- 21-30 years Post-F
- 31-40, 41-50 years Post-F

The information on Pre-F and Post-F for selected areas is gathered to complement the collected data.

(ii) Establishment of Silviculture Treatment Sample Plots Study

The objective of the study is to obtain information on the capability of forest treatment using different silviculture treatments, the response of residual stand and enactment of the management and silviculture systems of dipterocarp forests.

The study was held based on the development of 20 Permanent Sample Plots measuring 100m X 100m (1 ha) on a logged forest. All plots were created in the middle of treatment blocks.

The study area in the State of Johor only focused on Compartments 73, 141 and 142 of the Kluang FR which were established in 1991.

(iii) Establishment of Permanent Continuous Forest Inventory Plots Study

This study is aimed at identification of forest area and location available in each state according to the forest type stratifications. Besides that, the study can also estimate the volume of forest trees according to specific diameters, species group and potential area for harvesting, quantity and quality of source of rattans, bamboos, palms and screw pines and to evaluate any changes on them.

(iv) Forest Plantation Study

- Sample Plots

Sampling Plots of the forest plantations were established to obtain information on the rate of growth, suitability of trees with surrounding areas, types and spacing between plants and other information that are needed for any specific species. A total of 32 sampling plots have been developed in Ulu Sedili Forest Plantation. The earliest sampling plot was established in 1975 and the latest in 1995.

- Permanent Sample Plot

The plot was established for a long term purpose to study and infer the potential of Acacia mangium trees within the Ulu Sedili Forest Plantation project. The information under study was the rate of growth, distance between plants and diseases.

- Provenants' Trial Plots

The Provenants' Trial Plot was established for the *Acacia mangium* species from different provenant to obtain information on the best provenants in terms of growth, resilience towards diseases and suitability to its surrounding. It was established in 1984 with an area of 5 ha, at Block IC, Ulu Sedili Forest Plantation project.

- Seed Orchard Plot

The Seed Orchard Plot is planted with the best *Acacia mangium* seedling obtained from Queensland, Australia to be used as the main source for forest plantation seedlings supply. The plot, which has an area of 11 ha, was

established in 1984 at Block IC, Ulu Sedili Forest Plantation project.

- Marking of Selected Tree

65 Acacia *mangium* trees were selected as the best model trees from a specific clone and breed and have been used as local seedlings collection source. The selection and marking have been done in 1990 in all areas of Ladang Hutan Hulu Sedili.

(b) ITTO Enrichment Planting Study

The study is a collaborative effort between Malaysia and ITTO in the field of sustainable forestry management and development. It is aimed at updating new effective techniques, cost effective and suitable to the surrounding ecology. Besides that, this project will produce a set of guidelines to collecting wild seedlings, maintenance of nurseries and establishment of seedling clone reproduction.

(i) Site Preparation

The first phase of the project started in 1995 and ended in 1997, while the second phase started in 1998 until 2000. The third phase started in 2001.

(ii) Planting

Tree planting activities is done in batches for five (5) years since 1996. The types of trees were meranti which has a high commercial value. A part of the plantation study conducted a few thinning methods to obtain information on the best planting spacing to produce healthy plants and give the highest return.

(iii) Treatment

Treatments are done on all areas within planted area. The focus is within three (3) years after planting

according to the TM treatment, prescribed by the silviculture practice.

(c) Study of Plant Materials with GTZ

This study is a collaborative project between Malaysia and Germany conducted during the 8th Malaysia Plan. It was a program that considers breeding of trees for high quality production. This program involved all State Forestry Departments. During the FMP period, the results of the study will be used in the production of plant materials.

(d) Phenology Observation Team

Phenology Observation Team will be continued throughout FMP and climbing equipment will be upgraded from time to time. As an incentive, climbing allowances will be give to climbing team according to tasks conducted.

(e) Establishment of Seedlings Production Area

The choice of land area considers the matured trees and good genetic, easy to be visited, away from natural disasters, trees that can produce seeds and unlogged areas. For logged areas, mother trees will be monitored to identify flowering and fruiting trees.

(f) Monthly Reporting on Phenology Observation

This report will contain information on flower and fruit trees for the month. The report is prepared by the JSFD staff and distributed to FDPM Plantation Unit.

6.8 Management Plan of Mangrove Forest

The Sea Swamp Forest Management Plan which was prepared with the assistance of DANCED will be used during the FMP period. The plan contains information such as harvesting activities, the importance of flora and fauna maintenance, fishing activities, tourism and biological

maintenance. The plan needs to be reviewed from time to time in line with the rapid changes faced by the area surrounding the Sea Swamp Forests.

6.9 Forestry Information System (SIMP)

The project aims at providing a user-friendly forestry information system and suitable for current needs especially in the collection of revenue and generation of quick, accurate and user-friendly reports.

This project is a continuation of the 8thMP and previous FMP. Today, the system is not yet ready for use completely as there are technical problems especially in the generation of reports and State Government approvals. However, basic needs such as computer equipment have been received and used. During the FMP, efforts will be focused to ensure the system is fully functional.

6.10 Infrastructures

Complete infrastructure and logistic facilities are among the most important criteria in ensuring the plans are implemented smoothly and effectively. The infrastructure and facilities provided considers a few factors including the location of forest area, operational and development related activities and projects to be implemented, expected current and future workloads etc. Among the projects to be implemented are construction and maintenance of forest roads, building and maintenance of office buildings and quarters, procurement and maintenance of vehicles and work equipment,

6.10.1 Roads including Forest Roads

A total of 67 access road network and forest roads of 945.7 km throughout the state of Johor have been identified as common routes used in the operation, development and forest administration. Out of that total, 382.4 km are access roads (outside of PRF) and 569.3 km are forest roads (within PRF). The roads are named as per guidelines issued by the Forestry Department Peninsular Malaysia.

Besides the access and forest roads, JSFD also plans, builds and maintains roads heading to forest parks, education forests, within the compound of office/housing complexes and other roads according to current needs. These roads are normally tarred and the bridges are made of concrete, steel or wood.

During the FMP, all roads, in particular the access roads will be upgraded for use in all seasons and implemented in accordance to Forest Roads Specifications of Peninsular Malaysia.

6.10.2. Buildings

Department buildings such as offices, BPH, quarters, garage and store are provided to allow officers and staff to work efficiently. These building as made of concrete, wood or combination between concrete and wood, according to the designs prepared by the Forest Engineering Unit, FDPM. For buildings built within the City Council or District Council, the design plans must be approved by the related authority.

Electricity is supplied by Tenaga Nasional Berhad, while Syarikat Air Johor (SAJ) provides water supplies. For Ladang Hutan Ulu Sedili complex, effort will be made to allow water to be supplied by SAJ. Waste and sludge treatment, sewage and waste disposal will be done using services rendered by the local authority.

The total number of office buildings, BPH, quarters and existing buildings under the supervision of the Department by Forest District is 363. The buildings are still in good condition and will be maintained according to current needs. Damaged buildings will be disposed.

6.10.3 New Training Center

Training is an important field in human resource development programs. All levels of staff should be equipped with knowledge and skills on methodologies and up-to-date technologies in the area of forestry to allow them to conduct their jobs effectively and efficiently.

Besides that, department staff, workers of private sector companies involved in development and forest operation projects also need to be given trainings from time to time.

Currently, no dedicated and well equipped space is provided to conduct trainings. Thus, a fully equipped training centre will be built in Ladang Hutan Ulu Sedili Complex. Some of the existing

infrastructures will be upgraded according to current needs. Among the facilities to be provided are as follows:-

- Lecture Rooms (3 units);
- Workshop Rooms (3 units);
- Meeting Room;
- Offices and Library;
- Dormitory for 50 males and 50 females;
- Dining Hall;
- Multipurpose Hall;
- Praying Room (Surau);
- Guests House (5 units);
- Staff quarters - Class E (1 unit), Class F (3 units), and Class G (10 units);
- Football field;
- Volleyball court;
- Tennis court;
- Sepak takraw court;
- Hitch tract;
- Wall climbing;
- Arboretum;
- Interpretation track;
- TNB substation (1 unit).

6.10.4 Maintenance of Buildings

Maintenance of buildings needs to be done from time to time to ensure all services provided are comfortable, safe and in good condition. The plan for maintenance is yearly. However, the maintenance will highly dependent on the approved financial allocation. As most of the existing buildings are more than 20 years old, it is expected that the maintenance cost and work will increase

from time to time. Hence, proper financial allocation will be conducted to ensure the safety of the buildings.

6.10.5 Vehicles

Four wheel drive (4WD) vehicles are the main choice to be purchase in this FMP. Besides that, vehicles such as lorries, busses, motorboats and portable engines will also be purchased according to needs and to replace disposed vehicles.

During the FMP period, the number of vehicles needed and used totaled to 150 units.

(a) Purchase of Vehicles

Purchase of vehicles need to be done from time to time to ensure it is adequate and safe to be used. The purchase can be as an addition to the existing vehicles or as replacement of vehicles to be disposed. The number of vehicles to be disposed as at December 31, 2005 was 65 units and it is planned that 100 units will be purchased to replace the disposed vehicles and as required.

(b) Maintenance of Vehicles

Vehicles must be maintained according to the specified schedules to ensure good condition and safe to be used.

(c) Equipment and Communication

(i) Purchase of Equipment

- Computers

The JSFD has been using computers in its daily job including the tasks of forest inventory data collection. Currently, almost all office work makes use of the computers to expedite and ease daily duties.

During the FMP, JSFD will purchase a few units of computers and other equipment

including laptops and printers. The procurement for computers and computer equipment is planned at 10 units per year. The need of this equipment is to enhance the daily responsibilities especially at the Forest Ranger Offices and Forest Inspection Post. The purchase is also for the purpose of replacing damaged computers or printers.

- Mobile phones

In line with the current trend, JSFD will purchase mobile phones to ease communication. Currently, JSFD has owned a few units of mobile phones but with limited coverage and use. During the FMP, the mobile phones to be used will be enhanced for use in remote areas. In addition, additional new equipment will be made and distributed according to sites covered by each ranger.

- Firearms

The tasks of patrolling and enforcement involve staff safety. The increase in the rate of state crime at the moment requires the department's staff be equipped with adequate equipment. Thus, during the FMP, JSFD will purchase necessary firearms.

- Work Equipment

Functional work equipment is needed from time to time to ensure the accuracy of the information gathered. During the enforcement of the FMP, JSFD plans to purchase new equipment both in addition to the existing ones and as replacement of the non-functional and out-dated equipment.

(ii) Maintenance of Equipment

All equipment needs to be maintained as scheduled. For this purpose, JSFD will provide a maintenance schedule according to the types of equipment and specified duration.