

## V 技術協力の構想

### V-1. 協議事項

すでに述べたように、マレーシア政府は日本政府に対して、マレーシア国立林業研究所における林産研究について技術協力を要請してきた。本調査団は技術協力の可能性をあきらかにし、その分野、内容、範囲等を明確にするとともに、プロジェクトの基本構想を策定するため、1980年12月7日から12月25日までの間、日程表のとおりマレーシア国を訪問した。

その滞在期間中、マレーシア政府の協力により、同国の森林及び林業事情、林産加工業の実態、林業研究所の現状並びに将来構想などを調査するとともに、政府関係者と技術協力について協議を行った。その結果を要約すればおおよそつぎのとおりである。

- (1) マレーシア計画を推進してゆこうと、森林資源の保続と林産物の高度利用はきわめて重要な施策の一つである。
- (2) 林産研究の充実を図るため、1978年に林業研究所の組織の再編成と林産部門の拡充が行われたが、研究員の経験年数が低く、空ポストも多いというのに、林産施設の建設工事が遅れ、その完成は1982年と予定されている。
- (3) マレーシア政府は第3次マレーシア計画（1976～1978年）の推進にあたり、すでに日本政府に対し、つぎの研究課題について技術協力を要請している（1976年10月）。

- A 溶解パルプ生産 (Production and evaluation of dissolving pulps from raw cellulosic materials)
- B 木材接着剤と小径木からの合板製造 (Composite wood-research-bonding quality of wood and ply' wood manufacture from small diameter logs)
- C 木材抽出成分及び含有化学物質の研究 (Wood extractions and other chemical investigation of wood)
- D 廃材利用を含めた木材の高度加工 (Further processing of timber including utilization of waste)

これらの要請課題に関連し、前述のとおり宮崎信専門家が1977年12月から2か月間、木材化学分野の指導に派遣され、実験室の設計並びに機器の整備について助言を与えている。その後、北村専門家が1979年9月から2か月間、木材加工分野の指導に派遣され、合板の各種性能試験を中心に指導と助言を行っている。

- (4) つづいて、マレーシア政府は第4次マレーシア計画（1981年～1985年）の推進にあたり、つぎの研究課題について研究協力を要請してきた（1980年10月）。
- A 木材の難燃加工 (Fire performance of wood products)
- B マレーシア材の集成加工 (Glue lamination from Malaysia timber)
- C 刃物による切削加工技術 (Cutter tool technology)

D 木毛セメント板製造 (Cement-based panel products)

E 木材加工産業における公害防止技術 (Wood industrial pollution-control)

本調査団の訪マの目的はこの5課題を中心とした技術協力の可能性の調査である。

- (5) 1976年10月に研究協力を要請された課題については、すでに述べたようにその一部については個別派遣専門家に対応しており、また林業研究所でも研究に着手しているが、それらの課題は林産研究及び林産工業を発展させてゆくうえで重要であるばかりでなく、第4次マレーシア計画に関連する林業研究所の研究計画とも密接な関係があるので、本調査団は1980年10月の要請課題にそれらも加えて、研究協力の可能性について検討を行った。
- (6) その結果、南洋材の特性を活かした高度利用を図るうえで、最も重要であり、かつ緊急性のある課題としては、つぎの2課題が適切であると判断した。

ア 木材抽出成分及び含有化学物質の研究

イ マレーシア産材の集成加工技術

アの課題をとりあげた理由は、現在あまり利用されていない樹種、林地残材、工場廃材などを化学的に利用する際はもちろん、物理的に利用するにしても、南洋材特有の化学的物質の解明が重要な基礎となるからである。例えば接着障害や公害の原因を調査するにしても、材料に含まれる化学物質の分析資料がなければその解明は困難と思われる。また、このほかに、最近設置された化学機器のなかには、高度の技術がないと活用できないものが多いので、林業研究所の研究員を日本で十分に訓練するとともに、わが国からも専門家を派遣する必要があると考えたからである。

イの課題をとりあげた理由は、合板、集成材、ボード類などの製造はもちろん、小径木や廃材などを利用して付加価値の高い製品を製造する際にも、接着剤を利用した集成加工技術が基本となるばかりでなく、この技術の普及がこんごの林産工業の発展に貢献すると考えたからである。

なお、上記2課題のほかに、

ウ 木毛セメント板の製造

を追加することも考えたが、わが国の経験では南洋産広葉樹材の多くは針葉樹材に比べて、木毛原料としての適性が劣るうえに、マレーシアでは製品の普及度が必ずしも高いと考えられないので、緊急性に若干疑問が残る。なお、研究対象としては木毛セメント板の製造より、パーティクルボードタイプのセメント板の製造の方が今日的課題と思われるが、マレーシアでは実際に製造している工場はないようである。

- (7) 木材の難燃加工、刃物による切削加工技術、木材加工産業における公害防止技術などの課題については、問題の焦点がしばらくにくい現状であるので、研究協力の対象とすることなく、マレーシア側の研究員がわが国の実情を視察し、研修することで対応できるものと考えた。なお、これらの課題についても、こんごの情勢の変化により具体的に解決を要する問題が提起されれば、短期の専門家の派遣等による共同研究も考えられる。

- (8) 上記の説明に対し、マレーシア側としては林業及び林産業の重要性を強調するとともに、今後の協力を強く要請した。マレーシア側としては要請した課題はいずれも重要で、優先順位はないと述べていたが、調査団の提案に対する反論もなかった。ただ、マレーシア側の研究員は若く、経験が少ないので、日本における研修を十分に実施して欲しいと強調した。
- (9) 公害防止技術に関しては、1978年に環境保全法が公布され、林産工業関係の対策が急がれているが、林業研究所には専門家がいないので、緊急にその養成に協力して欲しいと要請された。これに対しては、わが国の林業試験場でも、この問題を全般的に扱っている研究員がいるわけではなく、産業と環境の対応のなかで段階的にかつ総合的に解決を図ってゆく場合が多いので、日本の実情を視察したうえで、今後の対応を考えることが望ましいと説明した。
- (10) 難燃加工及び木毛セメント板の製造に関しては、低コスト住宅の建設が大きな課題となっており、それに用いる材料の改良対策として、木材の難燃加工、木毛セメント板に適する樹種の選定が必要になっているので、これらの分野における協力も要請された。とくに難燃加工については林業研究所には研究者も研究施設も皆無であるので、この分野について重点的に研究機材の供与を考慮して欲しいと要請があった。
- これに対しては、つぎのように対応した。
- ① マレーシア側がどのような構造の住宅を対象にしているかわからないので、資料があれば提供して欲しいこと。
  - ② 日本でも在来工法による木造住宅の防耐火は難しく、ツーバイフォー工法等で対策を講じている段階であり、また、難燃処理合板なども規格化されているがほとんど使われていないで、石膏ボード等が用いられている現状であること。
  - ③ 工法、使用部位、要求される性能など開発目標を定めて難燃処理をしないと成果はあがらないと思われること。
  - ④ 日本の実情等を視察したうえで、今後の対応を考えることが望ましいこと。
  - ⑤ 機材供与は林業研究所の研究進捗状況および施設全般の整備状況に応じて選定することになり、難燃加工分野も全体の中で考慮してゆく必要があること。
- (11) さらにマレーシア側から、本協力プロジェクトの中で、研究員の日本における十分な研修の実施と、その人数、期間等について調査団としての意見を求められた。これに対しては、いま直ちに何人、何ヶ月と答えることは出来ないが、われわれも研究員の受入れを主体とした協力が適当であると考えており、できるだけ多くの研究員の受入れを希望していたことを関係筋に伝えるとともに、われわれもそのように努力したい。また期間については、必要に応じて短期から1年程度まで、幅のある選択が可能であると述べた。
- (12) 協力の今後の進め方についてどのように考えるかの質問があった。これに対しては、わが国の予算制度、技術協力システム、日本の林業試験場の態勢等を考慮すると、1981年度に協力実施内容の具体化を行い、実質の協力開始は1982年になると思われること、及びマレーシアの林業研究

所の拡張工事も1982年に完了する見込とのことであり、時間的にみて適当なものと考えたと述べた。

マレーシア側からは林業研究所の拡張工事は1981年にその一部が完了するから、できるだけ早期に協力開始を願いたい。とくに研究員の日本への派遣については、1981年にも実施して欲しいと要請があった。

日本側より、協力開始後はすでに述べたようにできるだけ多く研究員を受入れるように努力するが、1981年度内はきわめて限られた人数となるものと思われると説明した。

(13) 北村専門家の後任者派遣を強く要望し、空白期のないよう配慮して欲しいと要請があった。これに対してはできるだけ要望に沿うよう努力したいと答えた。

(14) 1981年9月に京都で開催される国際林業研究機関連合(IUFRO)世界大会にはできるだけ多くの研究員が参加できるよう配慮して欲しいとの要請があった。これに対しては日本の関係方面にその旨を伝えると答えた。

#### V-2. プロジェクトタイプ技術協力の可能性

マレーシア計画を推進してゆくうえで、森林資源の保続と林産物の高度利用はきわめて重要な施策の一つであり、林産研究の充実を図るため林業研究所の林産部門の拡充が行われ、研究施設も整備されつつあり、わが国に対する研究協力の要請もきわめて強いので、プロジェクトタイプの技術協力は可能であると考えられる。

ただ、林産部門の研究課題が広汎であるにもかかわらず、研究員が不足のうえ、その研究歴がきわめて浅いので、わが国の試験研究機関における研修に重点をおくことが最も効果的な技術協力になると考える。とくに最近の林産部門の研究には最新の計測器機類が多く使用されるようになってきており、それらの使用法に習熟していないと、研究成果をあげかねる場合が多いので、課題によっては研修生の訓練が前提条件となるものもあると思われる。

また、機械供与については難燃化に関するものがあげられたが、研究員も施設も皆無のうえ、難燃化処理の機材だけが、製品の燃焼試験まで含むのか明確にされなかったので、研修生の受入れ後に検討することが望ましい。なお、今回の要請課題にはあげられていなかったが、現地見学ではゴム幹材の防腐・防虫対策が強く要望された。この問題についてはマレーシアですでに基礎研究が行われているが、今後の情勢によっては研究協力が要請される課題の一つであろう。また、木材資源の燃料化についても要請がなかったが、新しい炭化法も今後の協力課題の一つとなろう。

#### V-3. 技術協力基本構想及び今後のスケジュール

第4次マレーシア計画に基づく林産研究計画をみると廃材の利用、木材の開発利用、天然材料供給の補完としてのゴムの木、ココナッツの利用、特用林産物の利用などがあげられているが、細目のなかには1976年と1980年に研究協力を要請された課題と関連するものが多いので、技術協力の分野と

しては木材抽出成分及び含有物質の研究とマレーシア産材の集成加工技術を主軸とし、他の要請課題を副次的に加え、必要に応じて協議のうえ修正してゆくことが望ましい。

協力の方式としてはマレーシア側の研究員のわが国における研修受入れに重点をおき、若干名の長期専門家と短期専門家を派遣することが望ましい。

機材供与については、難燃化の施設以外にはとくに強い要請はなかったが、研究協力が開始されれば、計測器機類について若干の要請があると思われる。

協力期間については、事前調査の性格上、協議は行われなかったが、マレーシア計画を推進するうえで緊急性があると考えられるので、1982年の4月頃から第4次マレーシア計画の終了時頃にかけて4年間ぐらいが適当と考えられる。協力課題別のスケジュールは早急に検討をすすめる予定である。

なお、技術協力に対するマレーシア側とのR/D協議等の打合わせは、IUFRO世界大会（1981年9月）以降が望ましい。

## 卷 末 資 料

### 1. 中間報告

#### BRIEF NOTES ON THE RESULTS OF THE STUDY FOR THE TECHNICAL COOPERATION ON THE FORESTRY PRODUCTS BY THE JAPANESE PRELIMINARY STUDY TEAM

The Government of Malaysia made a request to the Government of Japan to provide technical cooperation to the Forest Research Institute on the forestry products research.

Japan International Cooperation Agency (JICA), in response, to the request sent a team, headed by Dr. Ryozauro YAMAI, Director of Wood Utilization Division, Forestry and Forest Products Research Institute, Ministry of Agriculture, Forestry and Fisheries, to make a preliminary study on the possibility of the technical cooperation on the forest products in Malaysia between December 7th and December 25th, 1980.

During the period of study, our team held several discussions with the Malaysian officials concerned, on the present and future situations/planning on the forest products research.

From the study of the necessity of technical cooperation, on forest products research, the team will recommend the following conclusions to the Japanese Authorities concerned. These conclusions are also derived from the understanding of the basic needs of the Malaysian Government.

1. Forestry and forest products industry expansion is one of the most important economic expansions in Malaysia.
2. In Peninsula Malaysia, there is a need to utilize their forest resources effectively because of their potential prospects. Therefore, the expansion of the forest products research is emphasized.
3. The Malaysian Government, in the Fourth Malaysian Plan, has emphasized on the research of the utilization of wood-waste and the lesser-known species. Towards the forest products research, the Malaysian Government has come up with several recommendations and programmes. However, it has difficulties in the aspect of research expertise to implement these programmes.
4. Therefore, in view of the difficulties faced by the Malaysian Government toward the forest products research, a technical cooperation with the Japanese Government on this matter is necessary.
5. In October 1976 and October 1980, the Malaysian Government requested for a

technical cooperation based on the following proposals:

a) 1976 Proposal Items

- i) Production and evaluation of dissolving pulps from raw cellulosic materials
- ii) Composite wood-research-bonding quality of wood and plywood manufacture from small diameter logs
- iii) Wood extraction and other chemical investigation of wood
- iv) Further processing of timber including utilization of waste

b) 1980 Proposal Items

- i) Fire performance of wood products
- ii) Glue lamination from Malaysian timber
- iii) Cutter tool technology
- iv) Cement-based panel products
- v) Wood-industrial pollution control

6. On the 1976 Proposal Item the Japanese Government has sent individual research experts to look into some of the items. At the same time such research have also been carried out by the Forest Research Institute. We feel that these items are important to the forest products research and wood-industry expansion in Malaysia. Therefore, some of these 1976 proposed items are brought up in the 1980 proposal. In view of the overall proposed items of 1976 and 1980, the Japanese Preliminary Study Team concluded on the following items for technical cooperation.

- a) Wood extraction and other chemical investigation of wood
- b) Glue lamination from Malaysian timber
- c) Cement-based panel products
- d) Others
  - i) Fire performance of wood products
  - ii) Cutter tool technology
  - iii) Wood-industrial pollution control

7. As a matter of priority, technical cooperation is strongly emphasized for item 6 (a) and (b). Item 6 (c) may be considered if necessary.

A few long-term and short-term experts are necessary for the above technical cooperation. With regard to item 6 (d), it is only necessary to send counterparts/officials to be trained in Japan or alternatively short-term experts from Japan.

8. The Malaysian Government feels that the most important item for a technical cooperation is that the Japanese Government provides more opportunities for the Malaysian officials to be trained in Japan, and more necessary equipments to the Forest Research Institute.
9. Finally, it is hoped that such a technical cooperation will be highly successful if the facilities in the Forest Research Institute will be completed in mid 1982 as scheduled.

*Royzaburo Yamai*

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Dr. Royzaburo YAMAI  
Head, the Japanese Preliminary  
Study Team

Date: December 24th, 1980



2. 日本側R/D案

THE RECORD OF DISCUSSIONS BETWEEN THE JAPANESE IMPLEMENTATION SURVEY TEAM AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF MALAYSIA ON THE TECHNICAL COOPERATION FOR THE FOREST PRODUCTS RESEARCH PROJECT IN MALAYSIA.

The Japanese Implementation Survey Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as JICA) and headed by

visited Malaysia from                    to                    for the purpose of working out the details of the technical cooperation program concerning the Forest Products Research Project in Malaysia.

During its stay in Malaysia, the Team exchanged views and had a series of discussions with the Malaysian authorities concerned in respect of the desirable measures to be taken by both Governments for the successful implementation of the above-mentioned Project.

As a result of the discussions, the Team and the Malaysian authorities concerned agreed to recommend to their respective Governments the matters referred to in the document attached hereto.

Kuala Lumpur,                    , 1981

## THE ATTACHED DOCUMENT

### I. COOPERATION BETWEEN BOTH GOVERNMENTS

1. The Government of Japan and the Government of Malaysia will cooperate with each other in implementing the Technical Cooperation for the Forest Products Research Project in Malaysia (hereinafter referred to as "the Project") for the purpose of developing the forest products research in Malaysia.
2. The Project will be implemented in accordance with the Master Plan which is given in Annex I.

### II. DISPATCH OF JAPANESE EXPERTS

1. In accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to provide at its own expense services of the Japanese experts as listed in Annex II through the normal procedures under the Colombo Plan Technical Cooperation Scheme.
2. The Japanese experts referred to in 1 above and their families will be granted in Malaysia the privileges, exemptions and benefits no less favourable than those accorded to experts of third countries working in Malaysia under the Colombo Plan Technical Cooperation Scheme.

### III. PROVISION OF MACHINERY AND EQUIPMENT

1. In accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to provide at its own expense such machinery, equipment and other materials necessary for the implementation of the Project as listed in Annex III, through the normal procedures under the Colombo Plan Technical Cooperation Scheme.
2. The articles referred to in 1 above will become the property of the Government of Malaysia upon being delivered c.i.f. to the Malaysian authorities concerned at the ports and/or airports of disembarkation, and will be

utilized exclusively for the implementation of the Project in consultation with the Japanese experts referred to in Annex II.

#### IV. TRAINING OF MALAYSIAN PERSONNEL IN JAPAN

1. In accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to receive at its own expense the Malaysian personnel connected with the Project for technical training in Japan through the normal procedures under the Colombo Plan Technical Cooperation Scheme.
2. The Government of Malaysia will take necessary measures to ensure that the knowledge and experience acquired by the Malaysian personnel from technical training in Japan will be utilized effectively for the implementation of the Project.

#### V. SERVICES FOR MALAYSIAN COUNTERPART PERSONNEL AND ADMINISTRATIVE PERSONNEL

1. In accordance with the laws and regulations in force in Malaysia, the Government of Malaysia will take necessary measures to secure at its own expense necessary services for Malaysian counterpart personnel and administrative personnel as listed in Annex IV.
2. As to the Malaysian counterpart personnel, the Government of Malaysia will endeavor to allocate the necessary number of suitably qualified personnel corresponding to each Japanese expert to be dispatched by the Government of Japan as specified in Annex II, to fulfil the effective and successful transfer of technology under the Project.

#### VI. MEASURES TO BE TAKEN BY THE GOVERNMENT OF MALAYSIA

1. In accordance with the laws and regulations in force in Malaysia, the Government of Malaysia will take necessary measures to provide at its own expense:
  - (1) Land, buildings and facilities as listed in Annex V;
  - (2) Supply or replacement of machinery, equipment, instrument, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than those provided through JICA under III above;
  - (3) Transportation facilities and travel allowance for the Japanese experts for the official travel within Malaysia;

- (4) Suitably furnished accommodations for the Japanese experts and their families.
2. In accordance with the laws and regulations in force in Malaysia, the Government of Malaysia will take necessary measures to meet:
  - (1) Expenses necessary for the transportation within Malaysia of the articles referred to in III above as well as for the installation, operation and maintenance thereof;
  - (2) Customs duties, internal taxes and any other charges, imposed in Malaysia on the articles referred to in III above;
  - (3) All running expenses necessary for the implementation of the Project.

#### VII. ADMINISTRATION OF THE PROJECT

1. The Director of the Forest Research Institute of the Government of Malaysia will be responsible for the administration and implementation of the Project, and the Japanese experts will give necessary technical advice and guidance for the implementation of the Project.
2. There will be close consultation on any matters concerning the implementation of the Project between both sides. For this purpose, the Joint Committee will be established with the functions and composition as specified in Annex VI.

#### VIII. CLAIMS AGAINST JAPANESE EXPERTS

The Government of Malaysia undertakes to bear claims, if any arises, against the Japanese experts engaged in the Project resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions in Malaysia except for those arising from the willful misconduct or gross negligence of the Japanese experts.

#### IX. MUTUAL CONSULTATION

There will be mutual consultation between the two Governments on any major issues arising from, or in connection with this Attached Document.

#### X. TERM OF COOPERATION

The duration of the technical cooperation for the Project under this Attached Document will be five years from April 1, 1982. However, there will be a general review on the progress of the implementation of the Project after three years from the commencement of the cooperation taking

into account the measures to be taken by the two Governments in order to decide as to whether the cooperation should be modified for the rest of the period.

#### ANNEX I MASTER PLAN

1. The objective of the Project is to upgrade forest products research capabilities of the Forest Research Institute in Malaysia.
2. The activities of the Project will cover the following areas:
  - a. Development of research capabilities of Malaysian researchers through the implementation of research programmes in the fields mentioned under 4.
  - b. Exchange of information, samples, materials and research papers for the Project with the Forest Research Institute.
  - c. Other activities necessary for the implementation of the Project.
3. Activities mentioned under 2. above will be conducted at the Forest Research Institute.
4. Fields of Research
  - a. Wood Lamination
    - (1) Evaluation of appropriate gluing.
    - (2) Processing techniques of wood lamination including cutting processing.
  - b. Wood Extractives
    - (1) Research techniques of wood extractives.
    - (2) Research techniques of useful components.
  - c. Wood Analysis
    - (1) Analysis of wood components.
    - (2) Evaluation of appropriate wood for pulping.
  - d. Cement Excelsior-board Product
    - (1) Selection techniques of appropriate wood species for cement excelsior-board and cement chipboard product.

- (2) Standard test method of products.
- e. Other Fields
  - (1) Wood preservation.
  - (2) Fire retarding.

ANNEX II JAPANESE EXPERTS

Category	Field
1. Team Leader	
2. Experts	<ul style="list-style-type: none"> <li>(1) Wood Lamination</li> <li>(2) Wood Extractives</li> <li>(3) Wood Analysis</li> <li>(4) Cement Excelsior-board Product</li> </ul>

Note:

- 1. A team leader will be nominated by JICA among the experts.
- 2. Short-term experts in the fields mentioned above and other fields may be dispatched when necessity arises.

ANNEX III LIST OF THE ARTICLES

- 1. Machinery, equipment, instruments, tools, spare parts and other materials for laboratory work.
- 2. Chemicals.
- 3. Vehicles.
- 4. Books and other necessary documents.
- 5. Audio-visual aids and articles for indoor training.
- 6. Other necessary machinery and equipment, tools and materials to be mutually agreed upon.

#### ANNEX IV LIST OF MALAYSIAN STAFF

Category	Field
1. Project Manager	
2. Counterpart Experts	(1) Wood Lamination (2) Wood Extractives (3) Wood Analysis (4) Cement Excelsior-board Product (5) Wood Preservation (6) Fire Retarding
3. Laboratory assistants	
4. Clerical and service personnel including typist, clerks, drivers etc.	

Note: (1) The Malaysian side will assign at least two (2) suitably qualified Malaysian experts corresponding to each long/short term expert to be dispatched from Japan.

(2) Number of staff mentioned under 3 and 4 above will be adjusted as and when required.

#### ANNEX V LIST OF LAND, BUILDINGS AND FACILITIES

1. Offices for the Japanese experts.
2. Laboratories.
3. Meeting rooms with audio-visual aids and articles.
4. Garages.
5. Store rooms for machinery, equipment and materials, etc.
6. Land necessary for field tests.
7. Other necessary buildings and facilities.

#### ANNEX VI JOINT COMMITTEE

##### 1. Functions

The Joint Committee composed of those members as listed under 2. below will meet at least twice a year or whenever necessity arises, and work:

- 1) To formulate the annual work plan of the Project based on the master plan in Annex I.
- 2) To review measures taken by the two Governments.
- 3) To recommend to the two Governments particularly on matters concerning the implementation of the Project.

2. Composition

1) Chairman                      Director, the Forest Research Institute

2) Members

Malaysian side	Japanese side
(1) Project Manager	(1) Team leader
(2) Representatives of counterpart experts	(2) Experts
(3) Representative of the Forest Department Headquarters	(3) Representative of JICA
(4) Representative of the Economic Planning Unit	

Note:

The following persons may attend the Committee as observers:

- (1) Officials of the Embassy of Japan
- (2) Officials of the Forest Research Institute.
- (3) Other related persons recognized necessary by the Chairman.





ANNEX TENTATIVE IMPLEMENTATION PROGRAM

Item	Year	1982	1983	1984	1985	1986	1987	
<u>I. Japanese Contribution</u>	April	April	April	April	April	April	April	
1. Dispatch of Experts								
(1) Long-term Experts								
Wood Lamination								
Wood Extractives								
Wood Analysis								
Cement Excelsior-board Product								
(2) Short-term Experts								
		(subject matters, number and duration of these experts will be agreed upon during the operation of the Project)						
2. Training of Malaysian Personnel in Japan								
		Several man-month each						
		(subject matters, number and duration of Malaysian Personnel to be trained in Japan will be agreed upon during the operation of the Project)						
3. Provision of Equipment and Machinery								
						approximately 200 million yen		
4. Dispatch of Missions								
		Consultation	Guidance	Consultation/ Interim Evaluation	Guidance	Evaluation		

Item	1982 April	1983 April	1984 April	1985 April	1986 April	1987 April
<u>II. Malaysian Contribution</u>						
1. Malaysian Counterpart Staff						
Project Manager						
Counterpart Experts						
Wood Lamination						
Wood Extractives						
Wood Analysis						
Cement Excelsior- board Product						
Wood Preservation						
Fire Retarding						
Laboratory Assistants						
Clerical and Service Personnel						
2. Building and Other Facilities						
3. Running Cost (Wages, Installation of equipment, etc.)						
4. Others						
<p>Note: 1. This program is subject to conditions that necessary budget will be acquired for the implementation of the Project.</p> <p>2. This scope of Technical Cooperation is subject to change within the scope of the provisions given in the Record of Discussions.</p> <p>3. Regarding buildings and other facilities to be provided by the Malaysian Government, those required for a full scale operation should be completed in advance.</p>						

### 3. 半島マレーシア林業

## FORESTRY IN PENINSULAR MALAYSIA

### 1. INTRODUCTION

- 1.1 Peninsular Malaysia, which consists of eleven states, covers an area of 13.2 million hectares (32.5 million acres). The total area under forest is about 7.2 million hectares (17.8 million acres), which is about 54.8 percent of the total land area. The developed agricultural land is mainly under rubber, oil palm and padi.
- 1.2 The forests of Peninsular Malaysia form an important and valuable natural resource of the country and represent one of the few remaining extensive sources of quality tropical hardwoods in the world.
- 1.3 As a national renewable resource, forestry has significantly contributed towards the socio-economic development of the country. The contribution can be enumerated as follows: -
  - ° In 1978, the forestry sector accounted for about 8.0% of the Gross Domestic Product Valued at about \$1,861 million.
  - ° Timber industries earned \$1,554 million in terms of foreign exchange from export of Forest Products in 1979. This accounted for 7.6% of the total export earnings from Peninsular Malaysia.
  - ° In 1979, the total forest revenue collected from the states of Peninsular Malaysia amounted to \$145.0 million.
  - ° The sector also provided direct employment for about 72,000 workers in 1979.
- 1.4 Apart from its monetary value, forestry plays an important protective functions such as environmental stability, minimization of damage by floods and erosion to rivers and agricultural land and the safeguarding of water supplies. It must be stressed that the success and development of agricultural activities depend on the protective role of forests.

### 2. FOREST OWNERSHIP

- 2.1 Constitutionally, land and forests are under the jurisdiction of State Governments. Each State is empowered to enact laws on forestry. As such the legislative and executive authority over forest is a state

responsibility. However, all the eleven states in Peninsular Malaysia have accepted a National Forestry Policy.

2.2 The Federal Government through the Forestry Headquarters, which is under the Ministry of Primary Industries, is responsible for research, education and training and the provision of technical advice to States. On certain matters affecting both the States and the nation, the Federal Parliament is empowered to make laws to ensure uniformity and to safeguard national interests.

### 3. FOREST POLICY AND LEGISLATION

3.1 A National Forestry Policy was accepted by the National Forestry Council at its Fourth Meeting on 29th, August, 1977, and this was endorsed by the National Land Council on the 10th, April, 1978. The acceptance of this Policy is a major break-through to strengthen the institutional base and enhance co-operation and understanding between the Federal and State Governments for forestry and forest sector development. The salient points of the National Forestry Policy for Peninsular Malaysia are as follows: -

- ° Establish strategically located Forest Estates for production of timber and other commodities and for conservation of soil, water and environmental quality.
- ° Ensure security of the Forest Estates against destructive agents.
- ° Practice sound forest management.
- ° Encourage multiple use of forest.
- ° Promote integrated timber industries and efficient utilization.
- ° Employ modern scientific principles and appropriate technology.
- ° Upgrade forestry research, education and training.
- ° Promote sound development of trade and commerce of forest products.

3.2 Legislations which are considered of major importance for forestry apart from the State Forest Enactments passed between 1921 - 1935 include the Waters Enactment 1935, the Land Conservation Act in 1960, the National Land Code 1965, the Protection of Wildlife Act 1972, and the Malayan Timber Industry Board Act in 1973.

3.3 In terms of concept and objectives, the various State "Forest Enactments and Rules" have limited scope and depth to meet the present needs of a developmental industrial sector, which characterizes forestry today. In view of this there is an urgent need to revise the existing laws and have them upgraded in concept, scope and objectives to meet the present and foreseeable needs. Uniformity of such laws for application in all the States of Peninsular Malaysia have become more pressing. Consequently a draft of the proposed "Uniform Forest Act" for the States of Peninsular Malaysia has been prepared.

#### 4. ORGANISATION OF THE FOREST SERVICE

- 4.1 The Federal Forestry Department, which is under the Ministry of Primary Industries, is responsible for forestry sector planning, forestry research and development, provision of technical advice and services, as well as training facilities. The Department is headed by a Director-General, who is aided by two deputies and two assistants. The spectrum of activities is divided into functional units, each headed by a Director. The various units at Headquarters include Management, Silviculture, Planning, Forest Engineering, Forest Economics, Forest Education and Training, and Industrial Development and Timber Utilisation. In addition, the Director of Special Functions assists the Directorate on certain matters.
- 4.2 Forestry and forest products research is undertaken by the Forest Research Institute at Kepong in which are located an arboretum, a herbarium, nursery, soils laboratory, pulp and paper and fibreboard laboratory, a fully equipped timber research laboratory and experimental plantations.
- 4.3 At State level, each Forest Department is headed by a Director who is assisted by a Deputy (in many cases), a State Silvicultural Officer and District Forest Officers; the number of District Forest Officers being dependent on the size of the State. All the professional officers are in turn assisted by sub-professionals in most cases. All professional and sub-professional officers are Federal Officers seconded to the States and are liable for transfer to any part of Peninsular Malaysia. The uniformed field staff on the other hand (Forest Rangers and Foresters) are State employees. The organisational structure of the Forestry Department is shown in Chart 1.

## 5. FOREST RESOURCE

- 5.1 The total forested land in Peninsular Malaysia is about 7.20 million hectares (17.8 million acres), which is about 54.8 percent of the total land area. About 5.18 million hectares (12.8 million acres) of the forested land are located in the Permanent Forest Estate (P.F.E.) which is constituted for long-term forestry use, while the balance of 2.02 million hectares (5.0 million acres) are stateland forests destined for eventual conversion to agricultural development. The rate of agri-conversion envisaged in the revised Third Malaysia Plan is about 68,800 hectares (170,000 acres). See Maps 1 and 2.
- 5.2 Out of the total 5.18 million hectares (12.8 million acres) of Permanent Forest Estate, 3.28 million hectares (8.1 million acres) are Productive Forests and 1.90 million hectares (4.1 million acres) are protective Forests.
- 5.3 It is estimated that there are about 2.02 million hectares (5.0 million acres) of forest land suitable for agri-conversion, of which 1.46 million hectares (3.6 million acres) had already been logged either completely or partially. The extent of primary forest remaining unlogged is about 0.56 million hectares (1.4 million acres).
- 5.4 A very significant portion of the forest resource both within the proposed Permanent Forest Estate and agri-conversion forests had already been logged. The extent of virgin forests is about 1.82 million hectares (4.5 million acres). The total forest available for timber production is about 3.76 million hectares (9.3 million acres). Details are shown in Table 1.

TABLE I  
STATUS OF FORESTED LAND IN PENINSULAR MALAYSIA

Status of Forest	Million hectares	Loggable Forests million hectares
<u>Proposed Permanent Forest Estate</u>		
Virgin forests	1.26 *(3.1)	1.26 (3.1)
Logged over forests	2.02 (5.0)	1.21 (3.0)
Unproductive forests	1.90 (4.7)	-
Total	5.18 (12.8)	2.47 (6.1)
<u>Land Suitable for Agriculture</u>		
Virgin forests	0.56 (1.4)	0.56 (1.4)
Logged over forest	1.46 (3.6)	0.73 (1.8)
Total	2.02 (5.0)	1.29 (3.2)
GRAND TOTAL	7.02 (17.8)	3.76 (9.3)

\* ( ) value in million acres.

5.6 Nevertheless, the long-term timber supply in Peninsular Malaysia will depend on the productive forests in the Permanent Forest Estate totaling about 3.28 million hectares (8.1 million acres).

## 6. FOREST MANAGEMENT AND SILVICULTURE

### 6.1 Forest Management

There is no clearly defined forest management system in Peninsular Malaysia. Traditionally, a nominal rotation of 50 or 70 years is adopted for the determination of the annual coupe which often cannot be adhered to in practice. In addition, yield is regulated by the imposition of a minimum felling limit of 137 cm (4.5 ft.) girth at breast height under the Malayan uniform System (MUS).

Over the past few years considerable efforts have been devoted to the rationalisation of forest management in Peninsular Malaysia. In an endeavour to ensure sustained yield and environmental stability, the following forest management strategy has been adopted.

- ° to manage and utilise the forest resource for maximum benefit based on the inherent capability of the forest and its optimal use;



- ° to manage the utilisation of the forest resource based on comprehensive forest land use and management plans;
- ° to determine potential yield on the basis of systematic and in-depth appraisals of the forest resource base, its growth potential and other relevant factors;
- ° to regulate long flows based on a careful balance of supply and demand and maximum utilisation prospects and constraints;
- ° to harvest the forest resource conservatively by selective felling and retention of adequate natural regeneration, consistent with economical harvesting, to ensure the sustainability of the forest resource base; and
- ° to apply optimal forest management regimes developed on the basis of information generated by systematic integrated forest management and operations research.

In line with the Forest Management Policy and Strategy mentioned above, a Forest Management Development Programme was initiated under the Third Malaysia Plan. The Programme, which is essentially developmental and extension in nature, has three major components, namely: -

- ° quantification and characterisation of the forest resource base;
- ° planning of forest land use and management; and
- ° development of a sound and practical forest management system.

Under the Programme, a Disturbed Forest Inventory within the proposed PFE has been launched throughout Peninsular Malaysia and to date about 0.4 million hectares (1 million acres) have been surveyed. Forest Resources Appraisals have been completed for selected Forest Management Units (FMU) and Forest Landuse, Forest Management and Operation Plans have been drafted for some of these Units.

The most important purpose of the Programme is the evolution of a sound and practical forest management system for Peninsular Malaysia which will optimise the objectives of management under prevailing conditions. A Selective Management System (SMS) has been proposed based on a preliminary assessment of the forest resource base and its characteristics, the socio-politico-economic situation, and a common sense approach to resource management. The System requires the selection or management

(felling) regime based on inventory data, instead of an arbitrary prescription, which will be equitable to both the logger and the forest owner as well as ensure environmental stability. It is currently being evaluated through systematic and integrated studies in forest management and operations.

## 6.2 Silvicultural Practice

The systematic management of the forest resource in Peninsular Malaysia began since the beginning of this century. The earliest silvicultural management system introduced was the Regeneration Improvement Fellings (RIF) where only a few species were selectively removed. Only small areas of Lowland Forest Reserves were opened for exploitation followed by a series of silvicultural treatment done so cautiously under the R.I.F. System. The raising of future crops were confined to very few preferred species mainly the heavy hardwoods. Later as more areas in Forest Reserves were opened for exploitation, the R.I.F. System was found to be impracticable and uneconomical. Moreover, the war years showed that a departure from the R.I.F. System produced results which were not detrimental to the objective of raising high yielding crops of economic timber species. However, with the introduction of mechanical harvesting and the rapid growth of wood-based industries, substantial changes in silvicultural management system had to be made to meet the increasing demand for timber. Thus after the Second World War, the Malayan Uniform System (MUS) was formulated in 1948. The evolution of this system was due to the economic necessity of exploiting in one operation owing to the introduction of mechanised felling, road making and the lack of demand for firewood which made the felling of small sized trees uneconomical. Therefore, MUS can be described as the felling or removal in natural forests, in a single operation and followed immediately by the poison-girdling of unwanted or relic trees. An Enumeration (EN) of all the trees of exploitable size is carried out at the time of the seedling regeneration sampling (LSM). The sequence of operations carried out under MUS are as follows: -

<u>Symbol</u>	<u>Operation</u>	<u>Sequence (years)</u>
LSM	Milliacre sampling of regeneration )	n - 1 1/2 to n - 1/2
EN	Enumeration of big trees )	
F	Final Felling	n to n + 1
GCL	Poison girdling of unwanted trees and cutting and poisoning of climbers	immediately after F
LS 1/4	Quarter chain square sampling of saplings	n + 4 to n + 5
LS 1/2	Half chain square sampling	n + 8 to n + 10
LRS	Half chain square sampling of new crop	n + 20

The success of the MUS depends on the availability of well distributed seedlings of the required species at the time of felling. This is determined by the LSM which is a must, and the single most important operation in the system. In many forests, particularly rich hill Dipterocarp forests where shoreas (meranti) is predominant, there is always a sufficient minimum regeneration before the removal of mother trees. This condition, however, is not found in a large number of our forests.

Furthermore, where an area is opened for felling a number of years after sampling of the regeneration is carried out, the seedlings present at the time of sampling may have died or reduced in number at the time of felling. Therefore, this makes LSM operation redundant and MUS needs modification under such circumstances.

As a system, the MUS worked rather well for lowland forests but application in the hill forests has resulted in a number of inherent limitations which can be summarised as follows: -

- ° Forest exploitation has progressed to the hills, where the ecological, silvicultural and environmental factors of the forest differs from those in the lowland forests.
- ° Patchy regeneration where seedlings are confined to ridge tops.
- ° Higher damage to regeneration caused by more mechanised logging operations, especially in rugged terrain of hill forests.
- ° Due to the scale of operation, and heavy capital commitments,

loggers cannot delay harvesting in order to ensure adequate regeneration on the ground which depends on the uncertain and varying fruiting habits of the desirable hill forest species.

In view of this, the Selective Management System was introduced as this system is more appropriate especially for the hill forests. There is no fixed or standard felling limit set, but instead, there is a floating girth limit for each logging area. This felling limit is based on a Pre-Felling inventory of the forest and the assessment of what constitutes an economic volume of timber extraction. The next crop is not dependant on the seedlings but on the entire residual stand.

## 7. FOREST INDUSTRIES

7.1 Timber processing is an important economic activity in Peninsular Malaysia. The structure of the timber industries at the end of 1979 is shown in Table 2:-

TABLE 2  
TIMBER PROCESSING MILLS IN PENINSULAR MALAYSIA  
1979

Type	No. of Mills	Input M <sup>3</sup>	Output M <sup>3</sup>
1. Sawmills	595	7.9 million (5.60m. tons)	4.8 million (3.39m. tons)
2. Plywood/veneer	35	1.1 million (0.8m. tons)	0.5 million (995.4m. sq.ft.)
3. Small log mills	88	-	-
4. Match factories	4	20,214 (14,285 tons)	730,264 cases of 120 packets
5. Woodwool slab	3	11,320 (8,000 tons)	65,030 M <sup>2</sup> (700,000 sq.ft.)
6. Particle board	1	29,755 (21,028 tons)	1.97 mi sq.m. (21.2 mi. sq.ft.)
7. Pencil factory	1	4,035 (2,851 tons)	502,881 gross of pencil.

7.2 The two most important types of timber processing are sawmilling and plywood/veneer manufacturing which consumed about 80% and 12% respectively of the total log production in 1979 and produced about 4.8 million cubic meters (3.39 million tons) of sawn timber and 0.5 million cubic meters (995.4 million sq.ft.) of plywood/veneer. Other timber

processing mills are relatively small in capacity and cater only the domestic markets such as match factories, woodwool slab, particle board and pencil factories.

7.3 From Table 2, it is clear that the timber industries of Peninsular Malaysia are confined mainly to primary processing which generates relatively low employment opportunities and produces products of relatively low unit value. The combined rated capacity of the sawmilling and plywood/veneer industries is about 12.7 million cubic meters (9 million tons) of log input a year, based on 1.1 - shift operation for the sawmills and 2 - shift operation for the plywood/veneer mills. With the present annual log production of not more than 9.9 million cubic meters (7 million tons) in Peninsular Malaysia, most of these mills are operating below this rated capacity.

7.4 The distribution of the sawmills and plywood mills is also found to be far from satisfactory because it does not reflect the distribution of forest resource base. The five timber deficit states of Kedah, Penang, Selangor, Negeri Sembilan and Malacca whose forest resource constitutes only 13% of the total resource in Peninsular Malaysia, have sawmills and plywood/veneer mills which constitute about 37% of the total number of those mills in the country. On the other hand the three timber rich east-coast states of Kelantan, Trengganu and Pahang whose total forest resource constitutes about 65% of the total for Peninsular Malaysia, have only 33% of the total sawmills and plywood/veneer mills. This accounts for the general flow of logs from the east coast to the west coast of Peninsular Malaysia. See Map 3.

7.5 In view of this, it is the policy of the government not to encourage the establishment of new primary processing mills in the country. However, in line with the National Forestry Policy to encourage fuller utilization of timber resources emphasis will be given to: -

- relocation and modernisation of existing wood-based industries in order to increase efficiency of operation through amalgamation and integration.
- the establishment of integrated wood manufacturing complexes.
- to encourage the utilisation of wider range of sizes and species

of timber with the development of further processing i.e. secondary and tertiary processing with the aim of diversifying the range of products and increasing the value added.

## 8. FORESTRY EDUCATION AND TRAINING

- 8.1 Until 1972 facilities for higher education in forestry (university level) were unavailable in Malaysia and all professional foresters were trained at overseas institutions principally in the United Kingdom and Australia. With the establishment of the University of Agriculture in 1972, however, university level training in forestry leading to a Bachelor of Science degree was introduced in 1973 with a planned intake of about 20 - 30 students annually.
- 8.2 Intermediate level training in forestry leading to a Diploma in Forestry has been conducted since 1968 as a joint programme between the MARA Institute of Technology, which provided the basic courses in the first year, and the Forestry Department, which provides training in forestry subjects in the second and third years. A new Forestry College Complex was established under the Second Malaysia Plan (1970 - 75) with the assistance of the United Nations Development Programme. It was completed in mid-1973 with the primary objective to produce sub-professional grade personnel for service with the Forestry Department as well as the wood-based industries. The Diploma course in Forestry College, Kepong was, however, being phased out and this function was taken over by the University of Agriculture. A total of 209 students have been trained by the College over the 10-year period (1968 - 1978).
- 8.3 Vocational training for field operatives has been conducted annually in Peninsular Malaysia at the Forest School, Kepong since 1927. From 1947 to 1975 a total of 1,756 forest guards have been trained. During the Third Malaysia Plan (1976 - 80) a total of 715 forest guards have been trained. For the Fourth Malaysia Plan (1981 - 85) about 1,000 forest guards will be trained. On the other hand, training of foremen and forest labourers is usually carried out at State level.
- 8.4 A Logging Training Centre was established in 1975 to train forest workers for the forest industries. The Centre is located in the State of Trengganu. The infrastructural costs were funded by the Malaysian

Government and the provision of training staff and heavy machinery were given by the New Zealand Government under the bilateral assistance. Three courses are run annually, namely: -

- Surveying and Forest Inventory Course
- Plant Operators Course, and
- Course in logging.

A total of 278 forest workers have been trained since 1975.

8.5 In addition to the regular courses outlined above, various inservice courses are conducted for all categories of staff.

## 9. PROBLEMS

The forestry sector of Peninsular Malaysia is beset with many problems. However, these problems can be traced back to three root problems which are enumerated as follows: -

- Rapid rate of resource depletion.
- High rate of resource wastage.
- Slow rate of resource replacement.

### 9.1 Resource Depletion

The present rate of logging is 320,045 hectares (790,822 acres) annually, i.e. 101,241 hectares (250,163 acres) in the Forest Reserves and 218,804 hectares (540,659 acres) in the State Land Forest, whereas the annual rate of areas opened up for agricultural development is 79,127 hectares (195,520 acres). In terms of log production, the present rate of logging yielded 9.9 million M<sup>3</sup> (7.0 million tons) annually. At the present rate of logging, it is estimated that all the remaining stateland forest would be completely logged by the year 1988. If the present rate of forest depletion and exploitation is not reduced and controlled, the current log production of about 9.9 million M<sup>3</sup> (7.0 million tons) per year will abruptly decrease to about 4.95 million M<sup>3</sup> (3.5 million tons) by the year 1993.

### 9.2 Resource Wastage

Resource wastage occurs both in the logging operations and also in the processing mills. It has been estimated that about 50% of the timber harvested are wasted in logging operations. On the other hand, wastage in processing mills is in the region of 30 - 35% in terms of offcuts, trimmings and sawdust.

### 9.3 Resource Replacement

The rate of forest resource replacement is very slow as compared to the rate of logging. To date about 336,466 hectares (831,397 acres) have been treated. This has resulted in the build-up of over 2.02 million hectares (5.0 million acres) of productive forest opened up without any form of silvicultural treatment being carried out. As such, sustained log production will be affected.

9.4 All the three critical issues above are inter-related. They tend to reduce the future timber supply in this country. Unless these problems are remedied quickly, the long-term strength and viability of the forestry sector in Peninsular Malaysia would be affected.

### 9.5 Solutions to the Problems

In view of the impending timber shortage in Peninsular Malaysia in the nineties, the Forestry Department has embarked on a number of Forest Development Programmes on a big scale, particularly under the Fourth Malaysia Plan (1981 -85). Apart from this, the following measures should be taken as quickly as possible to conserve the existing forest resources and thus prolong and reduce the adverse socio-economic impacts of the impending crisis: -

- Establishment of Permanent Forest Estate (PFE) of about 5.18 million hectares (12.8 million acres) as agreed by the National Forestry Council as soon as possible.
- To reduce the present rate of logging of about 320,045 hectares (790,822 acres) annually to 74,870 hectares (185,000 acres) in Forest Reserves and 68,799 hectares (170,000 acres) in the State-land forests.
- To carry out forest inventory to determine the status of the forests.
- Establish forest plantations with quick-growing species to augment the timber supply during the deficit years.
- Intensify sound forest management and development of the natural forests in accordance with the forest opening.
- Intensify research activities on forest management and development; also to find ways and means of utilising the lesser-known timber species and to reduce timber wastage.



- Implement intensive training programmes to upgrade skills of the Forestry Department's staff and also private sectors, particularly in the field of forest management and development.

#### 10. FOURTH MALAYSIA PLAN (1981 - 1985)

10.1 Forest Development Programmes under the Fourth Malaysia Plan (1981-85) have been formulated in an effort to elevate the above-mentioned issues. The following strategies have been adopted under the Fourth Malaysia Plan for the forest sector development: -

- It is necessary to adopt conservational forest management policies and strategies which will ensure balanced use of the remaining natural forest resource through more effective resource allocation planning, more efficient harvesting and optimum forest resource utilisation.
- It is necessary to ensure fuller utilisation of the harvested raw material through more efficient processing, better industrial management and more innovative marketing of the finished product.
- It is absolutely necessary to adopt dynamic and expanding timber production policies and strategies which will ensure resource renewal not only to meet domestic requirements but also to take advantage of future export opportunities.

10.2 To fulfill the above strategies, seven programmes of activities have been formulated by the Forestry Department during the Fourth Malaysia Plan (1981 - 1985) after serious consideration of the national forest policy, the socio-economic and political requirements of the New Economic Policy and the capabilities of the Department. The seven programmes consist of twenty-three (23) forestry projects and can be enumerated as follows: -

FOURTH MALAYSIA PLAN (1981 - 85)

PROGRAMME	PROJECT
1. Forest Resource Management	1.1 National Forest Inventory 1.2 National Forestry Statistics 1.3 Forest Management and Development.
2. Forest Resource Development	2.1 Compensatory Plantation
3. Forest Research	3.1 Natural Forest Production 3.2 Plantation Forest Production 3.3 Community Forest Production 3.4 Forest Biology, Conservation and Protection
4. Forest Products Research	4.1 Waste wood utilisation 4.2 Development and utilisation of Timber 4.3 Utilisation of rubber wood, coconut and oilpalm stems 4.4 Minor Forest Products
5. Forestry Training	5.1 Staff In-service Training
6. Infrastructure Development	6.1 Infrastructure Development at Forest Research Institute (FRI) 6.2 Establishment of Field Centres 6.3 Forest Infrastructure Development
7. Third Malaysia Plan Continuation Projects	7.1 Infrastructure Development of FRI 7.2 Natural forest and Plantation Research 7.3 Wood Chemistry Research 7.4 Production Oriented Research 7.5 Education and Training Facilities 7.6 Timber Utilisation Research 7.7 Extension to Headquarters Building

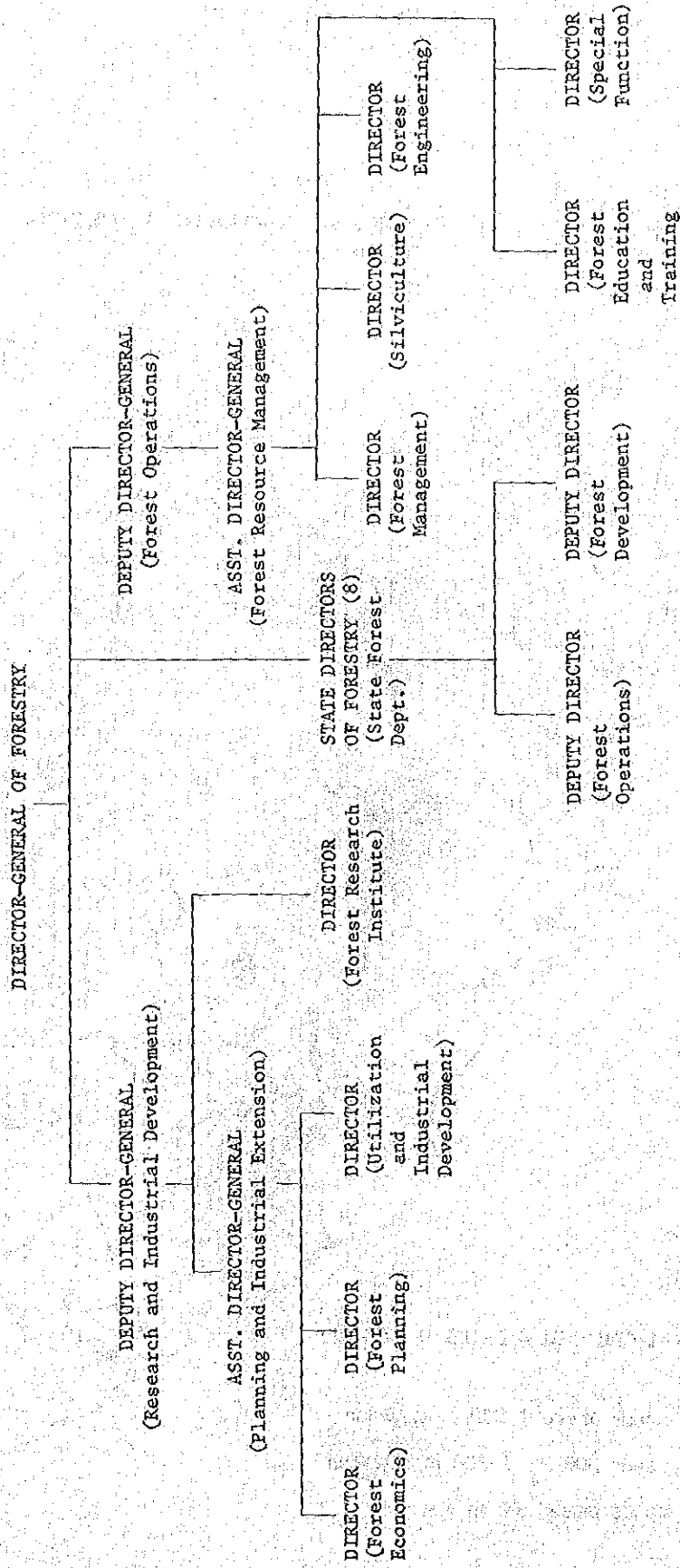
10.3 To meet its wood requirements in Peninsular Malaysia, forest plantations will be planted with quick-growing species such as Yamane (*Gmelina arborea*), Tropical pines, *Albizia falcataria*, *Eucalyptus* spp. and others. During the Fourth Malaysia Plan (1981 -85), 5,423 hectares (13,400 acres) will be planted annually. The total acreage

of compensatory plantations over the subsequent Malaysia Plans is 189,000 hectares (467,000 acres) which will be able to supplement the projected timber deficit in the nineties. These species will be planted on a 15-year rotation period which will be able to produce an annual timber production of 1.1 million cubic meters (0.8 million tons) between 1996 to the year 2,000.

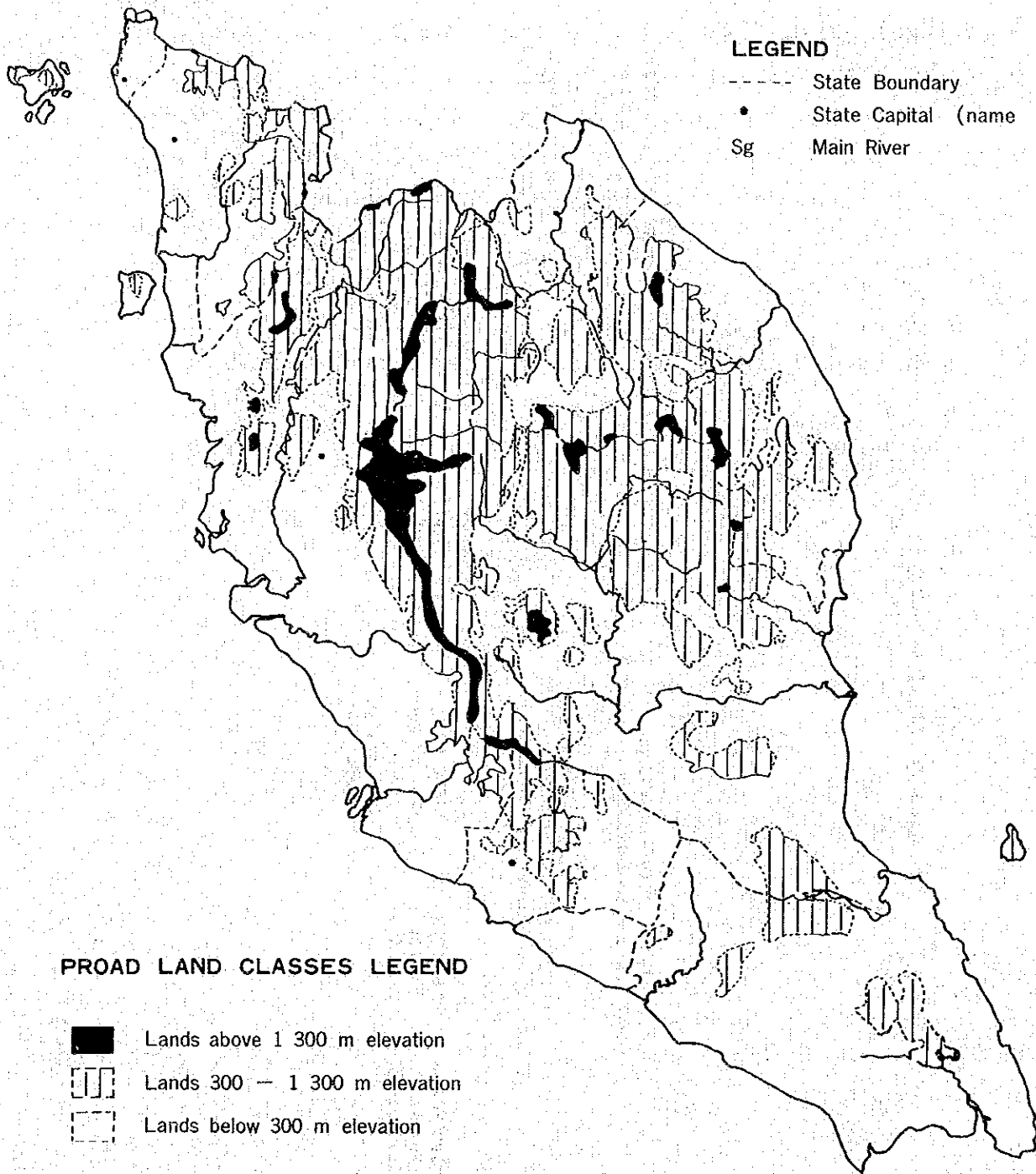
## 11. CONCLUSION

- 11.1 The timber resources of Peninsular Malaysia has been and continues to be a major contributor to the socio-economic well-being of the country. Therefore, as a national renewable asset, it should be planned and developed according to national objectives and priorities so that the country will continue to enjoy the benefits generated from forestry and forest industries.
- 11.2 However, the rapid rate of resource depletion without adequate forest development is viewed with serious concern. In view of this the above-mentioned policies and strategies need to be implemented.

CHART I. THE ORGANISATION OF THE FOREST DEPARTMENT  
PENINSULAR MALAYSIA

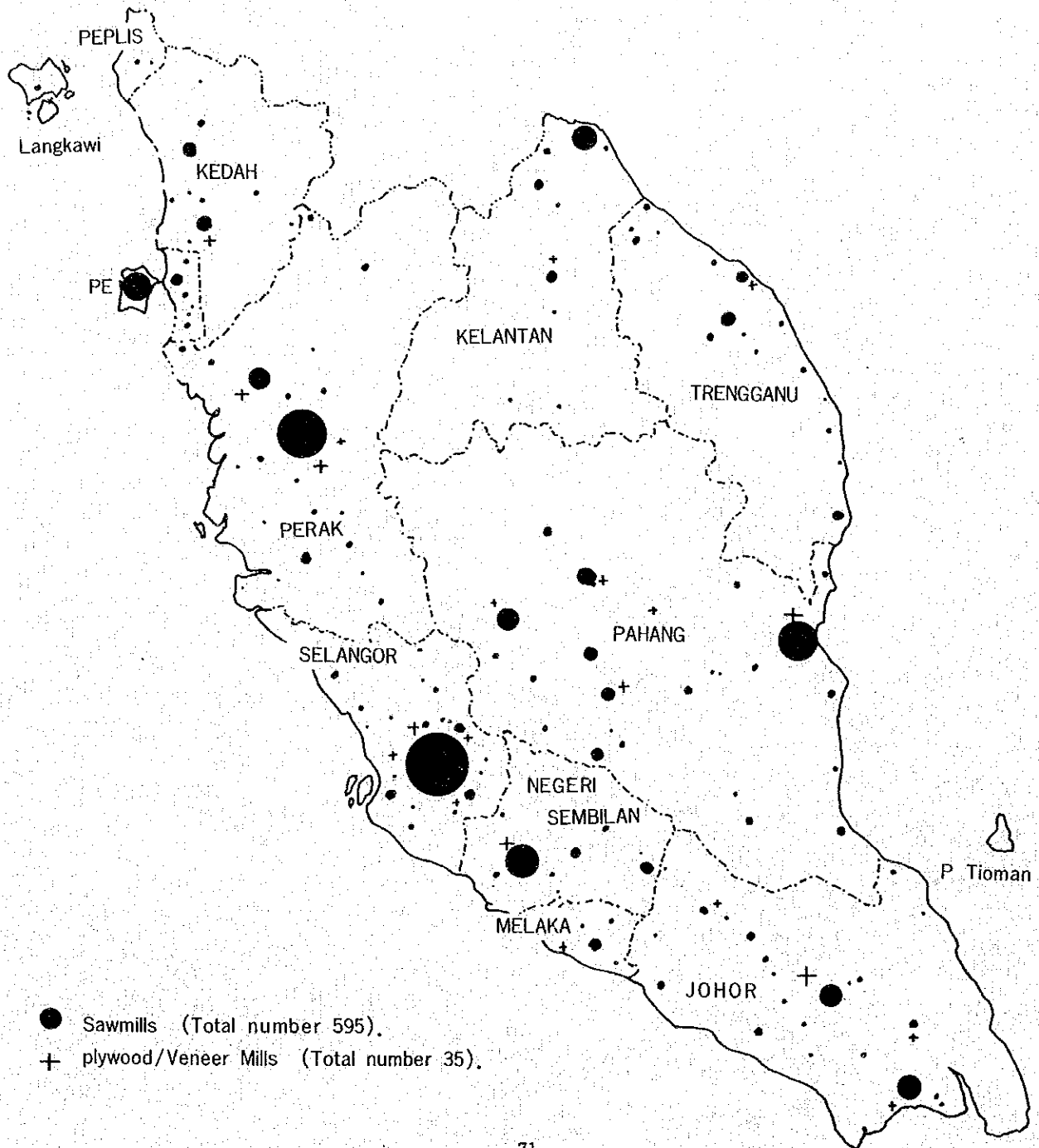


Map 1  
PENINSULAR MALAYSIA - GENERAL



Map 2

DISTRIBUTION OF PRIMARY WOOD PROCESSING INDUSTRIES  
IN PENINSULAR MALAYSIA



1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in the context of public administration and financial management. The text highlights that records should be kept in a clear, organized, and accessible manner, ensuring that all relevant information is captured and preserved for future reference.

2. The second part of the document outlines the various methods and tools used for record-keeping. It mentions the use of traditional paper-based systems as well as modern digital technologies such as databases, spreadsheets, and cloud storage solutions. The text stresses the importance of choosing the right method based on the specific needs and requirements of the organization, while also considering factors like cost, security, and ease of use.

3. The third part of the document focuses on the legal and regulatory aspects of record-keeping. It discusses the various laws and regulations that govern the retention and disposal of records, including the Freedom of Information Act and the Public Access to Information Act. The text emphasizes that organizations must be aware of these legal requirements and ensure that their record-keeping practices comply with all applicable laws and regulations.

4. The fourth part of the document discusses the importance of data security and privacy in record-keeping. It highlights the need to implement robust security measures to protect sensitive information from unauthorized access, disclosure, or loss. The text mentions the use of encryption, access controls, and regular security audits as key strategies for ensuring data security and privacy.

5. The fifth part of the document discusses the importance of record-keeping for decision-making and performance evaluation. It emphasizes that accurate records provide valuable insights into organizational performance, trends, and challenges. The text highlights that records can be used to identify areas for improvement, track progress, and make data-driven decisions that lead to better outcomes.

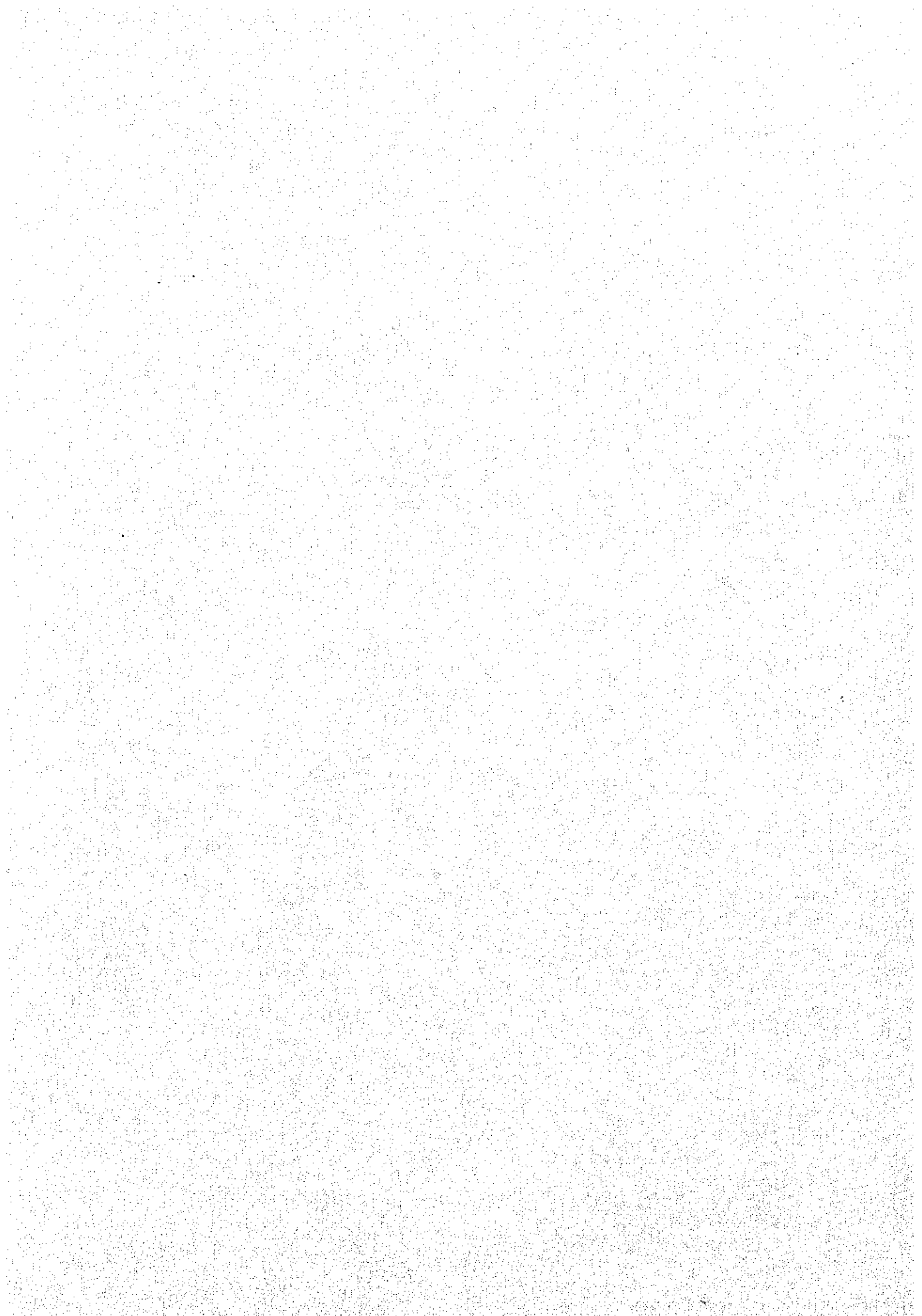
6. The sixth part of the document discusses the importance of record-keeping for disaster recovery and business continuity. It emphasizes that records are a critical asset for organizations, and having a robust record-keeping system in place is essential for ensuring that the organization can recover from a disaster and continue its operations. The text mentions the importance of having backup copies of records and a clear disaster recovery plan.

7. The seventh part of the document discusses the importance of record-keeping for historical and cultural preservation. It emphasizes that records are a valuable source of information about the past, and maintaining accurate records is essential for preserving the organization's history and culture. The text mentions the importance of archiving records and ensuring their long-term preservation.

8. The eighth part of the document discusses the importance of record-keeping for research and innovation. It emphasizes that records provide a wealth of data that can be used for research and analysis, leading to new discoveries and innovations. The text mentions the importance of organizing records in a way that makes them easy to search and analyze, and the importance of sharing records with researchers and other stakeholders.

9. The ninth part of the document discusses the importance of record-keeping for public participation and transparency. It emphasizes that records are a key tool for ensuring that the public has access to information about government activities and decisions. The text mentions the importance of making records available in a user-friendly format and providing clear instructions on how to access and use the records.

10. The tenth part of the document discusses the importance of record-keeping for accountability and trust. It emphasizes that accurate records are essential for holding individuals and organizations accountable for their actions. The text mentions the importance of maintaining records of all transactions and activities, and the importance of ensuring that these records are accurate and reliable.





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