

## 付 属 資 料

- 1．実施細則、協議議事録、要請書( Terms of Reference )
- 2．主要面談者リスト
- 3．質問書
- 4．収集資料リスト
- 5．ローカルコンサルタントリスト



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## PROFORMA FOR PROJECT-TYPE CO-OPERATION

### 1.0 TITLE OF PROJECT

SLOPE DISASTER MANAGEMENT STUDY FOR FEDERAL HIGHWAYS  
IN MALAYSIA.

### 2.0 BACKGROUND

The New Economic Plan (NEP), or Outline of Perspective Plan (OPP1) from 1971 through 1990 brought about great progress in the Government's effort to a good road infrastructure network throughout the country. Together with other objectives, NEP intended to increase the economic status and to promote development of the rural and under-developed regions of the country. During this period the priority was to implement numerous road projects in those regions.

In the successive plan, Outline of Perspective Plan (OPP2) for 1991 - 2000, another function of roads was demanded in the development of the nation. This plan, which encompasses the Sixth and Seventh Malaysia Plan, gives emphasis on improving the inflow of urban linkages and alleviating transport-related problems arising from rapid urbanization of major towns and cities. A huge budget has been provided for the construction of new road links, upgrading the capacity of the existing road network and the construction of ring roads. Despite the unexpected economic crises in 1998 - 1999, most of the projects in these aspects have been enthusiastically carried out by the government with minimum effect.

The Highway Network Development Plan (HNDP) study, which was conducted in 1991, proposed a road network configuration for Peninsular Malaysia, Sarawak and Sabah to sustain the ever increasing demand for a good reliable and efficient road network system in striving towards becoming an industrialised nation by the year 2020.

In such social background, the infamous Genting Bypass landslide occurred in June 1995, taking the lives of 21 people. In addition to this tragedy, a number of disaster related with slope failure happened throughout the country in these years which resulted significant damages and casualties. It is our concern that many more of such disasters may happen in the future in accordance with further development in the whole nation including mountainous region.

The building of nationwide road network requires more and more construction of new roads in mountainous region, which inevitably leads to the increase in the number of slopes. Some of the natural conditions, such as meteorological, geographical and geological conditions, cause the problem of instability of these slopes along roadside; large amount of precipitation through the year, steep mountain slope and laminated structures and/or heavy weathering of rocks under tropical conditions. Even at present many sections of the highway routes in operation or under construction are facing frequent traffic control or postponement of service operation due to risk of slope failures.

The establishment and maintenance of nationwide road network of high quality is indispensable for the achievement of an industrialised nation before 2020. Under these circumstances it is urgent for the nation to secure the safety and efficiency of road transportation by the implementation of the slope disaster management system.

### **3.0 OBJECTIVES**

#### **3.1 Purpose (Short-term Objectives) of the Study**

The main objectives of the Study will be:

- (i) To study present condition of slopes along the federal highways and their slope disaster management methods and systems.
- (ii) To recommend a slope disaster management plan for the selected federal highway(s).
- (iii) To develop a slope disaster management information system.
- (iv) To develop guidelines for slope classification, inspection and investigation, monitoring, and utilisation of the slope disaster management information system.
- (v) To develop a human resource development programme.
- (vi) To receive technology transfer from foreign experts.

#### **3.2 Goal (Long-term Objectives) of the Study**

The goal of the Study will be:

- (i) To reduce the risks of slope disaster along the federal highways and roads in Malaysia, and to maintain safe and smooth passage in order to avoid human losses and disturbance on economic activities,
- (ii) To apply methodology, system and lessons of the pilot study to other roads in Malaysia.

### **4.0 PROJECT DESCRIPTION**

The Study area for the slope disaster management will cover slopes along the federal highways and roads.

In the first stage, representative federal highways and roads will be selected for a preliminary study to grasp the present condition of slopes, slope failures and their

management methods. Candidates for the representative federal highway and road include (Figure 1):

- East - West Highway
- Simpang Pulai - Lojing Highway (2nd East - West Highway)
- Gap - Fraser Hill Road
- Tamparuli - Sandakan Road
- Penang Federal Road 6
- Bentong - Gua Musang Road
- Others

In the second stage, one or two federal highway(s) will be selected, as a pilot site(s), for a detailed study. The selection will be based on the seriousness of the slope problem, geological conditions, mode of failures, geographical distribution, economic importance and so on.

The Study will include undertaking of the followings:

- (i) A study of the present condition of slopes along the representative federal highways and their disaster management methods and systems.
- (ii) Geological, geotechnical and geophysical investigation for typical slopes along the selected highway(s).
- (iii) Installation of slope monitoring system for typical slopes.
- (iv) Establishment of a slope disaster management information system.
- (v) Recommendation for a slope disaster management plan for the selected highway(s).
- (vi) Development of guidelines for slope classification, inspection and investigation, monitoring, and utilisation of the information system.
- (vii) To have technology transfer
- (viii) To formulate a human resource development programme

## 5.0 PREVIOUS STUDY

The Public Works Department has conducted studies on slope disaster along the federal highways such as "An Evaluation of Earthwork and Slope Problems on the Tamparuli-Ranau Highway in Sabah" which was carried out in 1991 by IKRAM and Transport & Road Research Laboratory, UK and "East-West Highway Long Term Preventive Measures and Stability Study" which was carried out in 1996 by JKR. These studies focused mainly on the post disaster relief, rehabilitation and reconstruction.

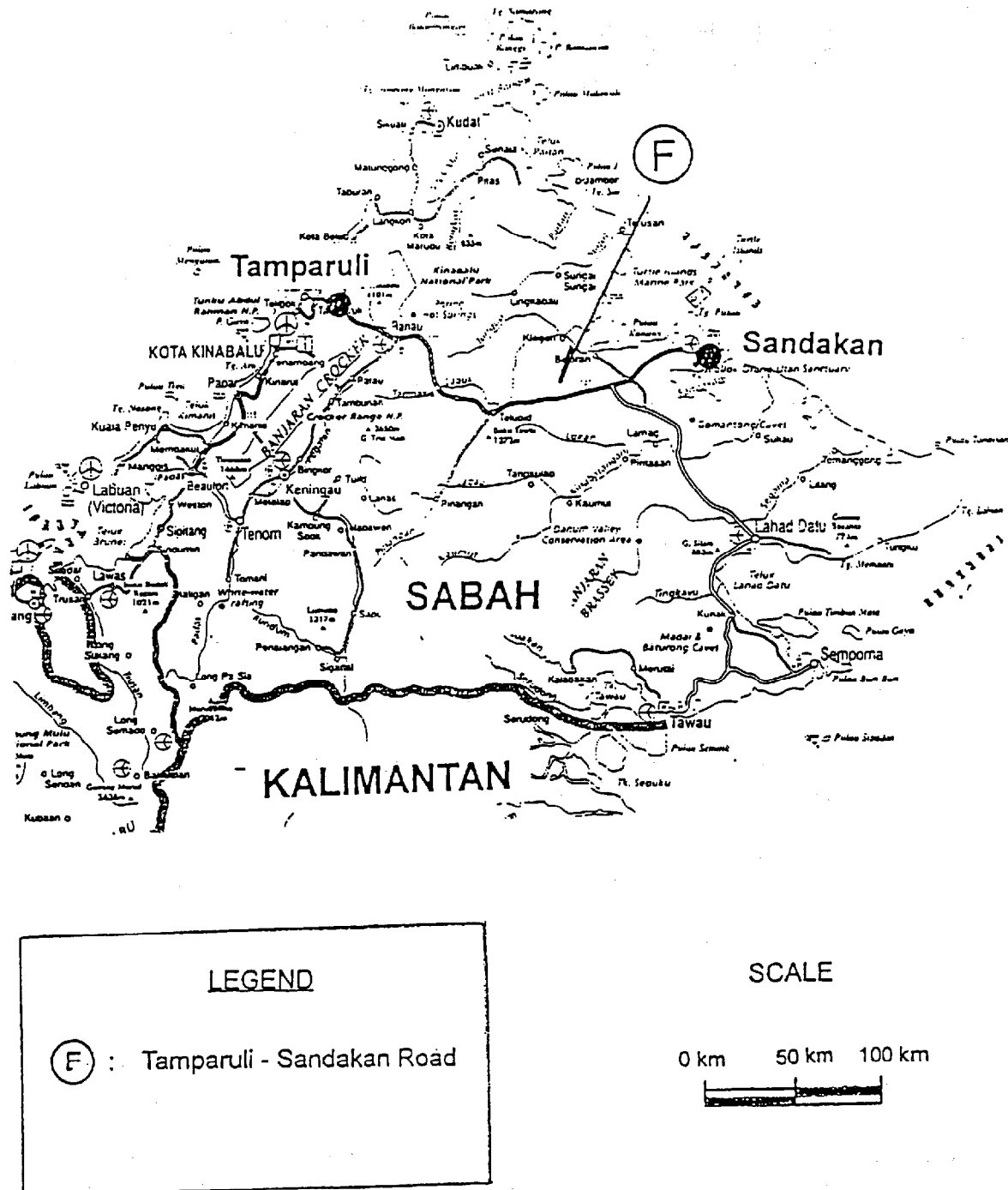


Figure 1 (b) Location Map of the Study Area, Sabah

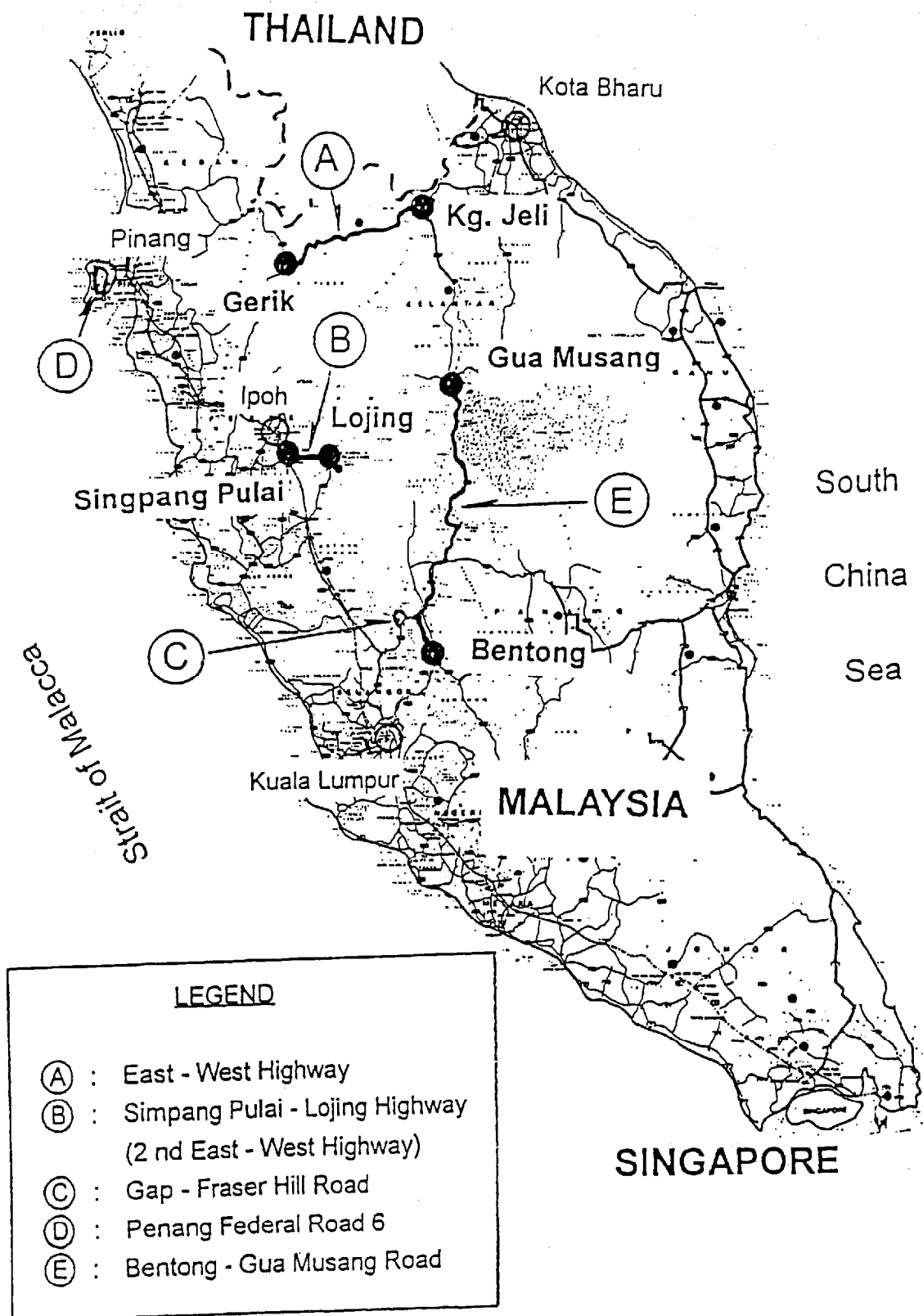


Figure 1 (a) Location Map of the Study Area, Peninsular Malaysia

The studies also highlighted seriousness of slope disasters along the federal highways and roads as well as an urgent need of a slope disaster management system which will reduce the risk of slope disaster and maintain safe and smooth passage of highways and roads.

## 6.0 PARTICIPATING AGENCIES

The Public Works Department Malaysia (JABATAN KERJA RAYA MALAYSIA, JKR) will be the lead agency and will be assisted by two other agencies, namely Geological Survey Department Malaysia, and Malaysian Meteorological Services Department.

## 7.0 SCOPE OF WORK

The scope of work for the Study will include the following (Figure 2):

1. Planning of the Study

A study plan will be formulated. After consultation with concerned agencies and organisations, a set of principles and framework of the Study will be generated and adopted.

2. Inventory Collection and Analysis

Data and information related to the Study will be collected and compiled. These data and information include:

- (a) Road system in Malaysia
- (b) Topographical maps and geological maps
- (c) Aerial photographs and satellite photographs
- (d) Natural conditions
- (e) Meteorological conditions
- (f) Social and economic conditions
- (g) Design methods of road
- (h) Traffic volume
- (i) Existing study on slope failures
- (j) Existing methods and systems for slope disaster management
- (k) Existing database / GIS / information systems
- (l) Related development plans
- (m) Institutional and legal aspects and
- (n) Others as required

3. Review of Existing Studies, Methods and Systems

From the collected and filed data and information the following issue will be reviewed:



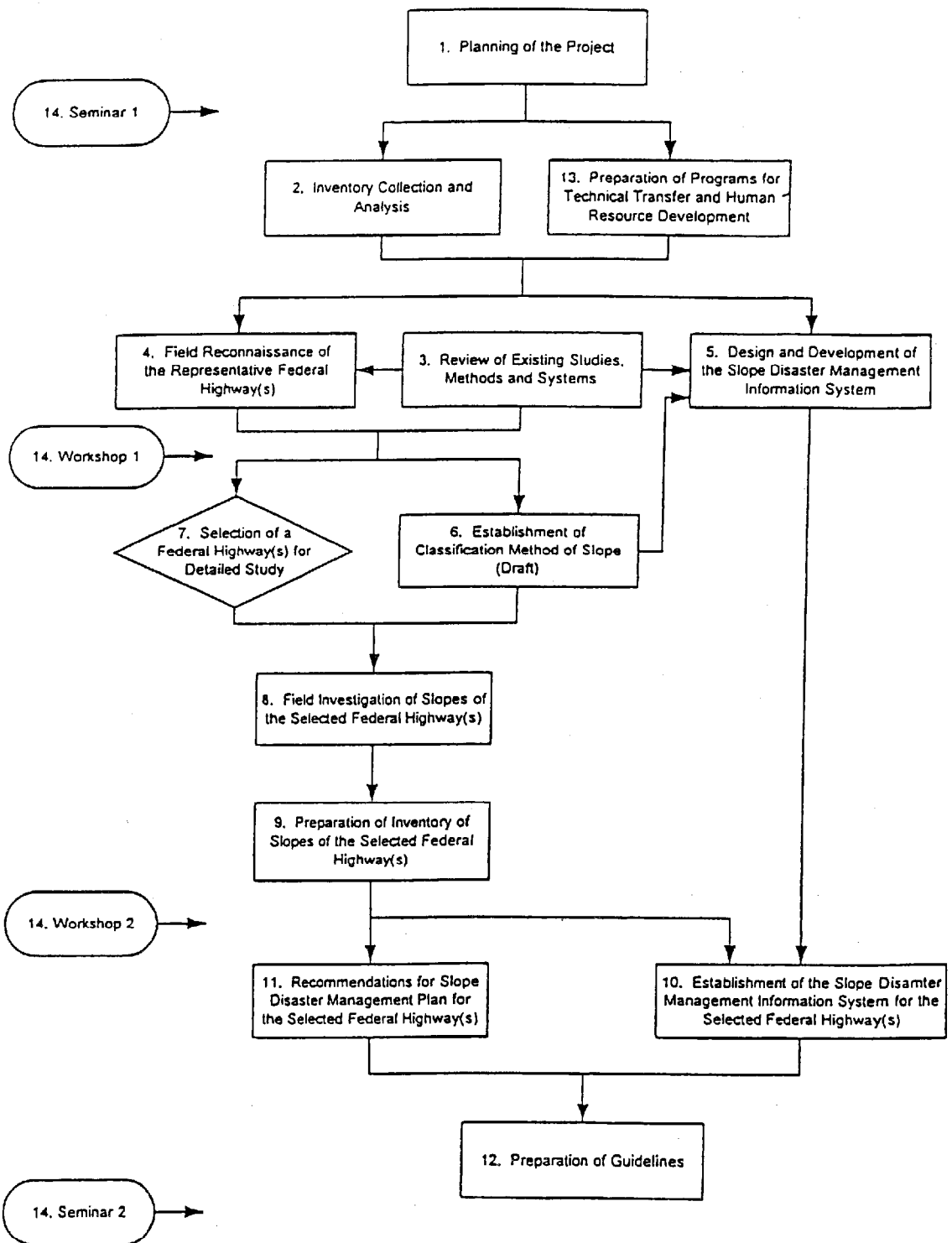


Figure 2 Flowchart of the Study

- (a) Slope failures
- (b) Investigation and inspection method of slope
- (c) Classification method of slope
- (d) Design method of slope
- (e) Strengthen method of slope
- (f) Traffic Control System

4. Field Reconnaissance of the Representative Federal Highways

For the representative federal highways, field reconnaissance will be carried out to study current conditions and practices including slope failures and their repair and reconstruction methods.

5. Design and Development of the Slope Disaster Management Information System

An slope disaster management information system, which will be compatible with the existing system of JKR, will be designed and developed. Required hardware and basic software of the information system will be determined, procured and installed.

6. Establishment of Classification Method of Slope (Draft)

From the study of existing data and information (Task 3) and the field reconnaissance (Task 4), the existing slope classification (or ranking) system of JKR will be refined and a draft of classification method of slope will be proposed.

7. Selection of a Federal Highway(s) for Detailed Study

Based on the inventory collection and analysis (Task 2), the study of existing data and information (Task 3) and the field reconnaissance (Task 4), one or two federal highway(s) will be selected for a detailed study.

8. Field Investigation of Slopes of the Selected Federal Highway(s)

Slopes of the selected federal highway(s) will be categorised according to the classification method of slope (draft) established in Task 6. Typical slopes will be identified for field investigation which comprises of geological survey, drilling and geophysical survey. Slope monitoring system will be installed at a selected slope(s).

9. Preparation of Inventory of Slopes of the Selected Federal Highway(s)

From the study of Task 8, an inventory of slopes of the selected federal highway(s) will be prepared.

10. Establishment of the Slope Disaster Management Information System for the Selected Federal Highway(s)

The inventory (Task 9) and basic data and information collected in Task 3 will be digitised and the database will be established. The hazard and risk maps will be prepared for the selected federal highway(s).

11. Recommendations for Slope Disaster Management Plan for the Selected Federal Highway(s)

Recommendations for a slope disaster management plan for the selected federal highway(s) will be prepared. The management plan will focus on:

- monitoring and warning
- traffic control system

12. Preparation of Guidelines

From the lessons learned or output from Tasks 3, 4, 8, 10 and 11, the following guidelines will be finalised or prepared:

- classification method of slope
- slope inspection and investigation
- monitoring
- utilisation of the slope disaster management information system

13. Preparation of Programs for Technical Transfer and Human Resource Development

A program for technical transfer and human resource development will be instituted.

14. Seminars and Workshops

As a means to disseminate information and to monitor the progress of the Study, two seminars, one at the start and another at the end of the Study will be conducted. Two workshops will be held at half way through the first and second years, respectively.

15. Reports

An inception report at the start of the Study, periodical progress reports, a mid-term interim report and a final report will be prepared.

## 8.0 PROJECT IMPLEMENTATION

The Study is scheduled to begin in July 2000 and is expected to last for twenty four months. The proposed source of assistance is the Japan International Cooperation Agency (JICA). A Steering Committee of all participating agencies, the Federal Economic Planning Unit (EPU) and representative of JICA will see to the proper implementation of the Study.

The first year of the Study will involve the following (Figure 3):

1. Planning of the Study
2. Inventory Collection and Analysis
3. Review of Existing Studies, Methods and Systems
4. Field Reconnaissance of the Representative Federal Highways
5. Design and Development of the Slope Disaster Management Information System
6. Establishment of Classification Method of Slope (Draft)
7. Selection of a Federal Highway(s) for Detailed Study
13. Preparation of Programs for Technical Transfer and Human Resource Development

The second year of the Study will involve the following:

8. Field Investigation of Slopes of the Selected Federal Highway(s)
9. Preparation of Inventory of Slopes of the Selected Federal Highway(s)
10. Establishment of the Information System for the Selected Federal Highway(s)
11. Recommendations for Slope Disaster Management Plan for the Selected Federal Highway(s)
12. Preparation of Guidelines

In addition, two seminars, one at the start and another at the end of the Study will be conducted. Two workshops will be held at half way through the first and second years, respectively.

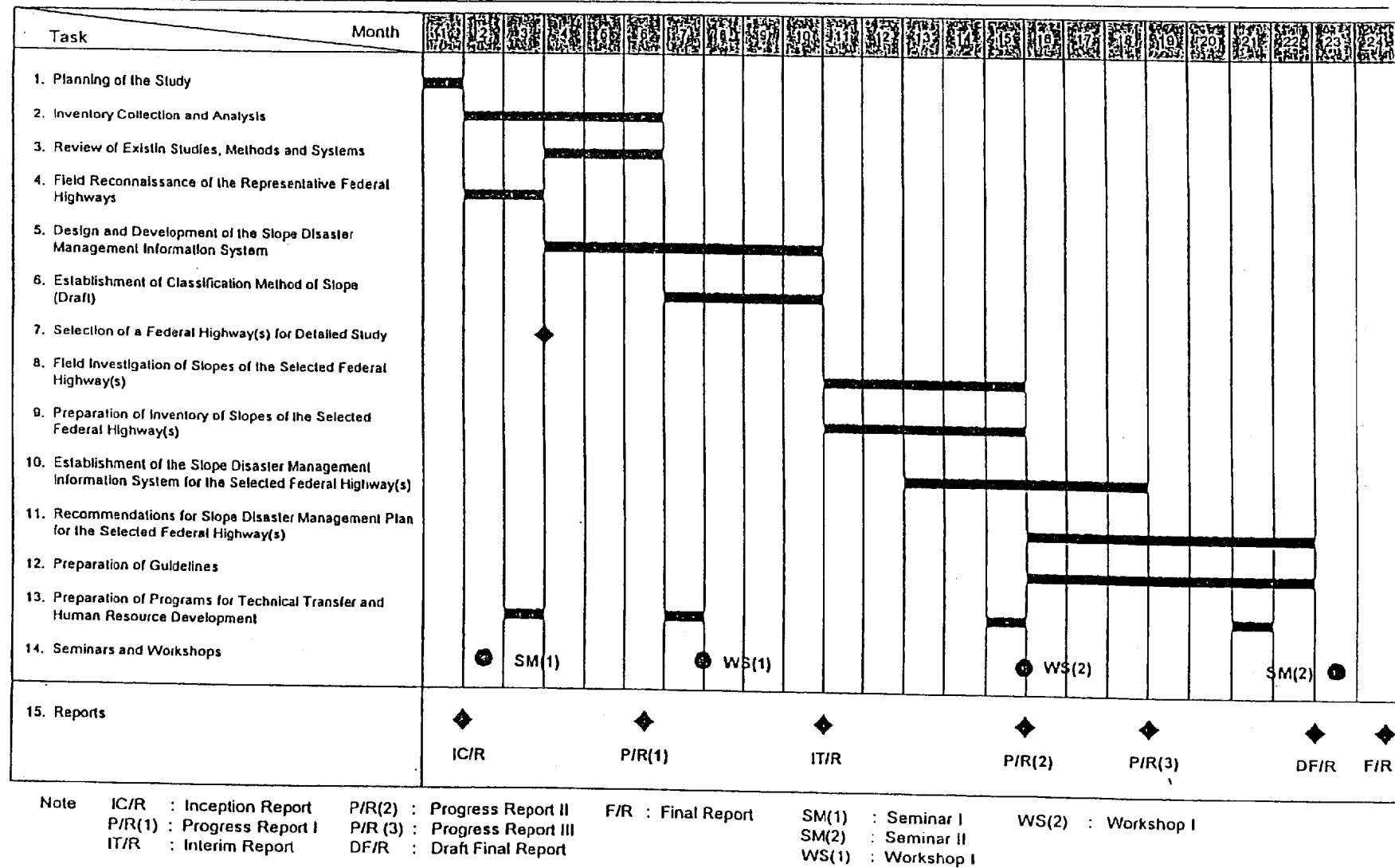


Figure 3 Time Schedule of the Study

## 9.0 RESOURCES SUPPLIED BY THE HOST COUNTRY

### 9.1 Manpower

The list of the local officials involved in the Study is shown in Table 1.

Table 1 List of local experts

Designation	Number	Agency	Time Involved (months)
Counterpart leader	1	JKR	10
Road Engineer	3	JKR	10 each
Geologist/Engineering Geologist	1	GSM	10
Geotechnical Engineer	1	JKR	10
Meteorologist	1	MMS	5
GIS Personnel	2	JKR	10 each
Database Personnel	2	JKR	10 each
Regional Road Manager	9	JKR	2 each

### 9.2 Equipment and Vehicles

The Public Works Department Malaysia will provide transportation for the Study.

### 9.3 Office Space

The Public Works Department Malaysia will provide sufficient space for the foreign experts to work in.

### 9.4 Local Cost Estimates

The local contribution will be RM 56,300. These costs are for office furnishing and maintenance (RM 4,900), field allowances (RM 38,400), supplies and maintenance of vehicles (RM 4,000), and office supplies and consumable (RM 9,000) as shown in Table 2.

Table 2 Estimated Local Cost

Item	FY2000	FY2001	Total
Office Furnishing and Maintenance	RM3,700	RM1,200	RM4,900
Allowances	RM19,200	RM19,200	RM38,400
Supplies and Maintenance	RM2,000	RM2,000	RM4,000
Office Supplies and Consumable	RM8,000	RM1,000	RM9,000
Total	RM32,900	RM23,400	RM56,300

## 10.0 FOREIGN ASSISTANCE REQUIREMENTS

### 10.1 Expertise

A list of foreign experts required for the Study is shown in Table 3.

Table 3 List of Foreign Experts

Designation	Number	Time Involved (months)
Team Leader (Road Disaster Manager)	1	10
Engineering Geologist 1	1	7
Engineering Geologist 2	1	7
Geotechnical Engineer / Monitoring Specialist	1	7
Road Engineer 1 / Slope Designer	1	7
Road Engineer 2 / Cost Estimator	1	3
Transportation Engineer / Road Planner	1	3
Disaster Management Information System Specialist 1	1	8
Disaster Management Information System Specialist 2	1	6
System Engineer	1	6
Training and Technology Transfer Specialist	1	3

## 10.2 Equipment and Vehicles

The foreign experts will hire 2 vehicles (4 wheeled-drive) for the Study. Specialised equipment, computer hardware and software, field investigation and slope monitoring equipment shall be provided by the foreign experts as and when necessary upon the recommendation of the experts.

## 10.3 Foreign Cost

The foreign cost will include for foreign experts' fee, travelling claims of foreign experts, study cost, equipment, field investigation, data process and analysis, establishment of information system, seminar and workshop, and report preparation,.

## 10.4 Training

Training for local officers involved in the Study will be provided. The training will include technical visits to Japan.

## 11.0 PROJECT OUTPUT

The Study will result in the formulation of a slope disaster management plan for the selected federal highway(s) which can be applied to other federal highways in Malaysia. Guidelines of classification method of slope, slope inspection and investigation, monitoring, and utilisation of the information system will be produced.

An slope disaster management information system will be established for the support of slope disaster management of the selected federal highway(s).

A comprehensive report with thematic hazard and risk maps of the selected federal highway(s) will be produced.

A technical transfer and human resource development plans for sustainable implementation of the Study and for other federal highways will be formulated.

## 12.0 BENEFITS AND JUSTIFICATION

The Study will set down methodology, action plan and activities to improve the slope disaster management of the selected federal highway(s) in Malaysia. The slope disaster management plan, the slope disaster management information system, and guidelines developed in the Study will help to reduce the risks of slope disaster, to maintain safe and smooth passage and to avoid human losses and disturbance on economic activities.

Technological transfer from the foreign experts to the local counterparts and the development of a human resource development plan will be the major components of the



Study. Through these, the local counterparts will be able to continue the sustainable disaster management of the selected highway(s) and this technology can be applied to other highways and roads in Malaysia.

The methodology, technology, know-how and lessons learned in the Study will be able to apply to the slope disaster or geo-hazard management, for example, in the urban or regional development.