CHAPTER 6 ORGANIZATION AND HUMAN RESOURCES DEVELOPMENT

6.1 Existing Organization and Human Resources

6.1.1 Existing Organization of JKR

(1) National Disaster Prevention Organization

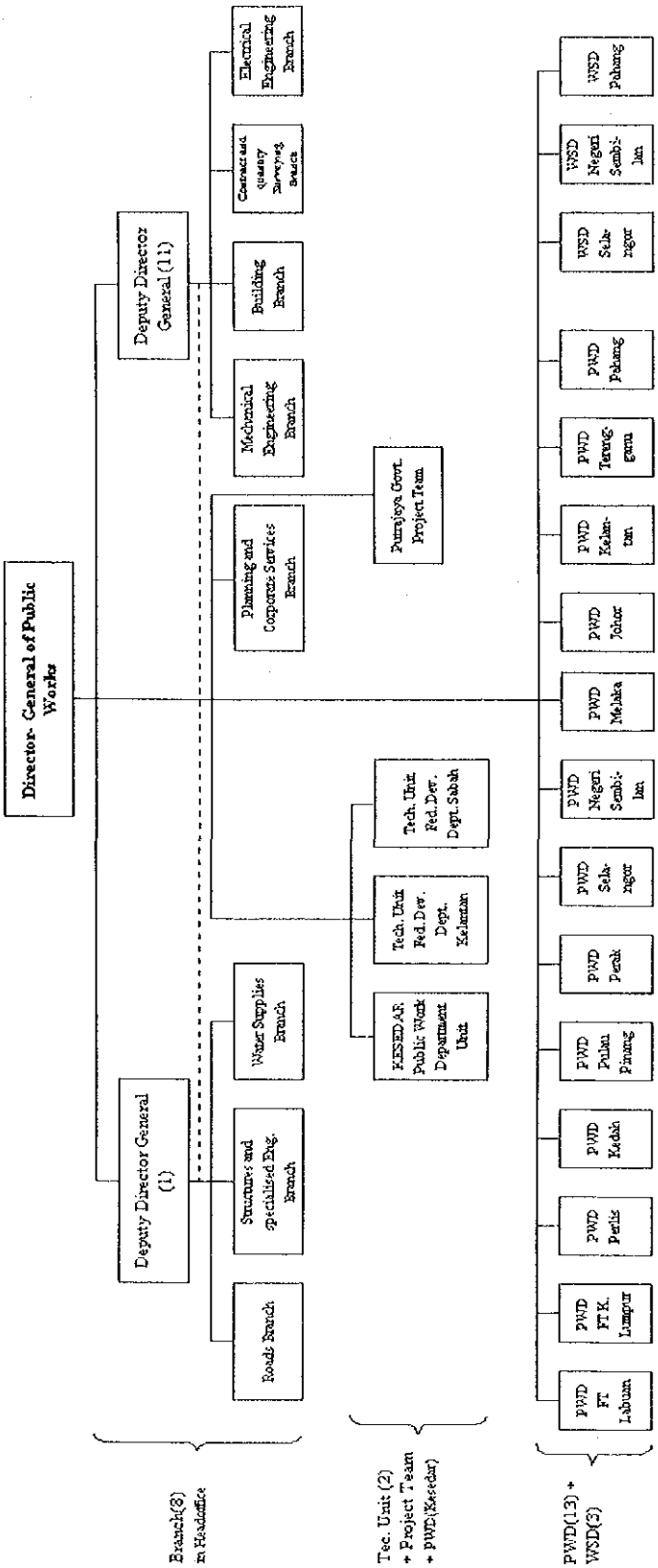
The national disaster committee is organized under the Prime Minister's Department. This committee is composed of 20 members representing the governmental agencies of most of Ministries and Departments including Ministry of Works, JKR and SMART (Special Malaysian Disaster Assistance and Rescue Team).

This committee is held irregularly and discusses with regard to three major disasters, which are caused by industrial activities, flood and fire and the rescue and recovery system are studied. The road disaster caused by slope failure is not directly connected to this committee except in the case of the roads flooded caused by heavy rain and landslide.

(2) Organization of JKR

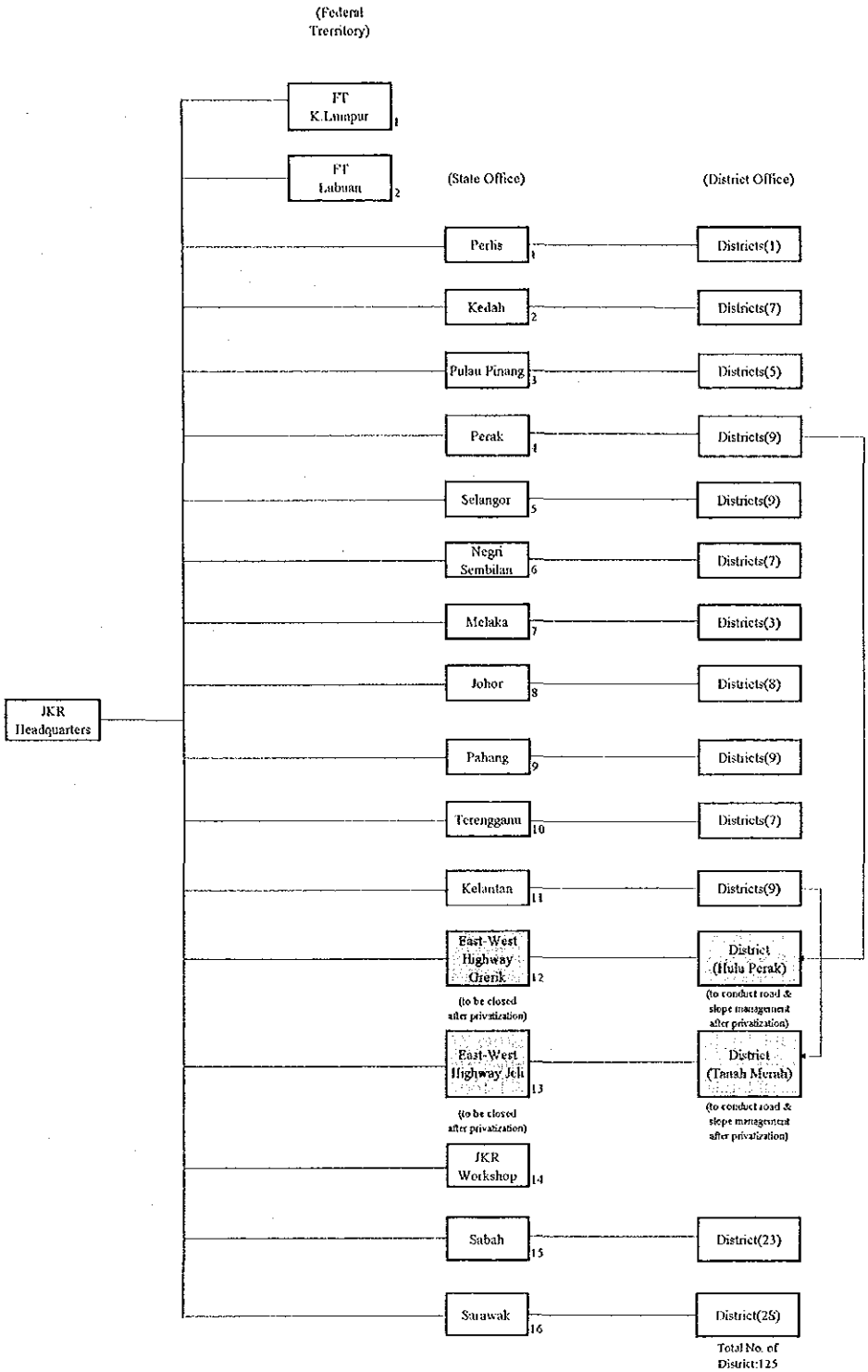
JKR is consisted of 8 Branches, 3 Units including Kesador PWD and 2-Technical Units and Putrajaya Government Project Team and 2 Federal Territory, 11 State PWD and 3 WSD as shown in Figure 6.1.1. Under 11 State PWD, there are 125 District Offices as shown in Figure 6.1.2. Gerik and Jeli Offices of the East-West Highways were closed after the privatisation. Headquarters of JKR is consisted of 8 Branches under the administration of Director General. Maintenance Unit belongs to the Road Branch as shown in Figure 6.1.3.

Total number of staffs of JKR is approximately 40,000. The number of staffs of the Headquarters and the Road Branch is approximately 9,200 and 510 in the year of 2001 respectively. The number of staffs of the Road Maintenance Unit is 24 which is composed of three sectors under Senior Superintending Engineer, such as (i) Slope Maintenance and Management, (ii) Mechanical and (iii) Pavement Management. These sectors are supported by other staffs including secretary for Senior Superintending Engineer.



Source : The Planning & Corporate Services Branch in JKR
Note : 1.PWD : Public Work Department
2. WSD : Water Supplies Department
3. KESEDARA : Southern Kelantan
4. FT : Federal Territory

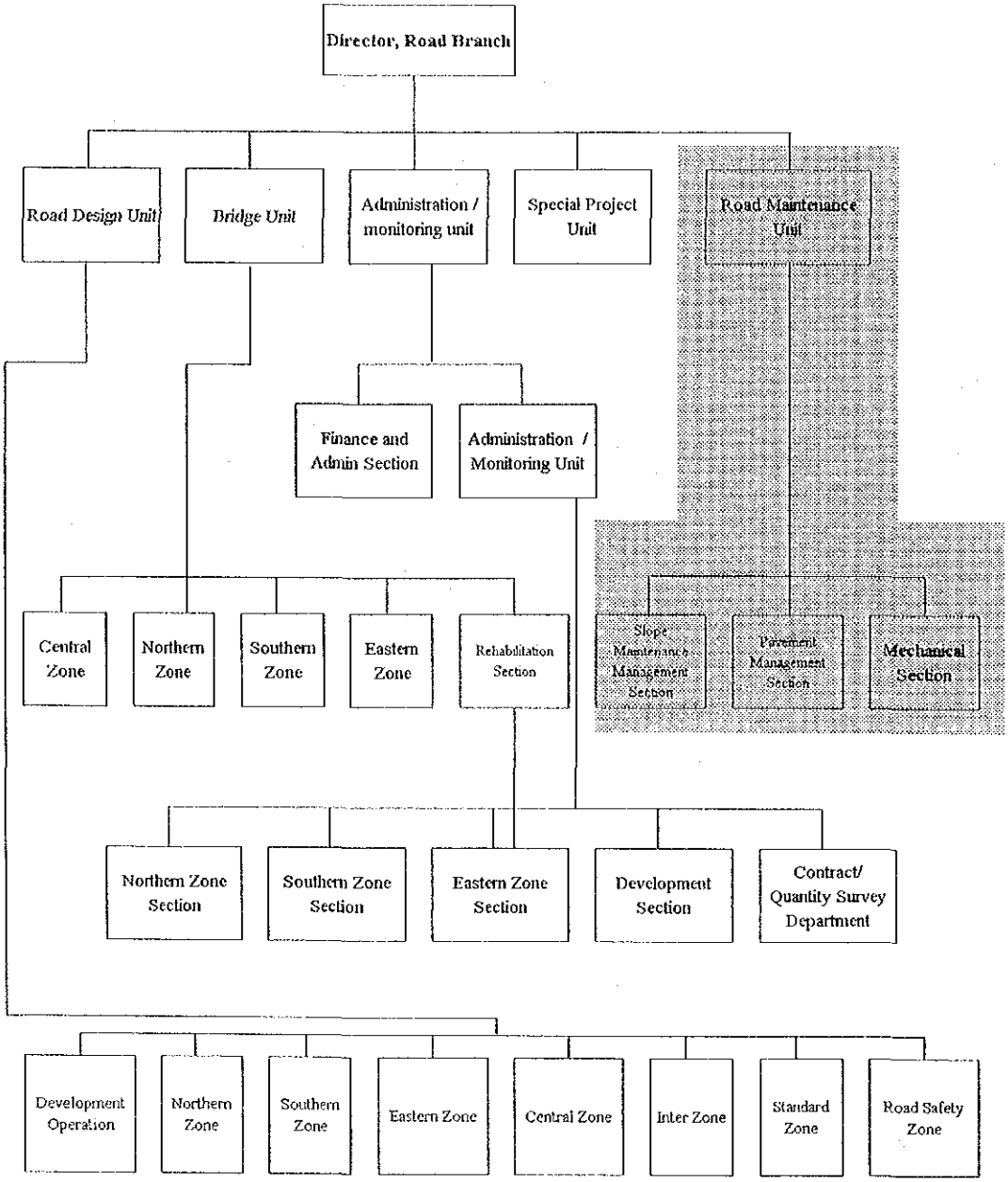
Figure 6.1.1 Organization Chart of Public Works Department (JKR)



Source : Road Maintenance Unit in Road Branch of JKR

Note: The figures in parenthisis are the No. of District Offices.

Figure 6.1.2 Organisation of JKR for Road Maintenance & Slope Management



Source : The Road Maintenance Unit of The Road Branch, JKR
Note : Grik Section and Jeli Section Will be closed after privalization

Figure 6.1.3 Organization Chart of Road Branch

Total number of staffs for the federal road maintenance including slope maintenance is approximately 500 for federal roads in Jan. 2001. These staffs are involved in full time for road maintenance staffs. But if there would be occasionally shortage of staffs for road maintenance, the staffs of other sections such as bridge and pavement would work temporarily for the road maintenance. These staffs who are potential temporary workers in a sense are approximately 250 for federal roads. Then total number of staffs engaging to road maintenance works is assumed to be 600 to 800 approximately.

On the other hands, the exact number of the staffs for road maintenance of the State Roads is not yet reported. But the fully involved in maintenance work for the State Roads is less than the one of the Federal Roads and total number of workers including the workers for maintenance of other sections are around 600.

The existing organization and human resources were studied as the case study and shown in Appendix 6.3.

6.1.2 Maintenance Cost Allocation

For the purpose of maintenance, the funds are allocated to the administrative agencies responsible for the management of various roads in the country. The Federal Roads, other than those, which have been privatised, are funded directly by the Federal Government. The funds are allocated to the Federal Public Works Department (JKR) for administrative and maintenance purpose. Maintenance of State Roads is the responsibility of the respective State Government via an annual State Road Grant by the Headquarters.

To facilitate the allocation of the grant, a computerized central register of all State Roads called the Malaysian Road Record Information System (MARRIS) is kept and updated annually at the Federal Treasury. The respective State Governments then relocate the funds to the various road agencies such as the State Public Works Department and the Local Authorities (Municipalities and District Councils, etc.). Roads, which do not have a public road reserve or such standard do not qualify for the State Road Grant.

The maintenance allocation of federal roads depends on the revenue of the Government of which sources are tax imposed on the individuals and companies. The tax is closely related to their income. Then Gross National Income (GNI) or Gross National Product (GDP) is the basic indicators to influence the Government revenue. In 1998, GDP shows negative increase rate as –6.9%, but the maintenance allocation indicates more drastic decrease as –53.9%. The priority of maintenance allocation for federal roads seems to have relatively low than other more important expenditures.(Refer to Table 6.1.1 and 6.1.2 and Figure 6.1.4 and 6.1.5)

On the contrary, there is the fact that the maintenance allocation for state roads shows rather increase in 1998 as 19.3%. The maintenance allocation for state roads is calculated on the basis of length of state roads by MARRIS (the Malaysian Road Record Information System) operated in the Road Maintenance Unit. And the Headquarters is obliged to

allocate the funds to the Sate Roads according to the Constitution. The drastic increase in 1996 was caused by big amounts of expenditure for the vehicles for road maintenance.

According to the budget in the year of 2000, total cost for road maintenance is RM 329 million and about 20% of it is allocated to the one of slope maintenance, approximately as RM 65 million. The rate of 20% for slope maintenance allocation is relatively large amounts. It is assumed that RM 65 million are included not only the cost of ordinary maintenance works such as routine works and inspection but also countermeasure works.

The share of the budget for the Road Branch in the national budget has been changed within the range of 1.80% to 2.49% during the period of 1996 to 2000. The share of the allocation for the road maintenance cost of the federal roads has been less than 1% since 1996. There were big drop in share was recorded in 1998 as 0.22% (RM 139 million) but the share was recovered to 0.43% (RM 329 million) in 2000. In 2001, the allocation was drastically increased to RM 557 million. It can be guessed that its share in the national budget has become higher (Table 6.1.3 and 6.1.4).

The share of the allocation of road maintenance cost in the Road Branch has fallen down from 31.4% in 1996 to 17.4% in 2000. On the other hand, the share of slope maintenance cost has also decreased slightly from 7.6% to 4.0% during the same period. The slope maintenance cost is classified into three categories. The emergency cost has occupied about 30% of all cost for slope maintenance (Table 6.1.5). These figures tells us the fact that there are still many slope failures in the Federal Roads.

The historical change of road maintenance cost by State is shown in Table 6.1.6. The road maintenance cost of the State reflects the road length of each State. The States of Johor, Selangor, Perak, Pahang recorded more than RM 30 million.

In Japan, with regard to the case of debris flow accident with a public bus at Hida River happened in 1968, the Supreme Court ruled against the Government for its non-negligence responsibility for the road disaster. . There were many passengers who died in the accident. But in Malaysia, the Government is called only the responsibility of negligence, if any, in this moment. for the damages to the people affected by the road slope disaster. Nonetheless, it is recommended that the JKR should make all the efforts to prevent at least any human loss caused by slope disaster.

If the responsibility of JKR will expand to the non-negligence damages by the slope disaster in near future, the criteria of safety should be more strict and the budget of countermeasure should be much more increased.

Table 6.1.1 Maintenance Allocation for Federal Roads & State Roads

(Unit: Million RM)

Year	Federal Roads	State Roads	Total
1990	150	377	527
1991	152	368	520
1992	163	382	545
1993	165	427	592
1994	218	479	697
1995	217	505	722
1996	331	529	859
1997	303	570	873
1998	139	681	820
1999	236	686	923
2000	335	733	1,068
Average Annual Growth Rate (%)			
1990 - 2000	14.31	7.04	7.63

Source : Road Maintenance Unit of Road Branch in JKR.

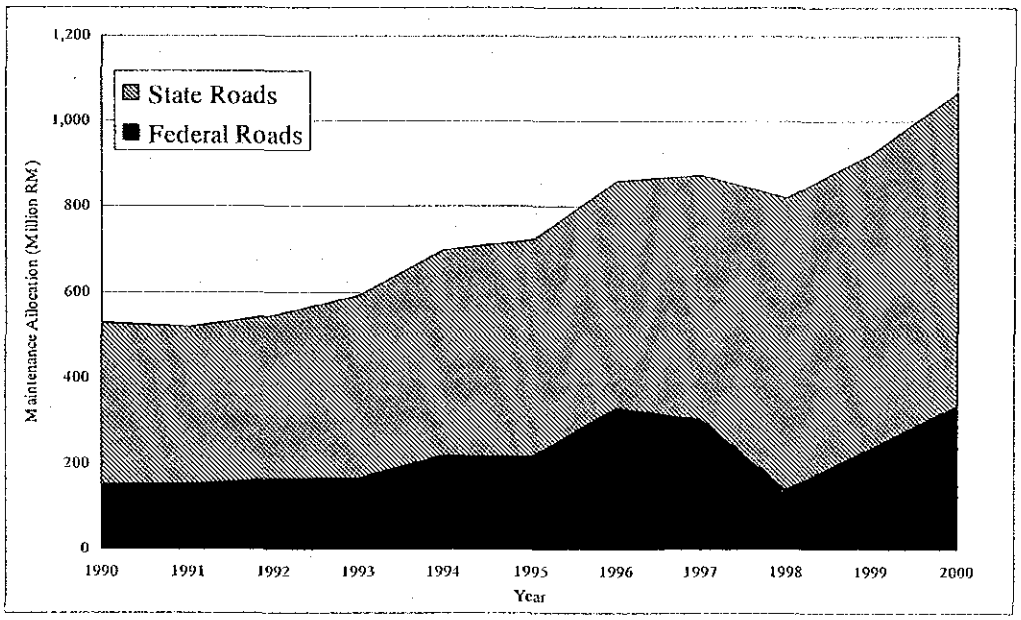


Figure 6.1.4 Historical Performance of Road Maintenance Allocation

Table 6.1.2 Increase Index of Maintenance Allocation for the Federal 6 State Roads

(1990=100.0)

Year	Federal Roads	State Roads	GDP (at 1987 constant prices)
1990	100.0	100.0	100.0
1991	101.6	97.5	109.5
1992	109.0	101.3	119.3
1993	110.1	113.1	131.1
1994	145.4	127.1	143.2
1995	144.8	134.0	157.2
1996	220.8	140.2	173.0
1997	202.0	151.2	186.0
1998	92.9	180.5	172.0
1999	157.7	182.0	181.9
2000	223.6	194.5	195.6
Average Annual Growth Rate (%)			
1990 - 2000	14.31	7.04	7.07

Source : Road Maintenance Unit of Road Branch in JKR.

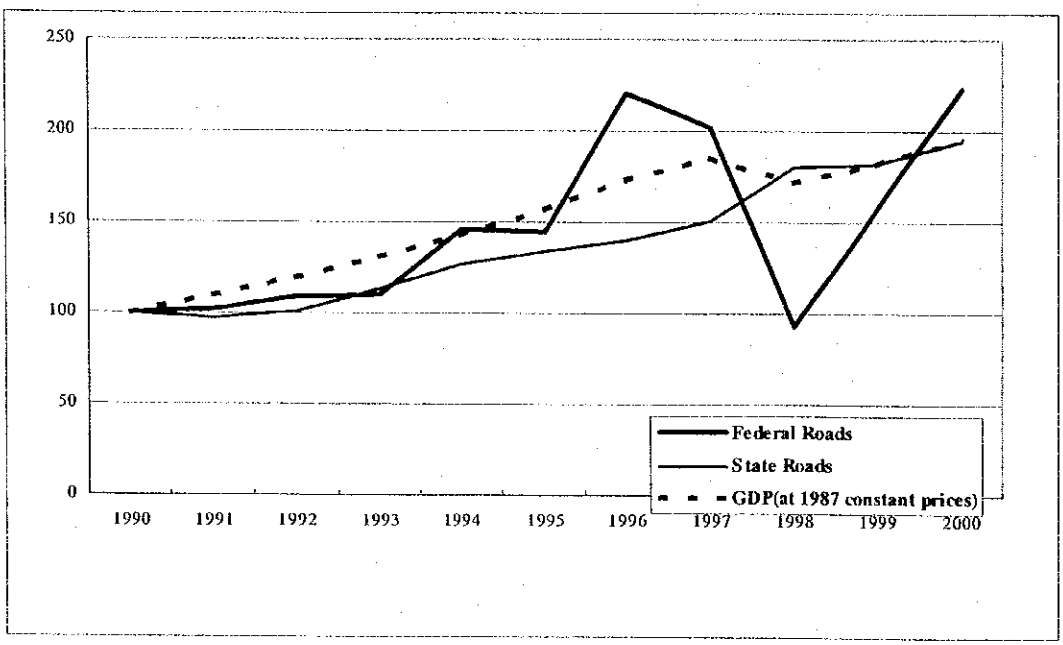


Figure 6.1.5 Comparison between GDP and Maintenance Allocation of Federal Roads and State Roads

Table 6.1.3 Historical Performance of Maintenance Cost for Federal Roads

(Unit : 1,000 RM)

Year	Total Road Maintenance Cost	Slope Maintenance Cost				Road Maintenance Cost	Road Branch	Nation *1)
		Emergency Works	Routine Works	Repair Works (Counter-measures)	Sub-Total			
1995	216,901	15,457	15,457	20,609	51,523	165,378		
1996	330,682	24,073	24,073	32,097	80,242	250,440	1,052,000	58,493,000
1997	302,515	20,479	20,479	27,305	68,262	234,253	1,286,000	60,414,000
1998	139,150	10,302	10,302	13,736	34,340	104,810	1,466,000	62,688,000
1999	236,140	16,186	16,186	21,582	53,954	182,186	1,447,000	73,936,000
2000	329,734	22,843	22,843	30,457	76,142	253,592	1,893,472	76,025,000
2001	557,442	33,447	33,447	44,595	111,488	445,954		

Source: 1. *1) Yearbook of Statistics, Malaysia 2000, Department of Statistics, Malaysia
2. Other figures are provided by the Road Maintenance Unit of Road Branch in JKR.

Table 6.1.4 Historical Performance of Weight of Maintenance Cost for Federal Roads in the National Budget

(Unit : %)

Year	Total Road Maintenance Cost	Slope Maintenance Cost				Road Maintenance Cost	Road Branch	Nation
		Emergency Works	Routine Works	Repair Works (Counter-measures)	Sub-Total			
1996	0.57	0.04	0.04	0.05	0.14	0.43	1.80	100.00
1997	0.50	0.03	0.03	0.05	0.11	0.39	2.13	100.00
1998	0.22	0.02	0.02	0.02	0.05	0.17	2.34	100.00
1999	0.32	0.02	0.02	0.03	0.07	0.25	1.96	100.00
2000	0.43	0.03	0.03	0.04	0.10	0.33	2.49	100.00

Table 6.1.5 Historical Performance of Weight of Maintenance Cost for Federal Roads in the Road Branch

(Unit :%)

Year	Total Road Maintenance Cost	Slope Maintenance Cost				Road Maintenance Cost	Road Branch
		Emergency Works	Routine Works	Repair Works (Counter-measures)	Sub-Total		
1996	31.4	2.3	2.3	3.1	7.6	23.8	100.0
1997	23.5	1.6	1.6	2.1	5.3	18.2	100.0
1998	9.5	0.7	0.7	0.9	2.3	7.1	100.0
1999	16.3	1.1	1.1	1.5	3.7	12.6	100.0
2000	17.4	1.2	1.2	1.6	4.0	13.4	100.0

Table 6.1.6 Maintenance Allocation for Federal Roads

(Unit : 1,000 RM)

Named of States	1995	1996	1996	1998	1999	2000
Johor	14,000.0	21,961.6	26,281.3	14,010.8	29,314.6	34,800.0
Melaka	2,200.0	4,349.0	3,928.1	1,122.8	4,556.3	5,600.0
N. Sembilan	16,201.1	19,606.9	19,520.5	5,563.6	20,196.5	28,900.0
Selangor	20,659.3	30,528.9	29,191.0	16,221.5	16,966.4	31,600.0
Perak	16,656.6	29,230.6	40,865.3	25,449.2	21,023.6	33,550.0
P. Penang	1,865.0	4,883.6	6,310.5	2,666.6	5,429.2	6,100.0
Kedah	6,225.0	11,890.0	11,806.5	6,663.2	15,262.4	28,800.0
Perlis	2,333.0	6,483.0	2,304.1	1,169.4	3,650.0	5,150.0
Pahang	20,666.4	40,266.9	43,860.0	23,561.4	42,800.3	43,900.0
Terengganu	10,000.0	15,648.6	12,294.3	4,858.8	12,688.1	21,020.0
Kelantan	10,240.0	16,861.3	16,020.6	5,413.8	14,632.6	20,800.0
Federal Territory of Labuan	2,000.0	2,150.0	996.3	1,645.9	3,434.6	6,200.0
FELDA *1)Pahang	10,800.0	13,620.0	14,410.2	0.0	0.0	0.0
LKPT*1) Negri Sembilan/Johor Utara	4,065.0	5,030.0	0.0	0.0	0.0	0.0
Unit JKR Kejora *2)	6,000.0	6,000.0	6,554.2	0.0	0.0	0.0
Unit JKR Dara *3)	5,620.0	10,195.0	5,001.4	0.0	0.0	0.0
Sabah	23,922.5	41,054.0	24,946.3	15,113.5	15,620.6	26,500.0
Sarawak	25,000.0	29,150.0	21,262.6	5,093.6	19,098.6	23,000.0
Timur Barak	8,852.0	11,403.0	6,096.4	6,111.4	8,408.6	9,500.0
Ferry Penkalan Kubor	25.0	0.0	68.0	488.0	345.0	290.0
Headquarters	8,448.6	8,156.9	6,662.4	685.8	2,411.0	3,023.9
Total	216,900.6	330,681.6	302,514.0	139,149.4	236,139.5	329,633.9

Source : The Road Maintenance Unit of Road Branch, JKR
Note : 1.The allocation for Headquarters is reserved funds for rescue of damages by slope disaster.
2. *1) Stands for Federal Land Authority.
3. *2) stands for the South East Development Area of JKR
4. *3) stands for the Dara Development Arc
5. The States of which figures are "0" have finished to be developed and are not allocated their maintenance

If the responsibility of JKR will expand to the non-negligence damages by the slope disaster in near future, the criteria of safety should be more strict and the budget of countermeasure should be much more increased.

6.1.3 Slope Maintenance and Management

(1) Ordinary Situation

In ordinary situation, the slope of the Federal Roads is maintained and managed by inspection, monitoring and the countermeasures. The countermeasures are conducted by prioritisation on the basis of Slope Priority Ranking System (SPRS) which was developed by the Road Maintenance Unit of JKR itself and is the revised system of Slope Maintenance System (SMS) and Malaysian Engineered Hill-slope Management System (MEHMS). A new slope inspection program JKR USJ 1/2000 was firstly designed, which is actually a simplified version of that used by SMS and MEHMS. Simplification was to ensure that district technicians could cope with the data and updating, and also to reduce

the level of training required. The variables selected for data collection was also based on them being relatively more sensitive to the output.

Basically three types of inspections are carried out as follows:

(i) Routine Slope Inspection: Such inspections are carried out by trained district technicians using the JKR USJ 1/2000 form. This inspection is mandatory for all slopes along the critical Federal Roads and carried out at least once a year during the months of August and September. The data is then keyed into the SPRS software and subsequently transmitted to JKR Headquarters by October for incorporation into the master database.

(ii) Confirmatory Slope Inspection: the Routine Slope Inspection is followed up with a Conformity Slope Inspection by a Headquarters' Engineer who randomly audits the data through site visit to ensure the credibility of the data coming in.

(iii) Special Inspection: Although proper routine maintenance can greatly reduce the probability of slope failure, the slope may still not be sufficiently safe because of reasons inherent to its geology. Therefore, input from a Geologist or Geo-technical Engineer is required and special inspections should be carried out at least once in every five years.

The data of result acquired from inspection is input to the SPRS and the priority ranking is conducted and automatically the cost of countermeasures is estimated. The prioritised slopes of which the countermeasures should be executed are studied and decided in JKR on the basis of roughly estimated cost by SPRS software, which is submitted to the Ministry Finance for budgeting. After appraisal by the Ministry of Finance, the contractor is selected by taking account of the cost proposed by candidate contractors.

(2) Emergency Situation

When slope failure happens, the staff of Sector of Pavement Management receives report of slope failure and one of the staff of Slope Maintenance and Management Section visit the site where the slope failure has happened. According to the scale of slope disaster, the Senior Assistant Director or Senior Superintendent Engineer visits the site.

The staff makes a report for the situation of slope disaster and submits to Senior Superintendent Engineer. Before privatisation, in case of emergency, if the workers or equipment of JKR are not enough to cope with recovery works, JKR nominates some contractors for recovery works such as excavation of mud and debris flown on the road as soon as possible according the emergency close, TI (Treasury Instruction) 55. The recovery costs for emergency works is expended from the rescue reserve kept by Senior Superintendent Engineer of the Road Maintenance Unit. The geo-technical engineers are

temporally from other Branch in JKR. The amounts of this rescue reserve are usually 1% to 5% of the total amounts of allocation to the Federal Roads maintenance and are preserved in advance as the contingency. (See the road maintenance allocation for Headquarters in Table 6.1.8)

After privatisation, the emergency works will be conducted by the concession private companies according to the Contract. The private companies are responsible for cleaning to make road passable and JKR has obligation for rescue and evacuation of affected people within 24 hours by cooperation with police and the other Government Agencies. With regard to not urgent repair works caused by slope failure, the inspection is conducted by JKR and the result of inspection is input in data base for the slope priority ranking system (SPRS) and the cost for countermeasures is roughly estimated by the computer program of SPRS software. After that, the more detailed cost estimation is conducted by JKR staffs such as geo-technical engineer and engineers of slope management sector of the Road Maintenance Unit. There five or six major private consultants. The actual counter measure works are conducted by the private contractors by open tendering. The major consultants other than the ones mentioned above conduct the big-scale projects, which are, called "Turn Key Projects" for the Federal Roads by the contract with JKR and supervise the project including road maintenance and slope maintenance.

The comprehensive organization for the road maintenance including slope maintenance before privatisation is shown in Figure 6.1.6.

6.1.4 Privatisation of JKR

(1) Meaning of Privatisation

The privatisation of road maintenance of JKR means that the road maintenance conducted by direct forces employed JKR is implemented by the private companies on the basis of "the long-term contract" (15 years) after joining the road maintenance staffs to the private companies.

(2) Progress of Privatisation

The existing organization chart of JKR after the privatisation is shown in Figure 6.1.6. The road maintenance work except the slope maintenance is executed by three private companies under the monitoring of UPPJ in each State and the slope maintenance is implemented by outsourcing to private consultants under supervision of JKR.

There is no drastic change of organization after privatisation with regard to road maintenance except District Offices of Jeli and Gerik for federal road maintenance, which were concentrated to federal road maintenance. After privatisation, these two offices were closed and all staffs for road works including road and slope maintenance were taken over by the private enterprises. Then existing district offices including Gerik and Jeli will succeed the all kinds of road works. The staffs of road and slope maintenance of other districts have choice for retiring JKR or joining to the private companies. Then all staffs of

road maintenance were not be taken over by the private enterprises. The names and their territories of private companies for road maintenance are summarized as follow;

Table 6.1.7 The Names of Companies and Their Territories for Maintenance

Name of Companies	*Name of Parents Companies*	Territory of Maintenance Works (States)
1. Belati Wangsa SDN BHD	Johawaki SDN BHD	1.Perak, 2.Keda, 3.Pulau Pinang, 4.Perlis
2. Roadcare (M) SDN BHD	HCM SDN BHD	1.Selangor, 2.Pahang, 3.Terengganu, 4.Kelantan
3. Sela Selenggra SDN BHD	Bumi Highway SDN BHD	1.Negri Sembilan, 2.Melaka, 3.Johor

Source: Planning and Corporation Services Branch in JKR

The staffs for road maintenance include the ones of slope maintenance. It is predicted that after the privatisation, the staffs for slope maintenance will be shortened and slope maintenance work will be conducted by outsourcing to private conductor and consultants.

After privatisation, the road maintenance works for the paved Federal Roads will completely be outsourced to the private contractors.

The maintenance cost for routine works will be paid by RM 1,560 per month per km. and the periodic maintenance cost will be examined and approved by the Ministry of Finance after the submission of cost prepared by the Road Maintenance Unit of JKR. The draft of road maintenance cost for the Federal Roads will be prepared by the Zone Headquarters after privatisation not by State Headquarters through District Offices before privatisation.

The ceiling for payment is set up as RM 100,000 for each contractor belonging to *Bumiputera* Contractors (Class: F) which are small sized contractors managed by Malaya. This policy is based on the national policy of preferential treatment to Malaya people because of their weakness for competitive power in the market. This amount is paid by each Ministry per year as maximum. Then this ceiling is also adapted to JKR and JKR can allocate these amounts to the *Bumiputera* contractors according to their characters and amounts of works.

(3) Major Advantages of Privatisation

Before privatisation, the periods of contracts between JKR and contractors with regard to road maintenance are short-term and different from each contractor. But after the privatisation, the period of contracts will be extended to 15 years and then the advantages of privatisation will be revealed. The major advantages are as follows.

(a) Quality improvement of road maintenance
(b) Faster maintenance works by reduction of complicated procedure for contract and decision making
(c) Reduction of personnel cost by retire or joining to private companies
(d) Creation of position for promotional staffs

(4) Items of Works for Private Companies Based on the Contract

Scope of works to be conducted by the private company according to the contract between JK and three private companies are as follows.

1) Routine Maintenance Works

- Pavement (R 01)
- Maintenance of Road Shoulder (R 02)
- Grass Cutting (R 03)
- Maintenance of Road Furniture (R 04)
- Maintenance of Bridges and Culverts (R 05)
- Road Line Marking (R 06)
- Drainage (R 06)
- Landscaping (A)
- Routine Inspection (B)

2) Periodic Maintenance Works

- Preventive Maintenance works
- Preventive strengthening of roads
- Normal preventive maintenance works on all roads, including resurfacing and all other associated works
- Preparation of Works Programme Schedule

3) Emergency Works

This category of works refer to the road maintenance activities where the occurrences of which are difficult to predict or not within the control of the company but which have an immediate effect on road maintenance and therefore have to be dealt with without delay. The occurrences of incidents whereby the company shall be responsible for the Emergency Works are as follows:

- Landslide
- Embankment Failures and Road Subsidence
- Failure/Collapse of Bridges and Their Related Components
- Collapse of Culverts and Drainages Structures

- Flooding
- Closure of Road Due to Spillage of Chemical, Hazardous, Toxic or Inflammable Materials

The company has the responsibility for the slope disaster management with regard to the emergency works for (i) landslide and (ii) embankment failure as mentioned above.

(5) Strengthening of Monitoring of Road Maintenance after Privatizatin

JKR is now proposing a plan to the Government to allocate the new sections to them the function of monitoring and supervising of road maintenance work by three private contractors. This would takeover the staff from the federal road maintenance of JKR by the privatisation. These new sections will be set up for three Zones, which are North, Central and East Coast and South. The three contractors are Northern Zone contractor: Belati Wangsa Sdn. Bhd., Central and East Coast Zones contractor: Roadcare (M) Sdn. Bhd. and Southern Zone contractor: Selia Selenggara Sdn. Bhd. respectively. The names of the three zones and their territories are summarized as follow;

But this plan has not yet approved by the Government. Until approval is received, the Headquarters has set up a Road Maintenance and Management Unit (UPPJ) in each Head Office of State. They have nominated and assigned one staff member to each State, to monitor and supervise the road maintenance work to be conducted by the private companies. The UPPJ is administered by the Headquarters. The staff assigned to the State Office of Selangor is sent from the Slope Maintenance Section of the Road Maintenance Unit of the Headquarters. Other staffs of the State Offices were approved by the Headquarters from the staff proposed by the States. Only one staff member was nominated from the staff of the State Office of Perak in the Northern Zone because of shortage of suitable staff. Therefore the North Zone is now tentatively monitored by one staff member from Perak State. (Figure 6.1.6)

6.1.5 Comments on Functions of Related Sectors for Slope Management

In this part, the functions of each section relating to the slope management are briefly reviewed as follows.

(1) Headquarters

1) The Slope Maintenance and Management Section in the Headquarters is conducted by four slope engineers and three supporting staffs under the Senior Superintending Engineer. Their roles are mainly : (i) Administration, controlling and managing all the systems such as SPRS, SMS and MEHMS, (ii) Monitoring the federal roads maintenance including slopes, (iii) Preparation of slope mandatory inspection program, (iv) Scheduling for implementation of slope repair countermeasure, and (v) Preparation of training program for slope inspection nationwide. The following table shows the roles of staffs of the Road Maintenance Unit.

After the privatisation, the staffs for road maintenance for the paved federal roads in Peninsular Malaysia will be taken over by three private contractors or retire JKR, and the roles of Headquarters on this part will not change in principle. But the controlling power will be transferred to the newly established offices of four zones. Then the roles of Headquarters for the federal road maintenance will be substantially weakened. On the other hands, the roles of the Headquarters for the slope maintenance is expected to be strengthened.

The present roles of staffs of the Road Maintenance Unit are shown in the Table 6.1.8.

2) IT Centre

The Information Technology Centre (ITC) belongs to the Planning and Corporate Service Branch. The ITC is composed of six sections. Their functions and the number of staff are shown in the following table.

The Digital Mapping of Utilities and Infrastructures Unit (UPU) is closely related to the effective implementation of SIMS. But the present staff of this sector are not enough to initiate SIMS, especially with regard to System Engineering Developer, GIS Specialist and Data Base Designer. Then this sector is expected to focus on providing the data base and system application with regard to GIS.

[Note: Effective from 1st, Feb. 2002, UPU(GIS) Unit is to be a part of Roads Branch]

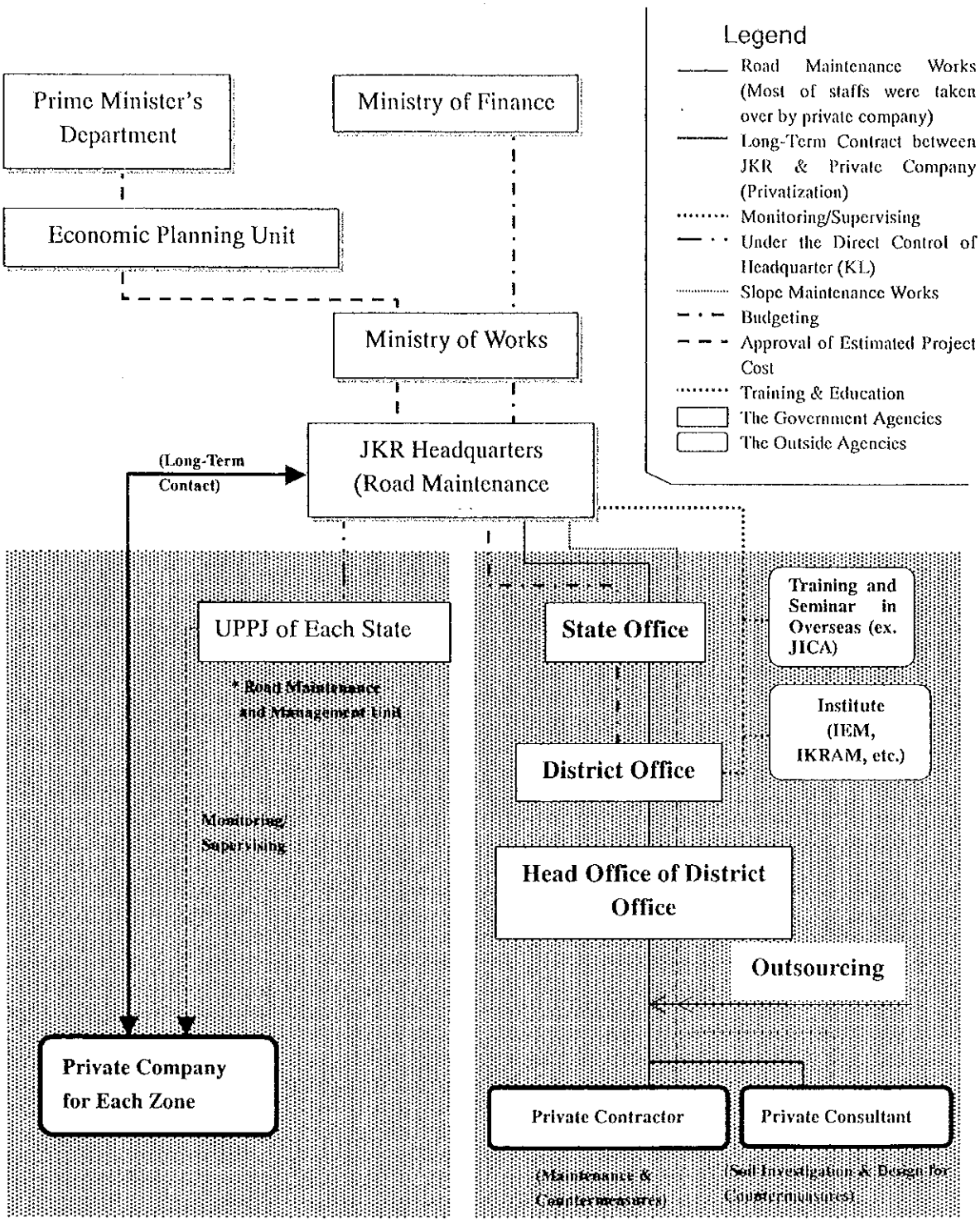
(2) State Offices

The State Offices control the maintenance of the state roads and slopes. With regard to the road maintenance and slope management for the federal roads, they have the functions of intermediate agencies, between the District Offices and the Headquarters. But at times, the State Office will control directly the slope repair work to be conduced by the private contractor, on the basis of a contract for medium scale of repair works.

After the privatisation, their roles in the paved federal roads will be transferred to the offices of three supervising units by reorganization of JKR. But the plan of reorganization is yet to be approved by the Government. Until the approval, the UPPJ will supervise the road maintenance work of the private companies. After the privatisation, the role of the State Office for the maintenance of state roads is expected to be strengthened.

(3) District Offices

The District Offices are located at the sites for the actual road maintenance and slope management including routine works (grass cutting, sewerage clearance and so on),



Road Maintenance Works

1. Slope maintenance: For All Federal Roads
2. Slope Countermeasure Works
3. Road maintenance: For Unpaved Federal Roads in Peninsula Malaysia and all Federal Roads in Sabah & Sarawak, Labuan (Federal Territory)

Figure 6.1.6 Integrated Organization for Federal Roads Maintenance After Privatisation

Table 6.1.8 The Functions of Staffs for Road Maintenance Unit in JKR

Position	Role
Senior Superintending Engineer	1. Administration & controlling all the system used by this section etc PAMS & SPRS. 2. Handling of complaints from road users. 3. Handling or of road gazeting. 4. Handling of local & international visitors & delegates. 5. Monitoring of federal roads maintenance including slopes. 6. Handling matters pertaining to speed limit, weigh restriction order, road closure including East Malaysia.
1. Sector of Slope Maintenance & Management	
(1) Senior Assistant Director	1. Managing all the slope system ex. SPRS, SMS, MEHMS 2. Preparation of slope mandatory inspection program. 3. Implementation of slope repair countermeasure. 4. Preparation of training program for slope inspection nationwide. 5. Monitoring the progress of maintenance & rehabilitation program
(2) Assistant Director	Responsible to Senior Superintending Engineer & Senior Assistant Director matters pertaining to slope. (Zone: EWH, Sarawak, North Perak & Northern Region)
(3) Assistant Director*1)	Responsible to Senior Superintending Engineer & Senior Assistant Director matters pertaining to slope. (Zone: East Coast , Central Region (Inc.Cameron Highlands)
(4) Assistant Director	Responsible to Senior Superintending Engineer & Senior Assistant Director matters pertaining to slope. (Zone: Southern Region, Frasers Hill, Sabah)
2. Sector of Mechanical	
(1) Senior Assistant Director	1. Ferry maintenance 2. Office transport management 3. *Technical advisor to Departments such as Ministry of Transport and Custom*
3. Sector of Pavement Management	
(1) Senior Assistant Director	1. Responsible to Senior Superintending Engineer 2. Implementation of pavement new technology. 3. Checking and approval of QA & QC plan. 4. Monitoring the implementation of road rehabilitation projects. 5. Updating data for road structure nationwide.
(2) Senior Assistant Director	1. Responsible to Senior Superintending Engineer 2. Policy Matters. 3. Money Matters (Budget) 4. Bailey Bridge Maintenance 5. Gazeting 6. Disaster matters (ex. slope failure and flood disaster)
(3) Assistant Director	1. Responsible to Senior Superintending Engineer 2. New Technology on pavement 3. Privatization matters. 4. Technical matters pertaining to pavement 5. QA & QC matters. 6. Technical committee member on Road specifications
(4) Assistant Director	1. Responsible to Senior Superintending Engineer 2. Responsible to Ir. Joseph Lim1. Pavement Appraisal Management suite. 3. State road grant. 4. Roadside Development.
4. Supporting Stuffs	
(1) Senior Technical Assistant (Retired &	Weight Restriction Order Specialist
(2) Senior Technical Assistant	Operational Budgeting Specialist
(3) Technical Assistant	Assistant to slope engineer
(4) Technical Assistant	Assistant to pavement engineer
(5) Senior Technician	Assistant to slope engineer
(6) Technician	Assistant to senior pavement engineer
(6) Technician	Assistant to slope engineer
(8) Clerk	Clerical works
(9) Office Boy	Miscellaneous
(10) Driver	Driving to designated places

Note : *1) This position is vacant and substituted by Assistant Director(2)
Source : The Road Maintenance Unit of the Road Branch, JKR

Table 6.1.9 The Functions of Sections in ITC

Name of Section	Functions	Grade	No. of Staffs
1.Project Management System	Monitoring the progress of all projects executed by JKR	JA, J2	2
		SA, F3	1
		J4	1
		J5	1
		J7	2
		Sub-Total	7
2. System Development and Office Application	Development of computer application (SQL, SYSBASE, SKALA, OFIS, CUTI, etc.)	JA, J2	1
		SA.F2	1
		SA, F3	2
		J5	2
		J7	1
		Sub-Total	7
3. Digital Mapping of Utilities and Infrastructures (UPU)	Provision of digital geo-spatial data and information of departmental utilities and infrastructure; on the basis of GIS to three Branches in JKR (Road, Water Supplies & Building) and NALIS (National Land Information System) managed by Land Office	JA, J2	1
		J3	2
		J5	1
		J7	1
		Sub-Total	5
4.Computer User and CADD	1. Centralization & uniformity of software of CADD 2. Development of web page for professional staffs (J1-J3)	JA, J2	1
		J3	6
		J5	1
		J7	2
		J9	1
		Sub-Total	11
5. Collaborative Computing & Desktop	Collaboration for e-mail menu only for professional staffs (J1-J3)	JA, J2	1
		J3	2
		J7	1
		J9	2
		J7	1
		Sub-Total	7
6. Network & Safety Operation Center	1.Making sure connection of LAN system	JA, J2	1
	2.Management of servers provided by TM net	J3	3
		J7	3
		Sub-Total	7
		Total	39

Source: ITC of Planning and Corporate Service Branch.
Note: 1. JA stands for "Civil Engineer"
2. SA stands for "System Analyst"
3. F stands for code for "Financial Management"

periodical works including slope inspection, monitoring, countermeasures and emergency measures. Emergency measures are conducted by the three private contractors after privatisation. Furthermore, the district offices are the terminals for data inputting for database of SPRS, SMS and MEHMS for road maintenance and slope management. Then the specialty and quality of the staffs for these works will directly reflected on the quality of the works for road maintenance and slope management.

The slope inspection is executed twice a year by the Head office of the District as usual. Before the privatisation, the emergency works such as removal of debris from landslides or slope failures to make the traffic pass through, has been done by the JKR staffs. But after

the privatisation, the private company will conduct the emergency work as a part of the work for road maintenance. But when the repairs or countermeasures for failed slopes become necessary, JKR would outsource the work to private contractors by tendering. The form of outsourcing for repair works is the same as before the privatisation. The contracts with regard to slope maintenance are agreed between JKR and the private contractors which are different from the three companies for the privatised road maintenance. The offices of Headquarters or State conduct the contracts with the private companies through the open tendering. Whether the concerned of contracts is HQ or state is decided on the basis of the scale and amounts of slope maintenance cost. After the agreement of contracts, the District offices are consigned by the State offices and Headquarters to supervise the actual works for slope maintenance by the private contractors.

(4) Private Contractor

As already mentioned, the private contractors conduct many kinds of civil works including some of the road maintenance works and countermeasures for failed slope by outsourcing from JKR. After the privatisation, the most of the workers engaged for road maintenance of the federal roads, left the JKR and joined the three private road maintenance companies.As the slope maintenance' work is defined as out of scope of routine road maintenance contract, it is requested for remaining limited staff in JKR district offices to manage the work. In this context, not only for the outsourcing of large size countermeasure works for slope failure, some of slope maintenance work may be shared by private contractors.

(5) Private Consultant

The private consultants for geotechnical engineering have been played important roles in the past. Because of limited number of geologist and Geotechnical engineer in JKR, JKR has outsourced to the private consultants for almost all of soil investigation and designing with regard to countermeasure works, though most of them are through general contractors..

In accordance with JKR's policy of emphasizing importance of effective slope disaster management, the role of private consultant will be increased more and more. It is recommended for JKR to keep good attention on the improvement of The quality and the quantity of engineers in slope engineering field, including geologist and Geotechnical engineer.

(6) Institute for training and education

It has been often pointed out and recognized that the quality for slope disaster management, maintenance and countermeasures, either, should be improved. Then the training and education are basically very important and urgent tasks for the slope management. IEM (Institute of Engineering Malaysian), BEM (Board of Engineering Malaysia), and KUMPULAN IKRAM SDN BHD (the name before privatisation, IKRAM (Institute Kerja Raya Malaysia) are the major institutes for training and education in Malaysia.

The main works of KUMPULAN IKRAM SDN BHD are as follows

i. Research
ii. Pavement & Materials
iii. Geo-technical & Geo-environmental Engineering
iv. Transportation & Traffic Safety
v. Education
vi. Services
vii. Training

KUMPULAN IKRAM SDN BHD belonged to JKR in the past but was privatized on Nov. 1996. They have some geologists and geotechnical engineers who have been the staffs of JKR before privatisation.

After privatisation, the burden of JKR for road maintenance will be reduced and the Headquarters can allocate their staffs and budget to slope management. Then, the roles of these institutes will absolutely increase to accelerate the improvement of quality for slope management not only for short range but also for the long range.

The Appendix 6.1 shows the expected functions of related agencies for slope disaster management. The comparison between the expected roles and the degree of achievement of the expected roles will be carried out and the Study team will recommend the improvement to realize the expected roles more completely.

6.1.6 Existing Human Resources

(1) JKR

From the viewpoint of human resources, first of all, the number of staffs for slope management must be grasped as accurately as possible. The number of staffs of the Road Maintenance Unit is 24 who are composed of three sectors headed by Senior Superintending Engineer.

Total number of staffs for the road maintenance including slope maintenance is 536 in full time and 800 including temporary workers for federal roads. On the other hands, total number of staffs for the state roads including the temporary workers is 600.

By privatisation, 386 staffs of 506 of candidate were taken over from JKR by the three private companies.(see Table 6.1.10). The difference between the number of staffs before the privatisation and the one of after privatisation, 120(=506-386) is the number of staffs who did not joined to the private companies for the road maintenance and retired from JKR.

Table 6.1.10 The Actual Number of Staffs for Road Maintenance to be Taken Over From JKR to Private Companies

(Unit : Persons)

No.	Name of State Offices	Grade																
		J3	A11	J4	J5	J6	J6	N6	N9	N11	R2	R3	R6	R6	R9	R10	R11	Total
1	Perlis	0	0	0	0	0	2	0	0	0	0	0	0	0	2	1	2	6
2	Kedah	1	0	0	2	0	10	0	0	0	0	0	0	0	4	4	8	29
3	Pulau Pinang	0	0	0	1	0	5	0	0	0	0	0	0	0	0	0	0	6
4	Perak	0	0	0	0	1	3	0	0	0	0	0	0	0	0	2	0	6
5	Selangor	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
6	Negeri Sembilan	0	0	0	0	0	1	0	1	1	0	0	2	0	6	9	6	28
6	Melaka	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
8	Johor	0	0	0	0	1	6	0	0	4	0	0	0	0	13	10	31	66
9	Pahang	0	0	2	0	0	1	0	0	4	0	1	4	1	26	25	24	88
10	Terengganu	0	0	0	0	0	2	0	0	3	0	0	0	0	0	0	0	5
11	Kelantan	1	0	1	2	2	10	0	0	0	0	0	0	0	0	0	0	16
12	JRTB Gerik	2	1	0	1	1	3	1	3	3	0	1	1	3	11	15	30	66
13	JRTB Jeli	1	0	0	0	0	3	1	5	2	0	0	1	0	3	5	5	26
14	JKR Work-shop	0	0	2	0	2	3	0	0	0	8	0	6	0	0	0	3	25
15	IP JKR KL	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3
Total		6	1	5	6	8	53	2	9	16	8	2	15	4	66	62	110	385

s

Source : The Planning and Corporate Service Branch of JKR
Note : The staffs who were not joined into the private companies were retired from JKR

(2) Skilfulness of Staffs

Secondly, from the viewpoint of human resources, the quality of the staffs for slope management is necessary to be evaluated by their skilfulness, which might be judged by integration of their professional knowledge and their experience. Even if the staffs have the excellent professional knowledge, the skilfulness will not improve unless the enough practical experience is not accumulated.

In the report of "Slope Management System in JKR" presented at 4th Malaysian Road Conference, 30-31 October & 1 November 2000, it is pointed out that lack of geo-technical considerations during past and recent construction of roadside slopes, many of these slopes are now experiencing geo-technical problems. To achieve further risk reduction, geo-technical control over present and future road development projects on hill slopes, regulating geo-technical designs to adopt structural alternatives like viaducts and canopies, control of roadside construction and farming activities, establishing monitoring and early warning systems, and studies to improve the technical and administrative weakness in the system is required.

The Table 6.1.11 shows the grades of staffs of road maintenance for the federal roads. The degree of skilfulness of workers for road and slope maintenance is the one of the fundamental factors for judgment of the quality of their works.

According to the grade of skilfulness of workers for implementation of slope management of JKR, there are five ranks: (i) very good, (ii) good, (iii) fair, (iv) satisfactory, (v) not satisfactory. The rank of road maintenance belongs to (ii) good but the one of slopes, (iii) fair. The rank of slope maintenance is one rank below of the one of road maintenance.

(3) Private consultants

JKR has conducted the soil investigation and designing for countermeasures of slope failure by outsourcing to the private. In the short-term, JKR must strive to select the private consultants, which have the most excellent slope engineers.

(4) Private contractors

The grade of workers of private contractors is not so much different from the one of JKR for both road and slope maintenance. But the major contractors such as MTD, Bumi Highway, Anjung Uma, Nazaria have their own geo-technical engineers. The JKR should recommend them to improve their professional competence as much as possible.

(5) Educational Institute

The educational institute contributing to training and levelling up of the staffs of JKR with regard to road slope maintenance and management including slope are as follows.

1) University and institute
   - Univ. Malaysia
   - Univ. Technology Malaysia
   - Univ. Technology Mara
   - Univ. Malaysia Sarawak
   - Univ. Putra Malaysia
   - Univ. Sains Malaysia
   - Univ. Kebangsaar Malaysia
2) Institute
   - Institute of Engineering Malaysia
   - Board of Engineering Malaysia
   - KUMPULAN IKRAM SDN BHD

Table 6.1.11 The Contents of Grade of Staff for Road Maintenance

Grade	Necessary Length of Service (Years)	Name of Position
J1	18-30	Superintendent Engineer
J2	16-20	Senior Executive Engineer
J3	0-20	Executive Engineer
A11	5-20	Senior Time Engineer
J4	10-20	Senior Technical Assistant
J5	0-15	Technical Assistant
J6	10-20	Senior Technician
J6	0-20	Technician
J9	0-20	Junior Technician
N6	18-30	Chief Clerk
N9	0-20	Clerk
N11	0-20	Typist
R2	15-20	Mechanics:skilled(Fitter for Workshop)
R6	12-15	Mechanics(Fitter for Workshop)
R6	12-15	Mechanics: lower level (Fitter forWorkshop)
R9	15-20	Driver
R10	0-15	Driver
R11	0-15	Lower general worker

Source : Planning and Corporation Service in the Road Branch.

6.2 Proposed Organization and Human Resources Development

6.2.1 Proposed Organisation

After the privatisation, the staffs for the slope maintenance and road maintenance especially of the District Office of Perak were reduced. The road maintenance is conducted by the private companies but the slope management must be conducted by the JKR. In this context, how to outsource the slope management to outsourcers with professional knowledge of geology is decisive point for the slope management in the future. Therefore it will be imperative for the JKR to decide for itself the core works and the other works to be outsourced with regard to the slope maintenance. On the basis of these considerations the following improvements could be proposed. These proposed improvements have already briefly reported in the Progress Report 2, but they were revised by taking account of the privatisation and by studying them in greater detail.

(1) Decentralization of Control Function of the Headquarters to the Local Offices

The slope management works have been rapidly increased because of expansion of the road network. The length of roadways has now reached about 160,000 km. The two engineers for slope management, as Assistant Directors, control and administer their own zones under Senior Assistant Director. When a slope failure occurs, the report on the disaster is sent by facsimile to the Headquarters and the engineer will judge whether or not he should visit the site on the basis of scale of slope failure. But it is difficult to make a suitable and accurate judgment of every slope failure, especially when the several large-scale slope failures happen at the same time but at different places.

Then the decentralization of control power with regard to road and slope maintenance which was executed by the Headquarters will result that the Headquarters could conduct more suitable judgment on more important core works such as administration, monitoring, planning and so on. Furthermore, the decentralization would bring the cost reduction for the works by transferring to the local offices.

(2) Strengthening of Road Slope Disaster Management Function

The function of the Slope Maintenance and Management Section in the Headquarters should be strengthened. This section must be responsible for conducting the slope disaster management and should concentrate mainly on the following works.

(i) Data collection of slope inspection
(ii) Calculate the risk rating
(iii) Determine the priority ranking
(iv) Prepare implementation plan
(v) Prepare tender documents for countermeasures
(vi) Monitoring

The JKR strives to prevent slope failures by the countermeasures. But, as already mentioned, unfortunately, there are still many potential slopes likely to fail. Therefore, for the immediate future, risk management is of greater importance than countermeasures to prevent the slope failure.

The risk management will function more effectively by the warning system closely connected to the information on existing slope conditions and the slope management information mainly generated by the SIMS and GIS information service.

In this context, the information system for risk management will play an important role for quick relief in an emergency situation in the event of slope failure. This information system should be connected by a hot line between the site and the decision-makers at local offices such as the States and Districts. The many lessons acquired by experiences in Japan will be useful to the slope disaster management in Malaysia.

6.2.2 Operation and Maintenance of SIMS

(1) Headquarters

The SIMS might be the core part of the Road Slope Disaster Management in JKR. The SPRS has been managed and controlled in the Slope Maintenance and Management Unit of the Headquarters. After the introduction of the SIMS proposed by the JICA Study Team, there should be an intermittent period to transfer from the SPRS to the SIMS and for it to function smoothly. The staffs for operation and maintenance of SIMS must necessarily be filled with the ***one engineering geologist/slope engineer*** and one ***system engineer for the SIMS, and one or two engineers and system engineers from the private companies.***

(2) State Office

The State Offices will function as the intermediate office for the SIMS. The slope inspection sheet to be recorded by the District Offices will be collected by the State Offices. The documents on slope maintenance will be finally checked by the staff of the State Offices who will revise and complete them where required. After the final check, the State Offices will send them to the Headquarters.

(3) District Office

The number of staffs of the District Offices after the privatization are assumed to be insufficient for slope management. Therefore the survey for slope management will be outsourced but the data of slope inspection sheets will be input and saved in files by the staffs of the District Offices. The staffs of District Office will control and supervise their work and collect the data of inspection sheets by files. The data will be checked and revised by the staffs of the District Offices and will be sent to the State Offices.

6.2.3 Proposed Human Resources Development

To assign the suitable persons to the suitable positions and to promote the suitable development for their abilities will heighten the efficiency of the organization and productivity and lead to improve the efficiency of road and slope maintenance works.

The human resources have to be suitably allocated to the positions in the organization to achieve their roles. Therefore the human resources development must be conducted in principle by taking account of the proposed improvements to organization as mentioned in 6.2.1.

After the privatisation, the most of the staff on road maintenance work were taken over to the private companies. Therefore the human resources development work must be focus on the slope management.

(1) Basic Policies

1) Human Resources Development for the Administrative Ability

All staffs of JKR are requested to strengthen the administrative ability to conduct the effective slope disaster management. By decentralization of control functions of the Headquarters to local offices such as the State Offices and the District Offices, the staffs of Headquarters are required more than ever to focus on administrative and monitoring works. The staffs of local staffs of the State and District Offices are required more than ever to focus on supervising the slope inspection conducted by private consultants.

To upgrade the general knowledge of geo-technical engineering, the staffs in the Headquarters and the local offices must not only train by themselves but must be trained by OJT conducted by the senior engineers and enrol in the training courses conducted by the Headquarters and by the other organization if necessary. Furthermore, the general knowledge for slope inspection and countermeasure works must be upgraded for the staffs of JKR.

For the effective slope disaster management, the quality check is one of the most important factors. At the moment of tendering, the following items must be carefully and prudently studied with regard to the staff or labour force of candidate contractors or consultants.

(i) Specialized engineers in the staff list
(ii) Years of experience of staff and labour force for countermeasure work of slope failure
(iii) Contents of countermeasure
- Total cost price
- Balance of unit cost and quantity of materials
- Balance of cost of labours and materials according to the type of slope disaster

- Period of implementation of countermeasure
- Consistency between the period of protection from slope failure and the cost for countermeasure works

With regard to improving the level of specialty of staff of private contractors, JKR cannot supervise directly. But the following items are revised or created with regard to the private contractors by JKR themselves.

(i) Data base of personal history (C.V.) of staff of contractor
(ii) Strengthening of monitoring system
(iii) Training system of geo-technical engineers

3) Human Resources Development for Economic Analysis

This type of human resources is essential for the Headquarters. The District Office should focus on data collection on the current condition of slope. The item of "Consequence" in slope inspection sheet could be the basic sources of information for the economic evaluation. Staff must learn the basic knowledge with regard to the methodology for the economic evaluation. The economic evaluation is composed of cost evaluation and benefit evaluation.

As an immediate requirement the present staffs who have worked on costing of countermeasures, are required to upgrade their ability to evaluate the cost calculated on the new slope management system to be proposed by the Study team. The evaluation ability includes (i) updating of unit cost for countermeasures, (ii) the total cost of countermeasures for risky slopes with a tendency to fail, (iii) judgment of suitability and rationality of costing and total costs tendered by the private consultants.

4) Human Resources Development for SIMS

The application of the SIMS will be managed in the Slope Maintenance and Management Section of the Headquarters. The staffs of this section should focus on planning and scheduling of training to maintain and operate the SIMS and coordinating the employment of specialists such as the system computer engineer, GIS specialist, mapping specialist, software specialist and so on.

One geologist as geo-technical engineer is indispensable in the Headquarters. Other specialists should be recruited temporarily from other Branches and Units in the Headquarters or from the private companies.

(2) Human Resources to be Outsourced

1) Motivations for Outsourcing

Outsourcing has been attracted as one of the effective ways to realize the management strategy. The major motivations of outsourcing are as follows.

(a) Limit of Direct Management

JKR can not manage and control directly all human resources in JKR organization for slope disaster management because JKR has not all human resources necessary for the slope disaster management

(b) Slim and Flexible Organization to Cope With Change

Outsourcing could realize slimmer and more flexible organization to cope with change outside of JKR.

(c) Concentration of Resources to Core Works

By outsourcing the professional works which could not be fulfilled by JKR, JKR can concentrate their human resources on the core works.

(d) Realization of Innovation by Reviewing Management Process

On the process of outsourcing, JKR will review the slope management process and realize the innovation of slope management.

(e) Activation of Outside Professional Resources

JKR can activate the professional resources for slope management outside of JKR.

(f) Existence of Outsourcers with High Level Management Performance

There are many human resources with more advanced and high quality slope management knowledge and experience outside of JKR

Particularly, the last two motivations are extremely important for the slope disaster management.

2) Purpose of Accelerating of Outsourcing

(a) Organizational Strategy

Concentration of know-how and human resources to core competence is one of the most important purposes of organizational strategy for outsourcing. Other purposes are considered to be restructuring, reengineering (aiming to heighten the effectiveness of working process by its improvement), re-allocating human resources to more suitable positions, streamlining the organization. These purposes would realize the flexibility of the organization and strengthen the effectiveness of slope disaster management.

(b) Financial Efficiency Strategy

Cost reduction is one of the most common reasons for the introduction of outsourcing. To convert the fixed cost for non-core works into variable cost would also contribute to the cost reduction. Reducing the reaction time of management could be one of the purposes of the financial efficiency strategy.

(c) Technical Strategy

Outsourcing from the viewpoint of technical strategy aims to strengthen the professional knowledge and to acquire the latest technology by utilizing the professional experts outside of JKR. This purpose is extremely important for information technology concerning SIMS.

3) Human Resources to be Outsourced

After the privatisation of road maintenance, most of the staff for road maintenance works joined the three private companies and the workers of the road maintenance including slope maintenance were dramatically reduced. One of the most serious problems for JKR is considered to be how to more effectively outsource the works or functions for which few workers remain. The following roles or specialities are now short-staffed in JKR and should be outsourced.

(a) Slope Inspection

Slope inspection will be conducted by the District Offices through outsourcing to a private contractor

(b) Slope Information Management System (SIMS)

The following skills and work items would be required to be outsourced to a local contractor as important tasks of operating SIMS

- Outsourcing of map creation in case of the Initial Slope Inspection

Work Items

The work items for map creation in case of the initial slope inspection are as follows;

- Aerial Photography
- Digital Mapping
- Land Survey
- Map Generation for GIS

Skill Sets

The following skill sets are necessary to be outsourced.

- Surveying and mapping technology for the above work item
- System Engineering Developer, GIS Specialist, Database Designer

with skill of sets of VB 6.0, Oracle/SOL Server, GIS-Arc View and Map Objects

- Outsourcing of periodical system maintenance with assistance from JKR staff

Work Items

The work items for map creation in case of the initial slope inspection are as follows;

- Maintenance of SQL Server
- Resolution of data and program conflicts
- Integration of data from multiple locations
- Provision of updating to standard values

Skill Sets

The following skill sets are necessary to be outsourced.

- System Engineering Developer, GIS Specialist, Database Designer

with skill of sets of VB 6.0, Oracle/SOL Server, GIS-Arc View and Map Objects

(c) Emergency Work (Clearing to Make Road Passable)

According to the contract between JKR and three private companies for privatisation of the road maintenance, the private companies are obliged to clear roads to make them passable within 24 hours.

(d) Countermeasure Works (Repair Works)

- Soil Investigation
- Design
- Countermeasure Costing

3) Introduction of Staff Consultancy System

The staff consultants are necessary for sustainable slope disaster management. They will work on specified tasks for a specified period on the basis of a contract with JKR. The staff consultancy system has already been introduced by ADB and the World Bank. They are expected to advise and recommend the following work items to the staff of Headquarters of JKR. They are required to have experience and professional technology with regard to "Basic Manager of Slope Disaster", "Slope Engineer with knowledge of geology", "Soil Engineer", "Geo-Technical Engineer", "System Engineer", "Information

Management including GIS", "GIS Specialist". The same kind of system has also been introduced into the Road Branch of the Ministry of National Land and Transport in Japan.

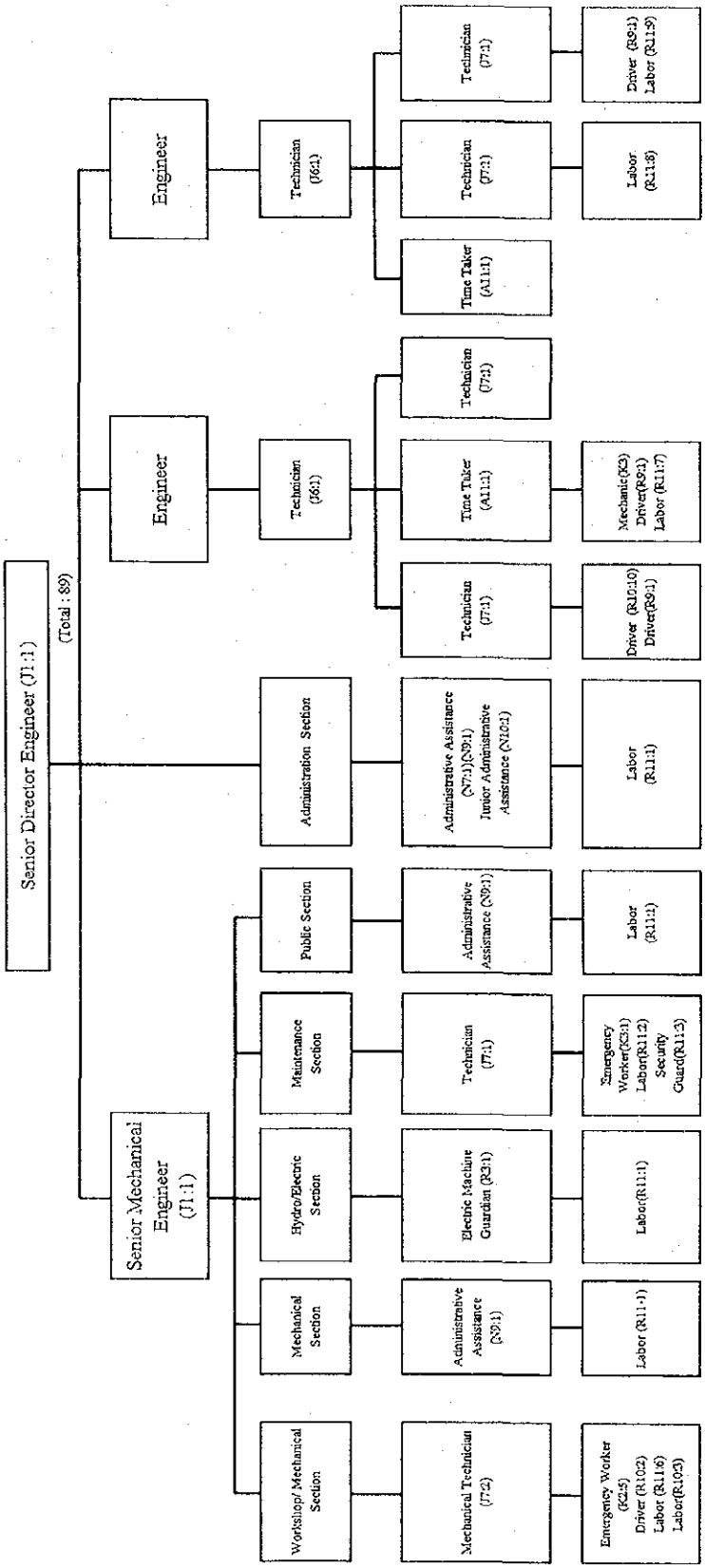
- Management of planning and scheduling for training of JKR staff, private consultants and contractors
- Effective monitoring and supervising of slope inspection
- Effective monitoring and supervising site investigation and instrumentation
- Effective operation and management of SIMS

6.3 The East-West Highways (Case-Study)

6.3.1 Existing Organization

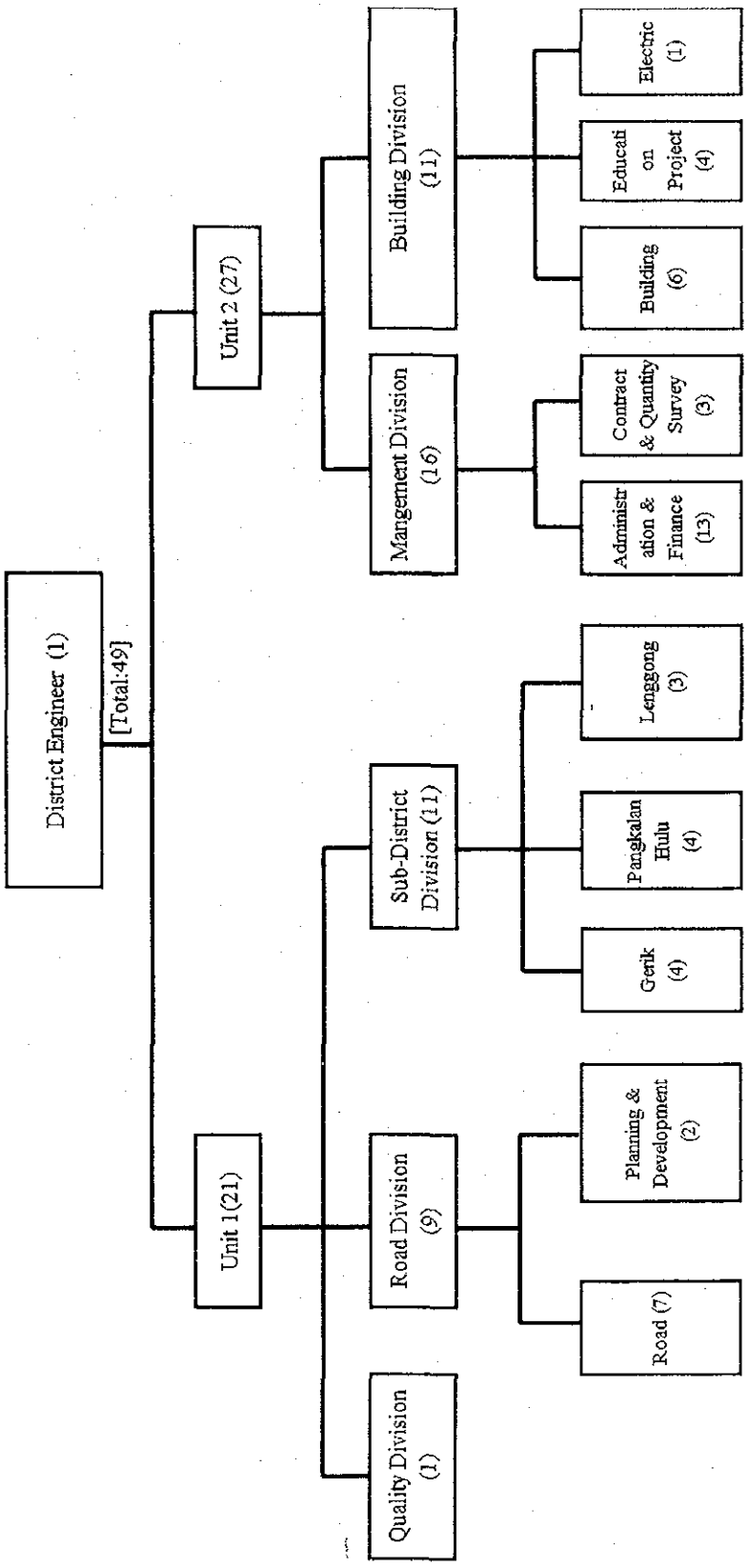
The case study was conducted for the East-West Highways before privatisation. The Gerik Office and the Jeli Office of the East-West Highways were closed after privatisation and the part of East-West Highway, which was administered by the Gerik Office, is now administered under the Head Office of Hulu Perak District. Then the Head Office of Hulu Perak District administers 86km of western part of the East-West Highway, which was under the administration of the Gerik Office before the privatisation. The Head Office of Huluk Perak District is composed of two Units and five sectors. Unit 1 is composed three sectors, which are (i) Road Division, (ii) Quality Division and (iii) Sub-District Division. The Sub-district Division comprises the three small districts (i) Gerik Office (86km of western part of the East-West Highway under the administration of the Gerik Office before the privatisation), (ii) Pengkalan Hulu Office (60km of No.66 Federal Road), and (iii) Lenggong Office (60km of No.66 of Federal Road). The organization chart of the Gerik Office of East-West Highway before privatisation and that of the Head Office of Hulu Perak District after privatisation are shown in Figure 6.3.1 to 6.3.4.

The road maintenance of the East-West Highway are conducted by the private company, Belati Wangsa Sdn. Bhd. whose parent company is Johawaki Sdn. Bhd.



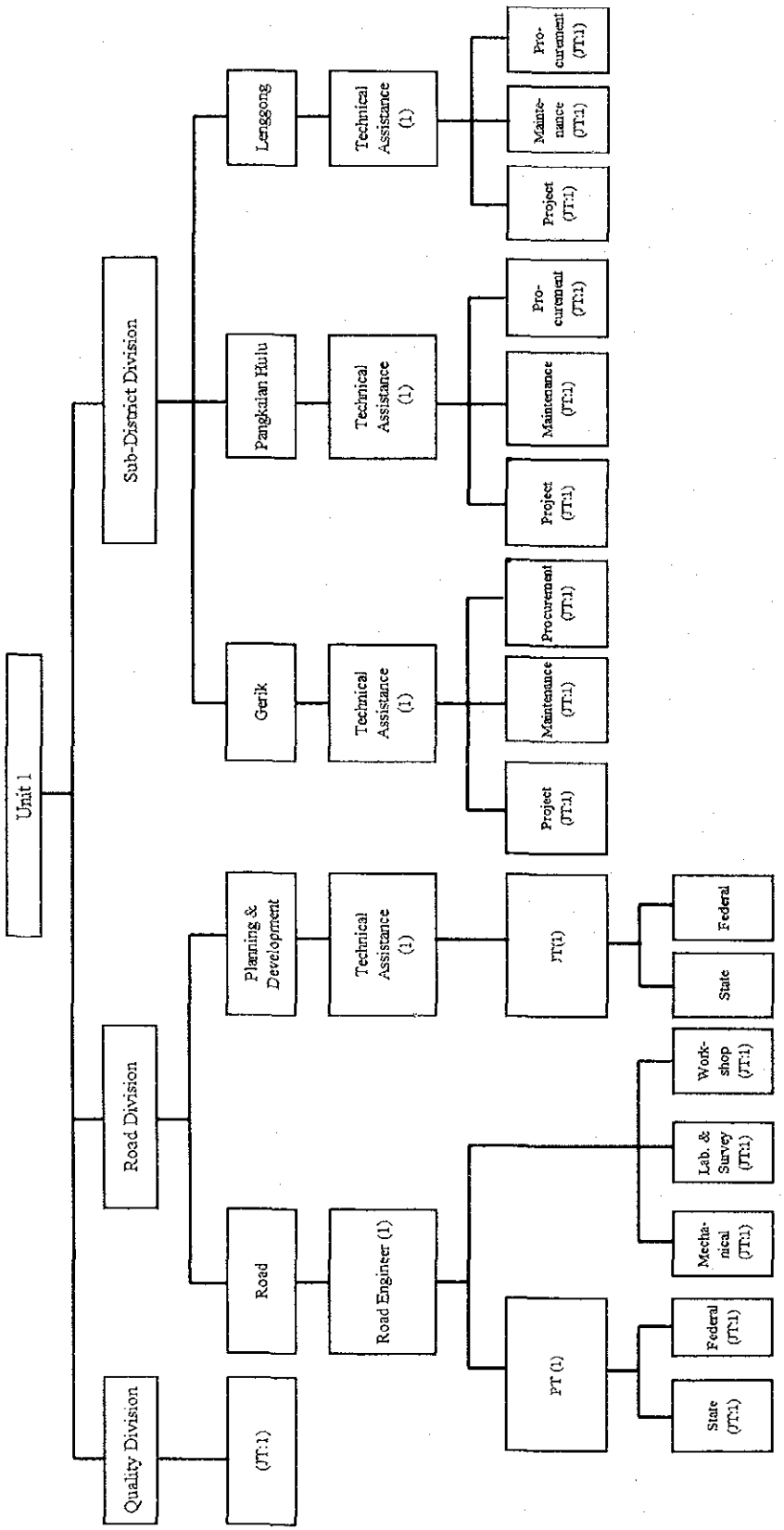
Source: The Gerik Office of the East-West Highways before the privatization
Note : 1.The alphabets with figures and figures in parenthesis stand for the grade and No. of staffs.
2. The number of staffs includes the vacant positions(7)

Figure 6.3.1 The Organization Chart of the Gerik Office of the East-West Highways Before Privatization



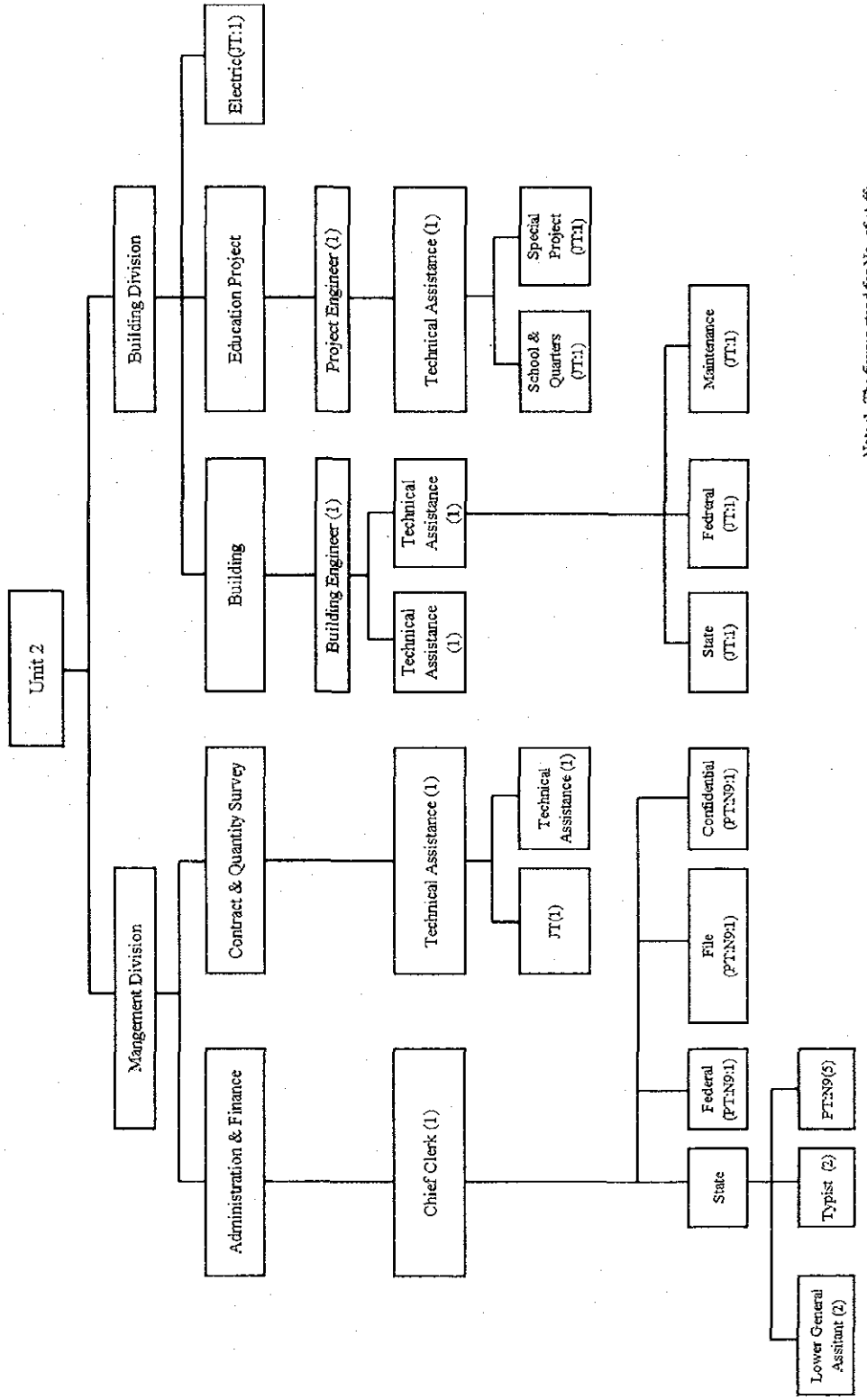
Note :1. The figures stand for No. of staffs
Source : The Head Office of Hulu Perak District Office

Figure 6.3.2 Organization Chart of District of Hulu Perak of JKR (General)



Note :1. The figures stand for No. of staffs
2. JT means Technician
Source : The Head Office of Hulu Perak District Office

Figure 6.3.3 The Organization Chart of Disrict Office of Hulu Perak(Unit:1)



Note :1. The figures stand for No. of staffs
2. PT(N9) means Administrative Officer
3. JT means Technician
Source : The Head Office of Hulu Perak District Office

Figure 6.3.4 The Organization Chart of Disrict Office of Hulu Perak (Unit:2)

6.3.2 Allocation of Slope Maintenance and Management Cost

The Study Team conducted the slope investigation for the western part of the East-West Highways (56.3km) which was administered by Gerik Office before privatisation. The cost for countermeasures are calculated and recorded in the inspection sheets by slope. All slopes were ranked by four risk grade such as "very high", "high", "moderate" and "low" on the basis of the risk score. The costs of slopes which belong to the grades of very high and high were checked and reviewed in details. The Head Office of Hulu Perak District which administers the western part of the East-West Highways (the case study route) after privatisation concluded the contracts with the private contractors with regard to the routine works and countermeasure works. The project for countermeasures costs is 11 million RM for 68 weeks (about three years) as shown Table 6.3.1. Then about 3 million RM per year will be spent for countermeasures for this route. The budget for the countermeasures of this total route of the East-West Highways is 10 million RM. Then 5 million RM , the half of 11 million RM on the basis of rate of length of roads (56.3/124=0.46), could be allocated for the countermeasures of the case study route. But about 3 million RM is already allocated by the contract with the private contractor. Then the allowance for other allocation is about 2 million RM. But from the next year, the big project more than 2 million RM for countermeasures is permitted to be proposed by the Road Maintenance Unit. Then the part of total cost of countermeasures for the slopes ranked as "Very High" (6.9 million) is financially affordable to be allocated from the next year.

Table 6.3.1 Contracts Between JKR and Private Contractors

Name of Contact	Contents	Period	Cost (RM)	Contractors
1. Project IIIF	Countermeasure for Slope Failure	68 Weeks	11 Million	Bumi Highway
2.Package IIB, IIC, IIIA, IIIC, IIID	Routine Works for Road Maintenance	3 Years (1999-2001)	3 Million	MTD
3. Package IIIB	Routine Works for Road Maintenance	2 Years (1999-2001)	2 Million	MTD

Source: Head Office of Hulu Perak District

6.3.3 Human Resources After Privatisation

The Gerik Office was closed as a JKR Office and is now rented by the private company. The Head Office of Hulu Perak District is the successor to the slope management work. The total number of staff in the Head Office of Hulu Perak District is 49, and the number of staff in the Road Division is seven, after privatisation (eight staff members before the privatisation). (Figure 6.3.3 to 6.3.4) Four staff members are working for the slope maintenance of the seven in the staff. They are composed of one engineer (executive engineer: J3), one technical assistant (J5) and two technicians (J6). Three of these staff is from the Head Office and one technician is from the sub-district of Gerik.

Table 6.3.2 shows the grades and the number of staffs on road maintenance at the Gerik Office before the privatisation. After the privatisation, they will continue to work for the road maintenance. Therefore the quality of the work will not change drastically.

Table 6.3.2 The Grade and No. of Staffs of the Gerik Office of the East-West Highways before the Privatisation

Grade	Names of Position	No. of Staffs
J1	Senior Director Engineer	1
J1	Senior Mechanical Engineer	1
J1	Superintendent Engineer	1
J2	Senior Executive Engineer	1
A11	Pencatit Masa (Time Taker)	3
J6	Technician	2
J6	Technician	6 (2)
K2	Tukang (Emergency Worker)	5 (4)
K3	Tukang Kayu (Emergency Worker)	1 (1)
K3	Tukang Pem Jambatan (Mechanic)	2
N6	Administrative Assistant	1
N9	Administrative Assistant	4
N10	Junior Administrative Assistant	1
R3	Electric Machine Guardian	1
R9	Driver	12
R10	Driver	15
R11	Security Guard	3
R11	Labour	29
Total		89 (6)

Source: The Gerik Office of the East-West Highways before the privatisation

Note : The figures in parenthesis are vacant and included in total

CHAPTER 7 IMPLEMENTATION OF SLOPE MANAGEMENT SYSTEM

7.1 Implementation to Nationwide Federal Road

The basic plan of nationwide implementation of the SIMS for federal roads is proposed in the following items:

(1) Background
  1) Current Slope Management System in Malaysia
  2) Development of SIMS
(2) Basic Concept of the Implementation Plan
  1) Contents of Implementation
  2) Target Roads for Implementation
  3) Priority for Implementation
(3) Proposed Implementation Plan of Phase-I
  1) Outline
  2) Scope
  3) Arrangement of Necessary Staff in JKR
  4) Outsourcing
  5) Procurement
  6) Training
  7) General Schedule of Implementation in Phase-I

7.1.1 Background

1) Current Slope Management System in Malaysia

The SPRS (Slope Priority Ranking System) was developed and implemented by JKR in 1999. At present this system basically covers the whole state of Malaysia with the exception of some limited districts.

SPRS is quite a functional and practical system for slope management that provides a priority ranking list for decision-making at JKR Headquarters within the implementation plan of slope countermeasures for the whole country. However, it is acknowledged that there are certain shortcomings or deficiencies in some areas like;

a) Input of geologist/slope engineering professionals
b) Reliability in hazard/risk rating
c) Reliability in cost estimation of countermeasure
d) Database of each slope
e) GIS function

2) Development of SIMS

SIMS, a new slope information management system was developed and completed in March 2002, through a JICA-JKR cooperative study. This system is combined with

"Guidelines of Road Slope Disaster Management", which includes the technical specifications for slope inspection and slope rating.

This system was developed with the aim of a more reliable and practical system for slope management. Its basic design principle is as follows:

a) To be based on the pre-existing Malaysian systems, SMS and SPRS
b) To improve and overcome the shortcoming and deficiencies of those systems
c) To adopt some of the methods of geological/slope engineering that have been developed and practised for many years in Japan.

In the above circumstances it is requested to prepare a plan for nationwide implementation of the new slope management system to the federal road network.

7.1.2 Basic Concept of Implementation Plan

1) Contents of Implementation

The contents of the New Slope Management System to be implemented in this proposed plan consists of:

a) Slope Inspection Methodology
b) SIMS, Slope Information Management System and
c) Slope Maintenance and Disaster Management System

The technical specification and other details of a), b) and c) are described in Guidelines for Road Slope Disaster Management, separate volume, of Draft Final Report of this study.

2) Target Road of Implementation

Table 7.1.1 shows the length of roads in the country, including toll expressways and toll highways, other federal roads, and state roads including municipality roads. According to mutual agreement between JICA and JKR at the start of this study, our principal target of implementation of this new system should be ***2) Class II, Other Federal Roads*** in Table 7.1.1. So the target roads for the implementation plan have a total length of **14,891 km.**

Table 7.1.1 Roads in Malaysia

Class/Category	Total Length (km)	Pavement Length (km)	Paved Portion (%)
1) Class I Toll Expressway & Toll Highway	1,190	1,190	100.00
2) Class II **Other Federal Roads**	**14,891**	13,592	91.3
3) Class III State Roads (incl. Municipality Roads)	50,109	26,263	72.4

(Source: Malaysian Roads, General Information 1999)

3) Priority in Implementation

Regardless of the actual budget allocation and expected performance, it will take many years to complete the implementation, particularly preparation of slope database for nationwide federal roads of 14,891 km. It was therefore recommended to prioritise the federal roads for implementation of the new system. Although there may be several options for determining the priority, the most sensible option is to use the results of SPRS, the present nationwide slope risk ranking system.

Table 7.1.2 shows a list of federal roads identified as prone to slope failure, based on the result of SPRS carried out in the year 2000. The core of this table was originally prepared and disclosed by JKR on a newspaper in July 2000. Twelve (12) roads were identified as prone to slope failure. (Note: Route No.6, Pulau Pinang Road, was not included in the original announcement, but was later added in consideration of its risk of rock fall). The total length of these twelve roads is 1,068 km, corresponding to about 7 % of the whole length of federal roads, 14,891 km.

From a practical point of view, it is recommended to perform the implementation in separate phases;
The 1st Phase: Twelve (12) roads of 1,068 km
The 2nd Phase: The rest of the federal roads of 13,823 km.
Actually the 2nd Phase would be divided further into several sub-phases, according to further prioritisation based on the result of SPRS.

Table 7.1.3 shows a summary of SPRS in conjunction with the number of slopes being rated as each risk level. There were 34 slopes rated as very high risk and 109 slopes as high risk over the entire federal road network. The twelve (12) roads, as mentioned before, identified as prone to slope failure account for one third of these slopes of very high or high risk, while two thirds were observed along other roads in twenty (20) districts. Of this latter category, road slopes rated as very high or high risk could be candidates for implementation in the early stage of Phase-II.

Table 7.1.2 Federal Roads Identified as Prone to Slope Failure

No.	Brief Description of Route	Route No.	Design Standard	Route Distance (km)	Percentage in hilly and mountainous area (%)	Distance in hilly or mountainous area (km)	Number of Past Slope Failure			
							Year 1998	Year 1999	Year 2000	3 years total
	A. WEST MALAYSIA									
1	Gerik - Pasir Putih (East-West Highway)	**No. 4**	R5	203	90%	183	8	5	5	18
2	Jalan Mengelilingi Pulau Pinang (Pulau Pinang)	**No. 6**	R1	62	40%	25	3	3	3	**9**
3	Bentong - Gua Musang - Kota Bharu	**No. 8**	R2	407	40%	163	2	2	2	**6**
4	Kuala Kubu Bharu - Gap - Teranum	**No.55**	R1	53	80%	43	10	8	8	**26**
5	Gap - Faser Hill	**No.56**	R2	8	100%	8	20	10	10	**40**
6	Tapah - Cameron Highlands	**No.59**	R2	65	95%	61	10	10	10	**30**
7	Kuala Lumpur - Bentong (Jalan Bentong Lama)	**No.68**	R2	60	70%	42	5	4	4	**13**
8	Baling - Kuala Kangsar	**No.76**	R3	164	80%	131	5	3	3	**11**
9	Seremban - Kuala Klawang - Simpang Pertang	**No.86**	R2	63	40%	25	3	3	7	**13**
10	Simpang Pulai-Lojin (The 2nd East-West Highway)	**(*1)**	R3	49	90%	44	(*1)	(*1)	(*1)	(*1)
	B. SABAH									
11	Tamparulli - Sandakan	**No.22**	R2	298	95%	283	10	10	8	**28**
12	Penampang-Tambunan-Keningau	No.500	R4	120	50%	60	(*2)	(*2)	(*2)	(*2)
	GRAND TOTAL			**1,551**	**69%**	**1,068**	**76**	**58**	**60**	**194**

(*1) As being State Road under construction, no record is available.
(*2) State Road until December 2000, then no record is available.

(Compiled in Decemebr 2001 by JKR)

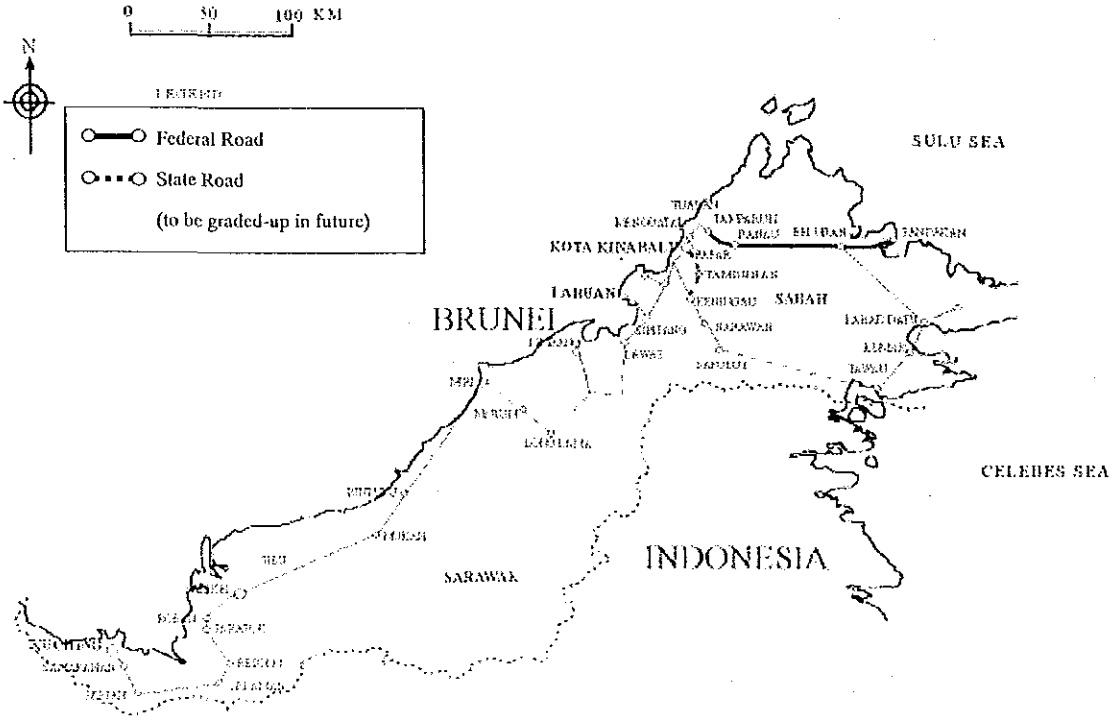


Figure 7.1.1 Federal Roads Identified as Prone to Slope Disaster (East Malaysia)

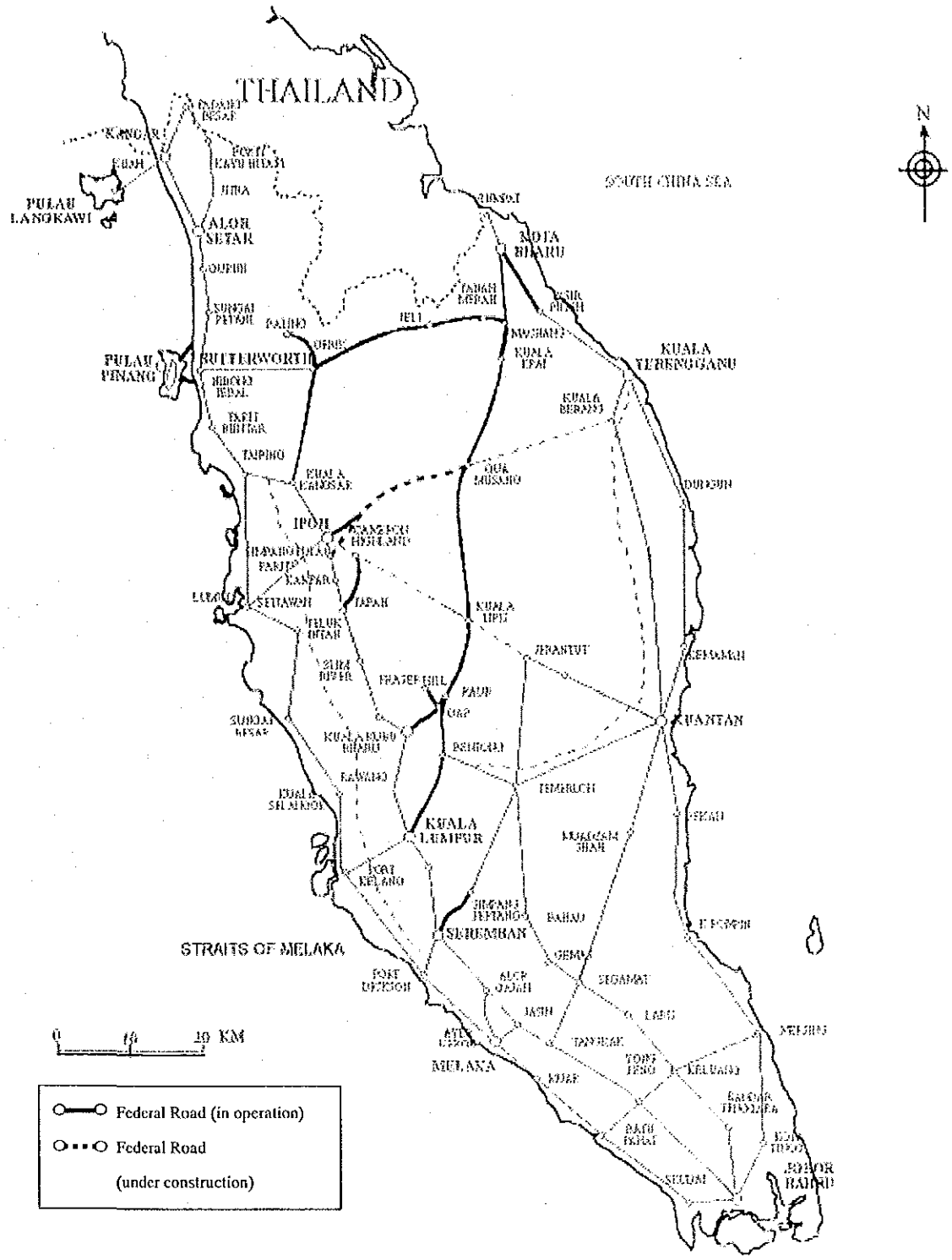


Figure 7.1.2 Federal Roads Identified as Prone to Slope Disaster (Peninsula)

Table 7.1.3 Number of Slope Rated on Each Risk Level (SPRS)

	State	Code	Risk Rating					Total
			Very high	High	Moderate	Low	Very low	
Statistics by State	Perak	A	9	21	61	33	5	114
	Selangor	B	0	0	27	83	18	128
	Pahang	C	8	34	131	153	248	572
	Kelantan	D	3	9	4	0	0	3
	Johor	J	-	-	6	8	2	16
	Kedah	K	2	1	69	97	93	261
	Labuan	L	1	3	1	-	-	5
	Negeri Sembilan	N	0	2	23	8	0	31
	Penang	P	0	7	21	4	0	32
	Sarawaku	Q	3	6	28	15	9	61
	Sabah	S	8	26	43	32	27	136
Statistics by Roads	(*) 5 roads identified as prone to slope failure	subtotal	13	36	111	163	134	457
	Other roads	subtotal	21	73	303	270	268	935
Total			34	109	414	433	402	1392

(*) Federal Roads No. 4, 6, 8, 55, 56and 59 (Refer to Table 8.1.1.)

January 2001

7.1.3 Proposed Implementation Plan of Phase-I

1) Outline

Although the final detail will depend on administrative policy and budget allocation, the implementation plan for Phase-I is proposed as follows:

a) Target Road: Twelve (12) roads, as listed in Table 7.1.2

b) Total Length: 1,068 km

c) Number of Slopes: 10,000 slopes (10 slopes per km in average)

d) Implementation Period: Two (2) years

e) Estimated Budget: RM 10 million

2) Scope

a) Slope Inspection

b) SIMS

Notes: In addition to the above, aerial survey and digital mapping is suggested to make the best use of the GIS function of SIMS. However, as it requires additional cost, it should be regarded as an option.

c) Slope Maintenance and Disaster Management System

3) Arrangement of Specialist in JKR

It is recommended that the following specialists be provided in JKR Headquarters to support the slope management staff in two (2) areas:

a) Engineering geology specialist
   i) To support the slope management staff in planning, supervision, and technical guidance in the implementation of slope inspection nationwide.
   ii) To be provided from other governmental organization like JMG (Mining and Geoscience Department, Malaysia) or from an engineering company

b) System development and system maintenance specialists
   i) To support the maintenance and further development of SIMS including planning, supervision, and technical guidance to JKR staff and subcontractors.
   ii) To be provided from a private company, under the contract, as it may not easy to get specialists in this area from other governmental offices.

4) Outsourcing

Out sourcing should be arranged in the following areas.

a) Slope Inspection

b) System maintenance

c) Aerial Survey and Digital Mapping (Option)

a) Slope Inspection

Table 8.1.5 shows the scope, assignment of engineers, and time schedule for outsourcing slope inspection. The suggested specifications and other related details are provided in Guide II Slope Inspection and other Guides of this study.

b) Development and Maintenance of SIMS

Table 8.1.6 shows the scope and time schedule for outsourcing the development and maintenance of SIMS. The suggested specifications and other related details are provided in Chapter 5 and 6 of this main report.

c) Aerial Survey, Mapping and Data Creation (Option)

As mentioned, aerial survey and digital mapping for SIMS is optional. Table 8.1.7 shows an outline of a suggested program for outsourcing these works, including the scope and time schedule, just in case a decision is made to undertake them.

Remarks: According to experience through our project and others in Malaysia, careful attention should be paid to the time schedule of aerial photography. Sometimes a long stand-by period of two to three months occurs before there are clear sky conditions. As aerial photographs are very useful for making preliminary study prior to full slope inspection, this fact should be kept in mind when scheduling slope inspection.

5) Procurement

For implementation of SIMS, it is necessary to procure hardware and software in each office of JKR concerned. The necessary hardware and software is as follows; .

HQ (IT centre)

Hardware: PC based Server with:

Pentium (P-III/ P-4)

128 MB Memory

CD writers

60GB HDD

for SIMS Database Slope Graphic Data (photographs and sketches) GIS data.

Workstation PC's with

Pentium (P-III/ P-4)

128 MB Memory

CD writers

20GB HDD

for SIMS Application (less than 50 MB of space)

Software: For Server

Windows 2000 Professional

MS SQL/Server

ESRI's MapObjects

For Workstation

Windows 2000 Professional

SIMS Software Application

ESRI's MapObjects

Local office

Hardware: PC with

Pentium (P-III/ P-4)

128 MB Memory

CD writers

20GB HDD

for SIMS Application (less than 50 MB of space)

SIMS Database (less than 100MB of space for 1,000 slopes)

Slope Graphic Data (photographs and sketches)

GIS data.

Software: Windows 2000

MS Access 2000

ESRI's MapObjects

6) Training

Training is one of the essential elements in implementation and effective operation of the new slope management system. The training program shall be carefully planned and carried out in three categories; slope management, slope inspection and system maintenance.

The trainees should be selected from each of the concerned offices of JKR as well as private companies to be involved in the outsourcing contract for implementation.

The detail of training program is discussed in the next Section 7.2.

7) General Schedule of Implementation in Phase-I

Table 7.1.7 summarizes the time schedule of a suggested implementation plan in Phase-I, for the twelve (12) selected roads.

Table 7.1.4 General Schedule of Implementation of Phase-I

	Time Schedule		Remarks
	The 1st Year	The 2nd Year	
Slope Inspection			
SIMS			
Training			
Management			
Slope inspection			
System maintenance			

Table 7.1.5 Suggested Program of Out-sourcing of Slope Inspection

Standard Schedule for Slope Inspection Work (per 100 km)

Work Item & Experience \ Time	MONTH 1	2	3	4	5	6	7	8	9	10	11	12	TOTAL QUANTITY (M/M)	DETAILS OF WORK
1. PREPARATORY WORK														- Prepare maps and aerophotos
Chief Engineer	▬												1.0	- Detect landslede and debris Slope
Engineering Geologist	▬												2.0	- Collect disaster record
2. SELECTION OF SLOPE														- Dicide slope ID (based on slope inspection)
Chief Engineer		▬	▬											- Detect slope (1000 slope)
Engineering Geologist		▬	▬										6.0	- Dicide failure type
Assistant Engineer		▬	▬										6.0	- Topological survey
3. SLOPE INSPECTION														- Inspect Slope (600 slope, 4 slope /day)
Chief Engineer			▬		▬								1.0	- Propose countermeasure
Slope Design Engineer			▬	▬	▬								4.0	
Engineering Geologist 1			▬	▬	▬								5.0	
Engineering Geologist 2			▬	▬	▬								5.0	
Engineering Geologist 3			▬	▬	▬								5.0	
Assistant Engineer 1			▬	▬	▬								5.0	
Assistant Engineer 2			▬	▬	▬								5.0	
Assistant Engineer 3			▬	▬	▬								5.0	
4. REPORTING														- Arrange preparatory work
Chief Engineer					▬	▬							1.0	- Arrange inspection results (600 slopes)
Slope Design Engineer					▬	▬							2.0	
Engineering Geologist					▬	▬							2.0	
Assistant Engineer					▬	▬							2.0	
<TOTAL>														
Chief Engineer	0.5	0.5	0.5	0.5	0.5	0.5							3.0	
Slope Design Engineer			1.0	1.0	1.0	1.0							4.0	
Engineering Geologist	1.0	1.0	3.0	3.0	1.0	1.0							10.0	
Assistant Engineer		1.0	3.0	3.0	1.0	1.0							9.0	

Preparatory work

Slope selection

Slope inspection

Reporting

Table 7.1.6 Suggested Program of Outsourcing of Development and Maintenance of SIMS

Development and Maintenance of SIMS

12-Dec-01

Work Item	Description	Time Schedule (in months)												Person Days/ Month	Remarks Amount (RM)
		1	2	3	4	5	6	7	8	9	10	11	12		
1.0 Headquarter System															
1.1	Server Maintenance and Configuration	•••••	•••••	•••••	•••••	•••••	•••••		•••••		•••••		•••••	1	4,500
1.2	Database Backup and Archival	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	1	6,000
1.3	Workstation Maintenance and Configuration (4 HQ systems)	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	1.5	9,000
1.4	User Support	•••••	•••••	•••••	•••••	•••••	•••••		•••••		•••••		•••••	1.5	6,750
	Sub-Total														26,250
	Taxes (5% GST)														1,313
	Total														27,563
2.0 District System															
2.1	Database Backup and Archival		•••••		•••••		•••••		•••••		•••••		•••••	1	3,000
2.2	Workstation Maintenance and Configuration (2 Districts, 1 System each)	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	•••••	1.5	9,000
2.3	User Support	•••••	•••••	•••••	•••••	•••••	•••••		•••••		•••••		•••••	1.5	6,750
	Sub-Total														18,750
	Taxes (5% GST)														938
	Total														19,688
	Grand Total														47,250

Table 7.1.7 Suggested Program of Outsourcing of Aerial Survey, Mapping and Data Creation

Aerial Survey, Mapping, and Data Creation

12-Dec-01

Length of Highway Selected: 100 km
Width Along Highway: 2 km

Work Item	Description	Time Schedule (in months)												Remarks
		1	2	3	4	5	6	7	8	9	10	11	12	Amount (RM)
1.0 Aerial Photography														
	1.1 Mobilisation and Demobilisation													38,000
	1.2 Setting of Aerial photo signal with photo control points													188,800
	1.3 Aerial Photography													304,000
	1.4 Reporting													16,800
	Sub-Total													545,600
	Taxes (5% GST)													27,280
	Total													572,880
2.0 Photogrammetric Mapping														
	2.1 Mobilisation and Demobilisation													16,000
	2.2 GPS Survey													81,600
	2.3 Ordinary Leveling													49,600
	2.4 Field Verification													19,200
	2.5 Aerial Triangulation													21,600
	2.6 Digital ortho-photo Mapping including 10 m contour lines													260,800
	2.7 Digital Mapping													198,400
	2.8 Reporting													4,800
	Sub-Total													652,000
	Taxes (5% GST)													32,600
	Total													684,600
3.0 Data Creation														
	3.1 Vector Data Creation													25,000
	3.2 Raster Data Creation													7,200
	3.3 Slope Inspection Data													16,000
	3.4 GIS and Inspection Data Integration													6,000
	Sub-Total													54,200
	Taxes (5% GST)													2,710
	Total													56,910
	Grand Total													**1,314,390**

7.2 Human Resources for Implementation

7.2.1 Human Resources of JKR

(1) Head Quarter

1) Road Maintenance Unit

The staffs of the Slope Maintenance and Management Sector of the Road Maintenance Unit is expected to fulfil the following functions as core competencies with regard to slope disaster management.

(i) Administration, management and controlling of the systems used by this section such as SIMS to be introduced by JICA in this study
(ii) Monitoring of slope maintenance and management
(iii) Controlling budget officer for slope maintenance
(iv) Preparation of mandatory slope inspection program
(v) Planning of implementation of countermeasure against slope failure
(vi) Monitoring of routine slope inspection conducted by the District offices
(vii) Preparation and execution of training program for nationwide slope inspection
(viii) Instruction of counter measures to the District and State Offices when the slope disasters occur (Risk Management)

2) Human Resources of UPU

The staffs of UPU (The Digital Mapping of Utilities and Infrastructures Unit) is expected to cooperate to maintain the SIMS by providing the experience with regard to the GIS system..

(2) State Office

The State Offices are expected to have the following functions as core competencies with regard to slope disaster management. The staff s of State Offices should strive to strengthen these core competence.

(i) Collecting information for the data base of SIMS
(ii) Reporting to the State Offices with regard to information for monitoring of slope maintenance to be conducted by the District Offices
(iii) Monitoring the execution of risk management to be conducted by the District offices on the basis of diagnosis for disaster prevention by outsourcing to private contractors
(iv) Coordinating and submitting to HQ the budget for road maintenance proposed by the District Offices
(v) Monitoring or Supervising the mandatory (routine and periodical) slope inspection to be executed by the private contractor

(vi) Monitoring or Supervising implementation of counter measure works against slope failure to be executed by the private contractor
(vii) Risk management in emergencies by co-operation with the District Offices (reporting the conditions of slope disaster to JKR, control of traffic, formation of rescue groups)
(viii) Monitoring the traffic recovery works from slope failure executed by private contractor under supervision of District Offices.

(3) District Offices

The District Offices are expected to have the following functions as core competencies with regard to slope disaster management. Therefore the Staffs of District Offices should strengthen these core competences.

(i) Providing information for the SIMS database
(ii) Reporting information to State Offices from monitoring of slope maintenance (routine and countermeasure works)
(iii) Supervising the mandatory (routine and periodical) slope inspection by patrol on the basis of diagnosis for slope disaster prevention to be conducted mainly by the private contractors
(iv) Execution of risk management on the basis of diagnosis for disaster prevention by cooperation with private contractors
(v) Submitting the budget to the State Offices with regard to maintenance cost including routine, recovery and countermeasure works
(vi) Implementation of counter measure works against slope failure to be executed by private contractor
(vii) Risk management in emergencies by co-operation with the State Office and three private companies for slope maintenance (reporting the conditions of disaster to HQ, traffic control, forming of rescue group)
(viii) Supervising the traffic recovery works from slope failure to be executed by three private contractors

7.2.2 Human Resources to be Outsourced

As already mentioned in 6.2.3, the staffs of slope maintenance and management are shortened after privatization and the following works should be outsourced.

- Slope Inspection
- Slope Information Management System (SIMS)
  - Map creation in case of the Initial Slope Inspection
  - Periodical system maintenance with assistance from JKR staff
- Emergency Work (Clearing to Make Road Passable)
- Countermeasure Works (Repair Works)
  - Soil Investigation

- Design
- Countermeasure Costing

- Introduction of Staff Consultancy System
  - Management of planning and scheduling for training of JKR staff, private consultants and contractors
  - Effective monitoring and supervising of slope inspection
  - Effective monitoring and supervising site investigation and instrumentation
  - Effective operation and management of SIMS

7.3 Training Programme

Table 7.3.1 shows the training programme for slope disaster management. The contents of this programme are explained as follows.

(1) Course of Slope Disaster Management

1) Contents and Materials

The comprehensive and basic guidance for slope disaster management will be the subject of this course, including the general management of slope disasters, slope inspection, slope countermeasure selection and cost estimation, and SIMS application. The main materials for this course will be "Guideline I: Guide to Slope Maintenance and Road Disaster Management" prepared by the JICA Study Team.

2) Instructor

The instructor of this course could be the Head of the Road Maintenance Unit with position of Senior Superintending Engineer (Grade : J1) or the Chief of the Slope Maintenance and Management Section with position of Senior Assistant Director (Grade : J2).

3) Specialty Level of Trainee

The course attendees will only be JKR staff. The specialty level of staff targeted for training from the Slope Maintenance and Management Sector of the Road Maintenance Unit will be Assistant Director, Grade J2. For the departmental GIS Unit, it will be Senior Executive Engineer (J2). The trainees of the State Office and the District Office will be Senior Executive Engineer (J2).

(2) Course of Slope Inspection

1) Contents and Materials

The guidance and site training (OJT) in this course will be instructed on the basis of "Guideline II: Guide to Slope Inspection" and "Guide IV: Guide to Slope Countermeasure Selection and Cost Estimation". This training will only be provided to staff of Headquarters and the State Office of JKR. Both guidance and site training (OJT) will be trained to the staff of the District Office of JKR and Geo-technical Company for initial inspection work.

2) Instructor

The instructor of this course could be a combination of Assistant Director of Slope Maintenance and Management Section (J2) and one Geo-Technical Engineer. The Geo-technical Engineer will be assigned from other agencies such as JMG (Department of Mineral and Geo-science).

3) Specialty Level of Trainee

The specialty level of the staff of the Headquarters and State Office of JKR would be Assistant Director (J2) and for the District Office would be Road Engineer (J3) and Technician (J7). For the Geo-technical Company, the staff

Table 7.3.1 Training Programme for the Slope Disaster Management

Training Course			Slope Disaster Management	Slope Inspection	SIMS Operation
Training Materials			**-Guideline I:** "Guide to Slope Maintenance and Road Disaster Management"	**-Guideline II:** "Guide to Slope Inspection" **-Guideline IV:** "Guide to Slope Countermeasure Selection and Cost Estimation"	**-Guideline V:** "Guide to Slope Information Management System (SIMS)" *** Separate Volume depending on User Level**
Instructor for guidance and OJT			-Engineer in Road Maintenance Unit	-Engineer in Road Maintenance Unit - Geo-technical Engineer/Geologist from other	-Engineer in Road Maintenance Unit - System Engineer from other organization
Trainee Speciality and evel and Training Scheme	JKR H.Q	Slope Maintenance and Management Sector	-Guidance to Engineer	-Guidance to Engineer and Technician	-Guidance as **Advanced User Level** to Engineer - Guidance as **General User Level** to Technician
		IT Center	-Guidance to Engineer	No need (If available, self-teaching the baseline knowledge by reference to GuideII and GuideIV)	-Guidance as **Administrative User Level** to Engineer and Technician
	JKR State Office		-Guidance to Engineer	-Guidance to Engineer	-Guidance as **General User Level** to Engineer
	JKR District Office		-Guidance to Engineer	-Guidance to Engineer and Technician	-Guidance as **Advanced User Level** to Engineer - Guidance as General User Level to Technician
	Private Sector for Sub-Contract	Geo-technical Company for Initial Inspection Work	No need	-Guidance and OJT to Geologist/Geotechnical Engineer and Civil Engineer	No need (If available, self-teaching the baseline knowledge by reference to GuideV)
		System Company for System Maintenance using SIMS	No need	No need (If available, self-teaching the baseline knowledge by reference to GuideV)	-Guidance as **Administrative User Level** to System Engineer

are required to have the speciality level of Geo-technical Engineer and Civil Engineer.

(a) JKR

The speciality level of staff from the Slope Maintenance and Management Sector of the Road Maintenance Unit and the State Office will be Assistant Director (J2) and from the UPU (GIS) Unit, it will be Senior Executive Engineer (J2). The trainees of the State Office and the District Office will be Senior Executive Engineer (J2).

(b) Private Sector for Sub-Contract

The private sector for sub-contracting this course will be Geo-technical Company for initial slope inspection work. The level of speciality of staff of this company will be Geo-technical Engineer and Civil Engineer.
Engineer (J2).

(3) Training Program for System Use and Maintenance

For the effective use of SIMS, training will be imparted to persons identified by JKR. Training will be provided at three levels.

- Review and training during development of SIMS
- Training of SIMS Users
- Training of SIMS Administrators

During the development of SIMS, short training sessions have been conducted for JKR. As a result of these training sessions, enhancements have been made in SIMS. These training sessions have also provided some degree of familiarity with the application for individuals participating in the training sessions. In a separate training session, an overview of ArcView GIS was also provided to inform JKR of some basic concepts in GIS, the capabilities of ArcView, and the customised and easier access to GIS being provided as a part of SIMS.

The more extensive training in the use of SIMS will be conducted after the final seminar. Participants selected by JKR for this training will be presented with an overview of SIMS and then a module-by-module training session will be conducted, making them conversant with the application, the process of entering data, doing analysis, and generating output maps and reports from the system.

To support these users and the general functioning of SIMS, individuals selected by JKR as SIMS administrators will be given specific training into their role as SIMS Administrators, the functions controlled as administrators, and the maintenance of the system. This training is expected to provide the foundation essential for the continued and successful operation of SIMS as applied to multiple users. In addition to enabling the administrator in modifying/ enhancing the standard data tables, managing scoring ranges, adding GIS data,

this training session will also address the data import and export from the individual locations to the centralised master database at JKR HQ.

To assist in the training, and for the future user of SIMS, a "User Manual" will also be provided. This document will provide a module-by-module guidance for the general user. It will also provide the SIMS administrator with information on the standard tables and the procedures for making enhancements/ revisions to the system database. Guidance sections on SIMS data import/ export and addition of GIS data will also be part of this administrative section of the user manual.

(4) Period of Training

1) Management

The training of slope disaster management will be prioritised to the staff transferred from other sections to the Slope Maintenance and Management Sector. A half-day will be the required training period.

2) Slope Inspection

Slope inspection will basically be outsourced to a private consultant and implemented on the basis of a contract between JKR and the private consultant. The training for slope inspection will be executed after the contract is signed and in advance of implementing the slope inspection. A half-day for guidance and 1-2 days for site training as OJT is assumed to be a suitable period.

3) System Maintenance

The specific training for individuals selected by JKR as SIMS Administrators will be conducted in collaboration with the system engineer dispatched from the System Company. A half-day for instruction as occasion arises is assumed to be suitable. Additionally, a half-day training for general user using "User Manual", as necessary (or periodically), will be provided under guidance of JKR Headquarters.