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MINISTRY OF FORESTRY
THE REPUBLIC OF INDONESIA

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR IMPROVEMENT
OF FOREST FIRE EQUIPMENT
IN
THE REPUBLIC OF INDONESIA

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BASIC DESIGN STUDY REPORT
ON
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THE REPUBLIC OF INDONESIA

MARCH 2001

JAPAN INTERNATIONAL COOPERATION AGENCY
KOKUSAI KOGYO CO.,LTD.



1163679[2]

PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct a basic design study on the Project for Improvement of Forest Fire Equipment and entrusted the study to the Japan International cooperation Agency (JICA).

JICA sent to Indonesia a study team from October 22 to November 30, 2000.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Indonesia in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

March 2001



Kunihiko SAITO

President

Japan International Cooperation Agency

March 2001

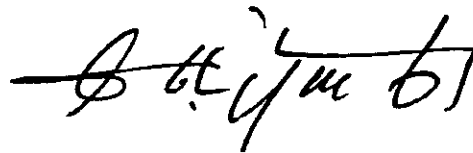
Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Improvement of Forest Fire Equipment in the Republic of Indonesia.

This study was conducted by Kokusai Kogyo Co., Ltd., under a contract to JICA, during the period from October, 2000 to March, 2001. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Indonesia and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

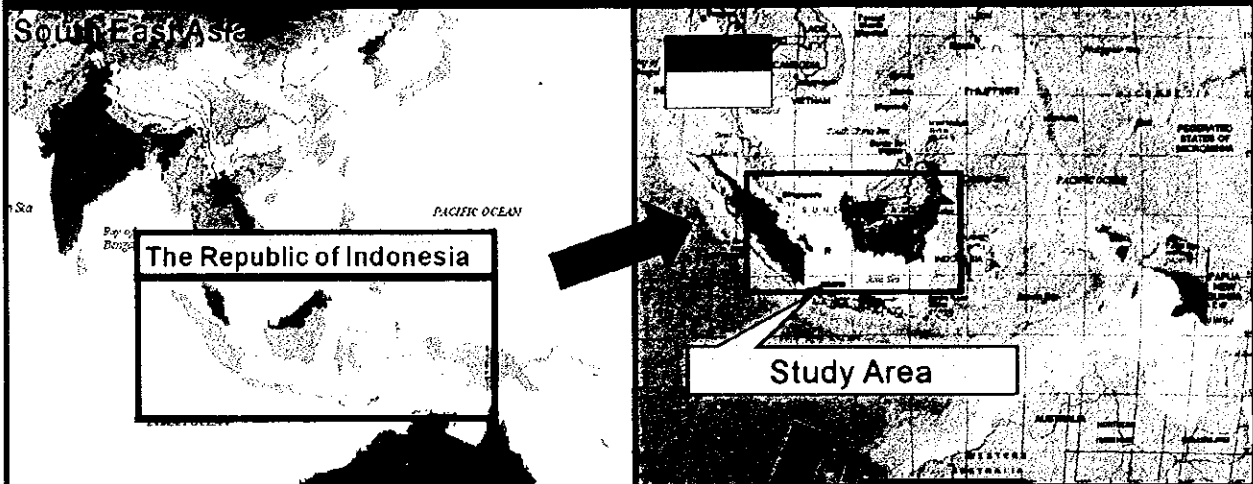
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Kinya Nakamura', written in a cursive style.

Kinya NAKAMURA
Project manager,
Basic design study team on the Project
for Improvement of Forest Fire Equipment
Kokusai Kogyo Co., Ltd.

Project Location of The Project for Improvement of Forest Fire Equipment in The Republic of Indonesia



Project Site (4 National Parks)

March 2001

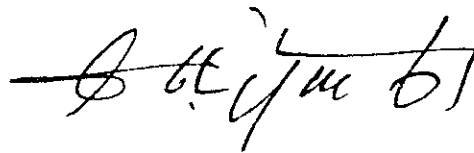
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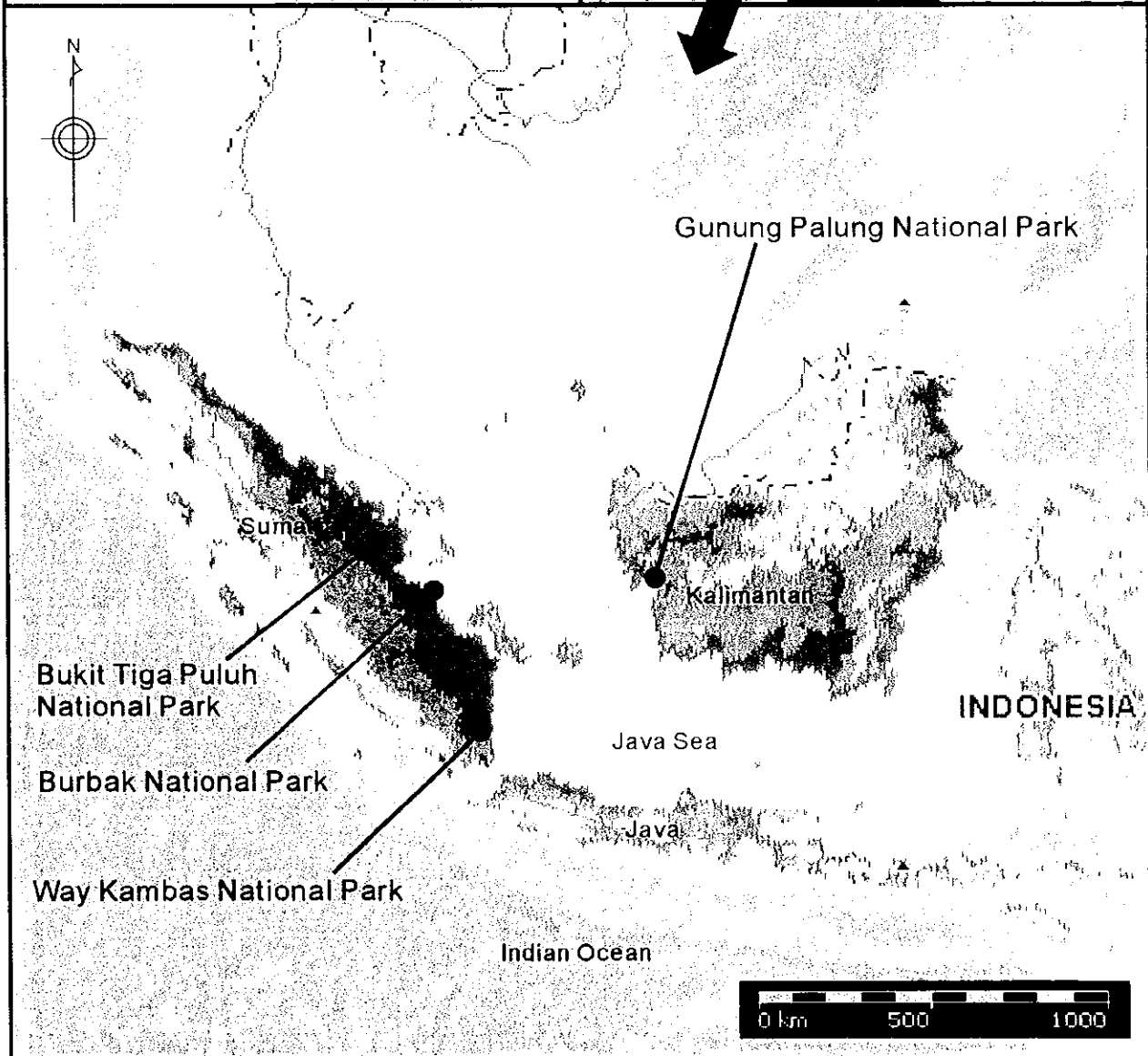
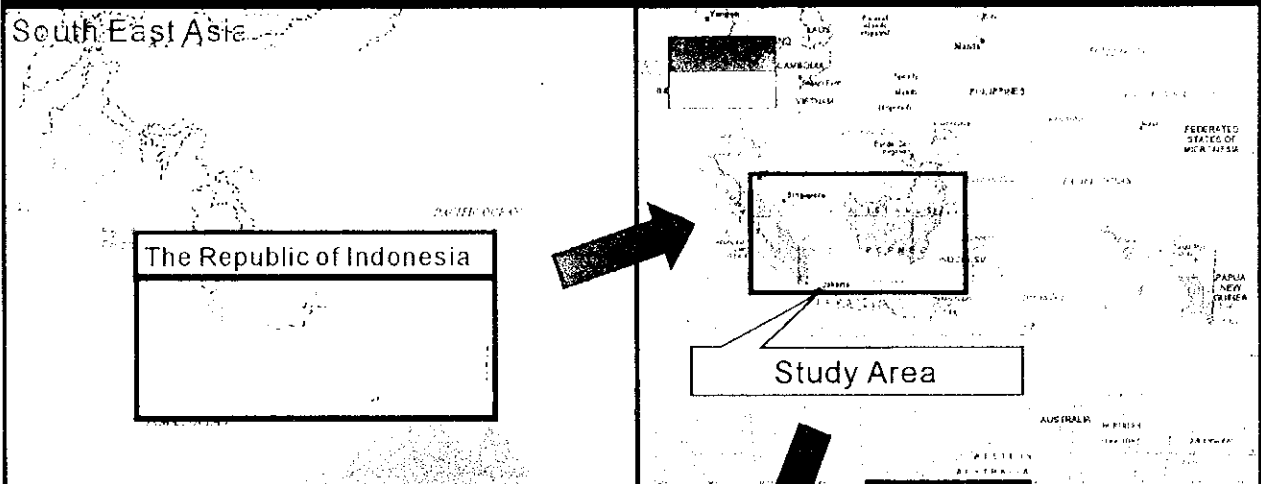
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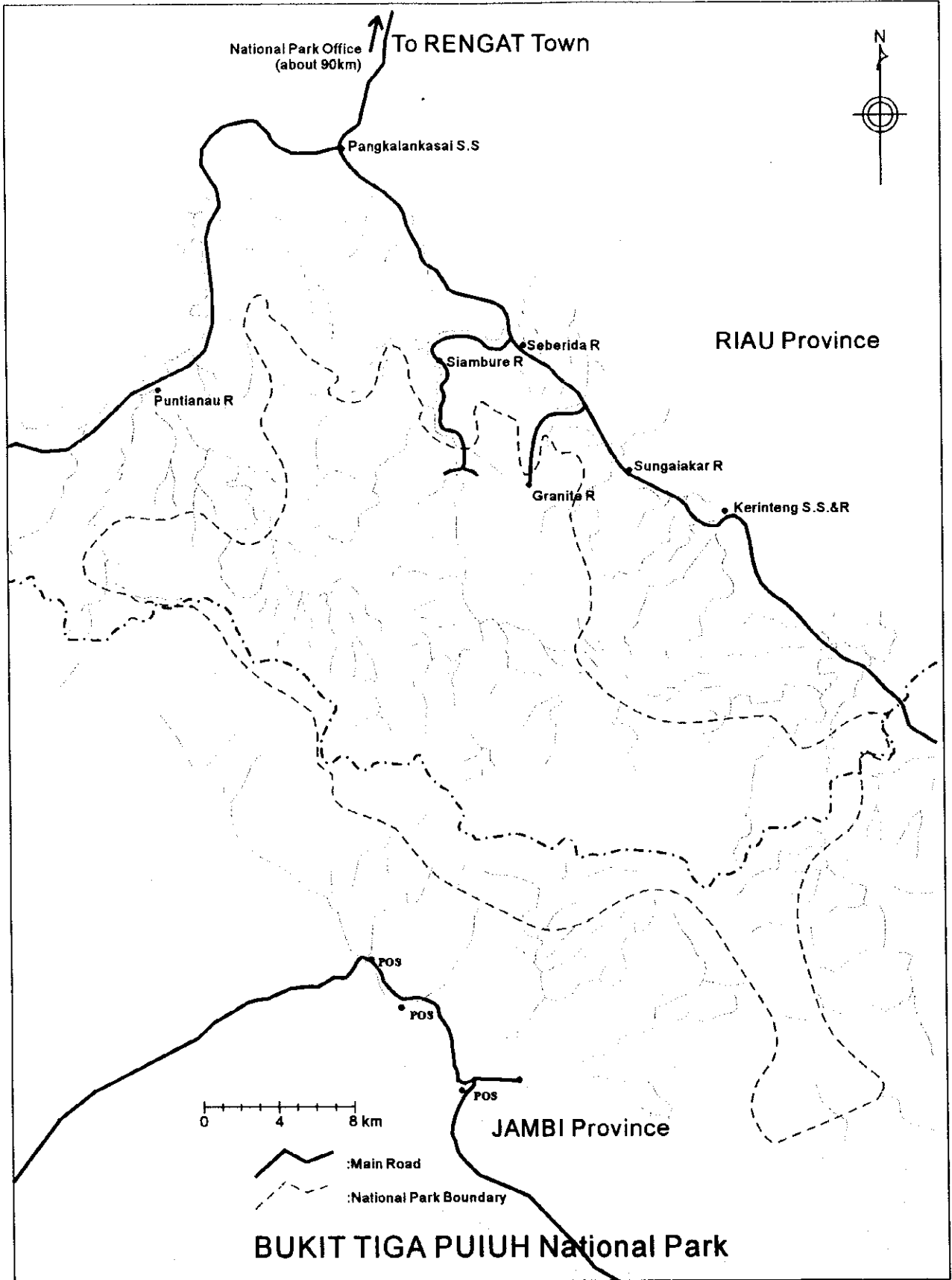
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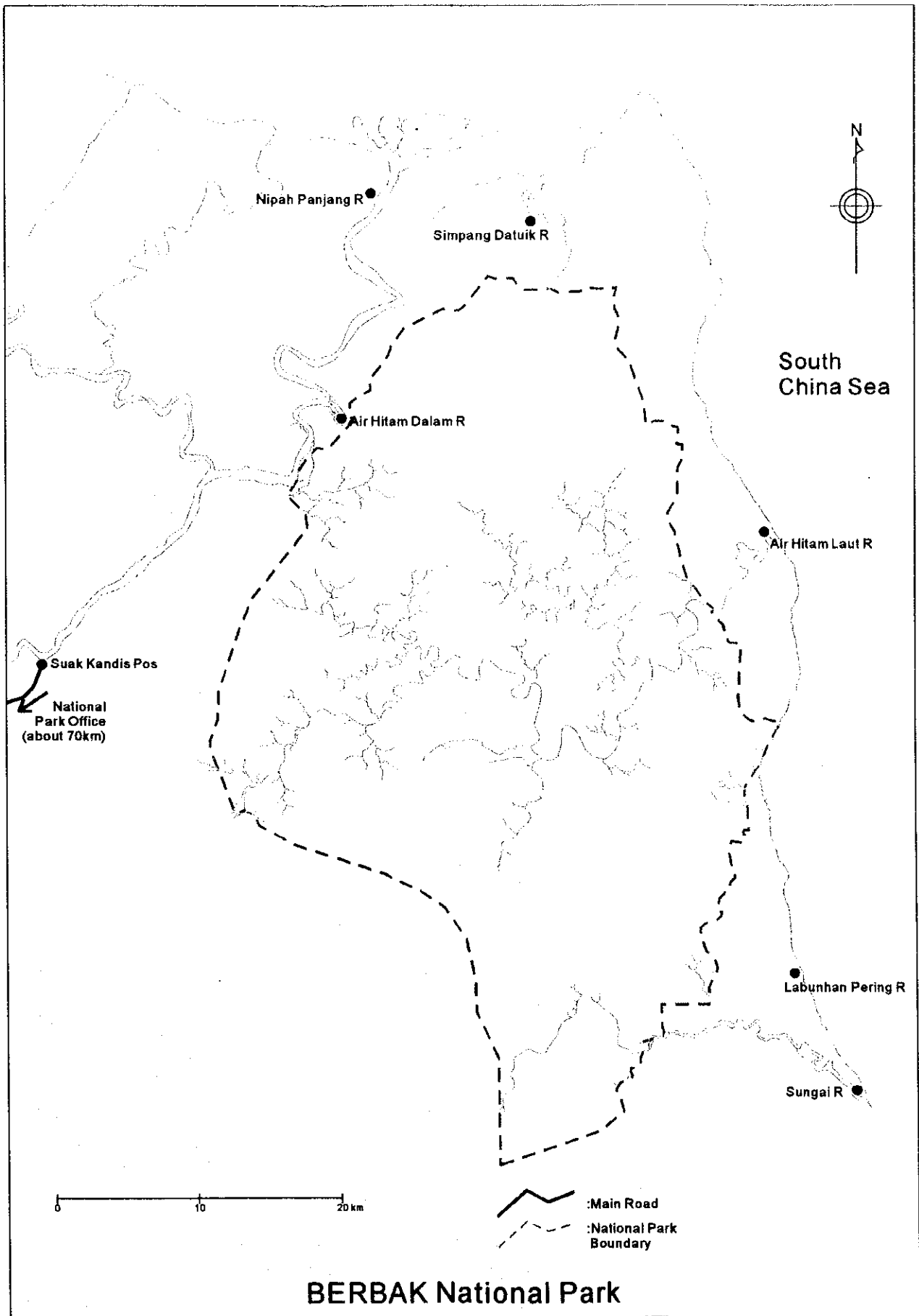
Kinya NAKAMURA
Project manager,
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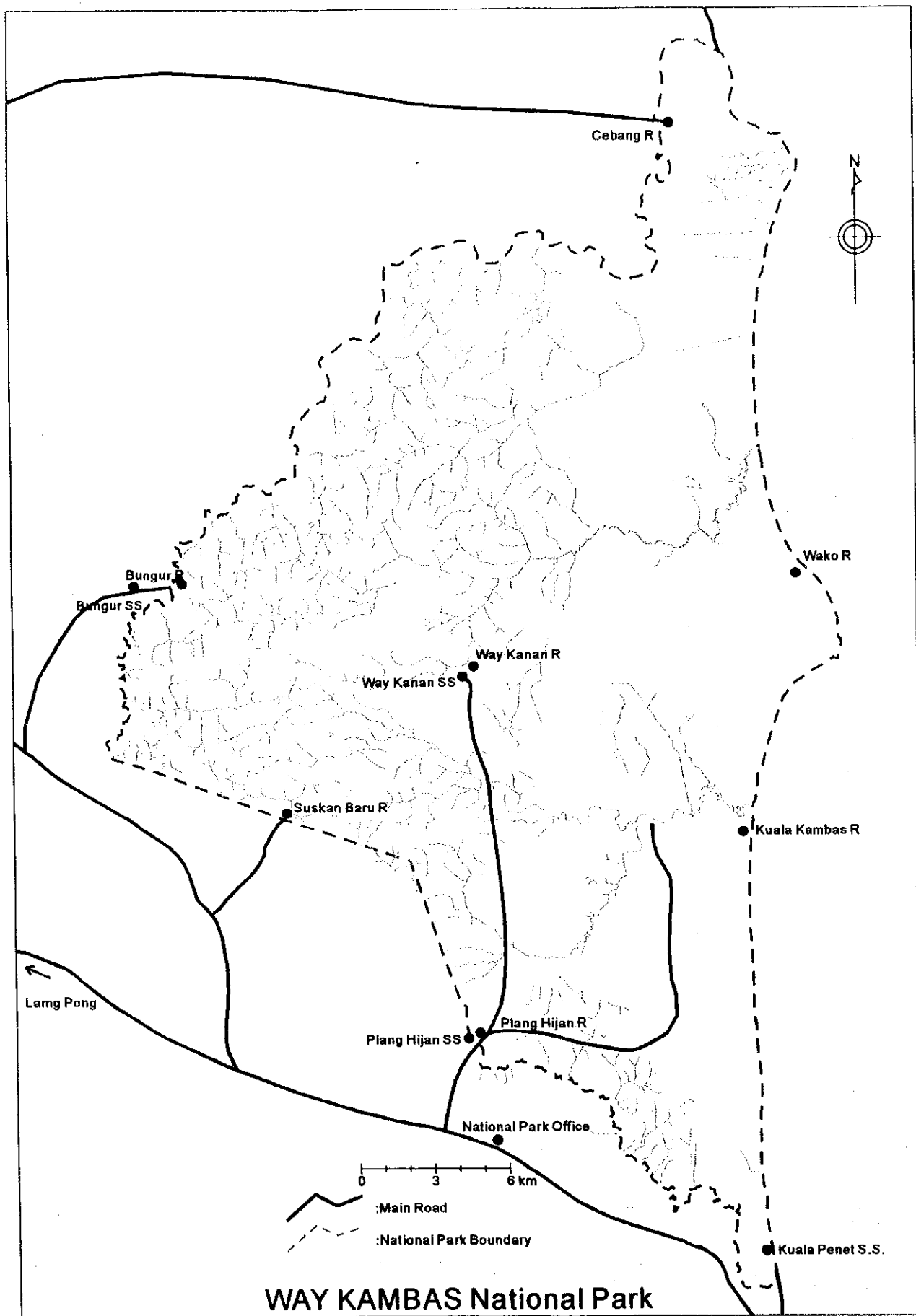
Project Location of The Project for Improvement of Forest Fire Equipment in The Republic of Indonesia



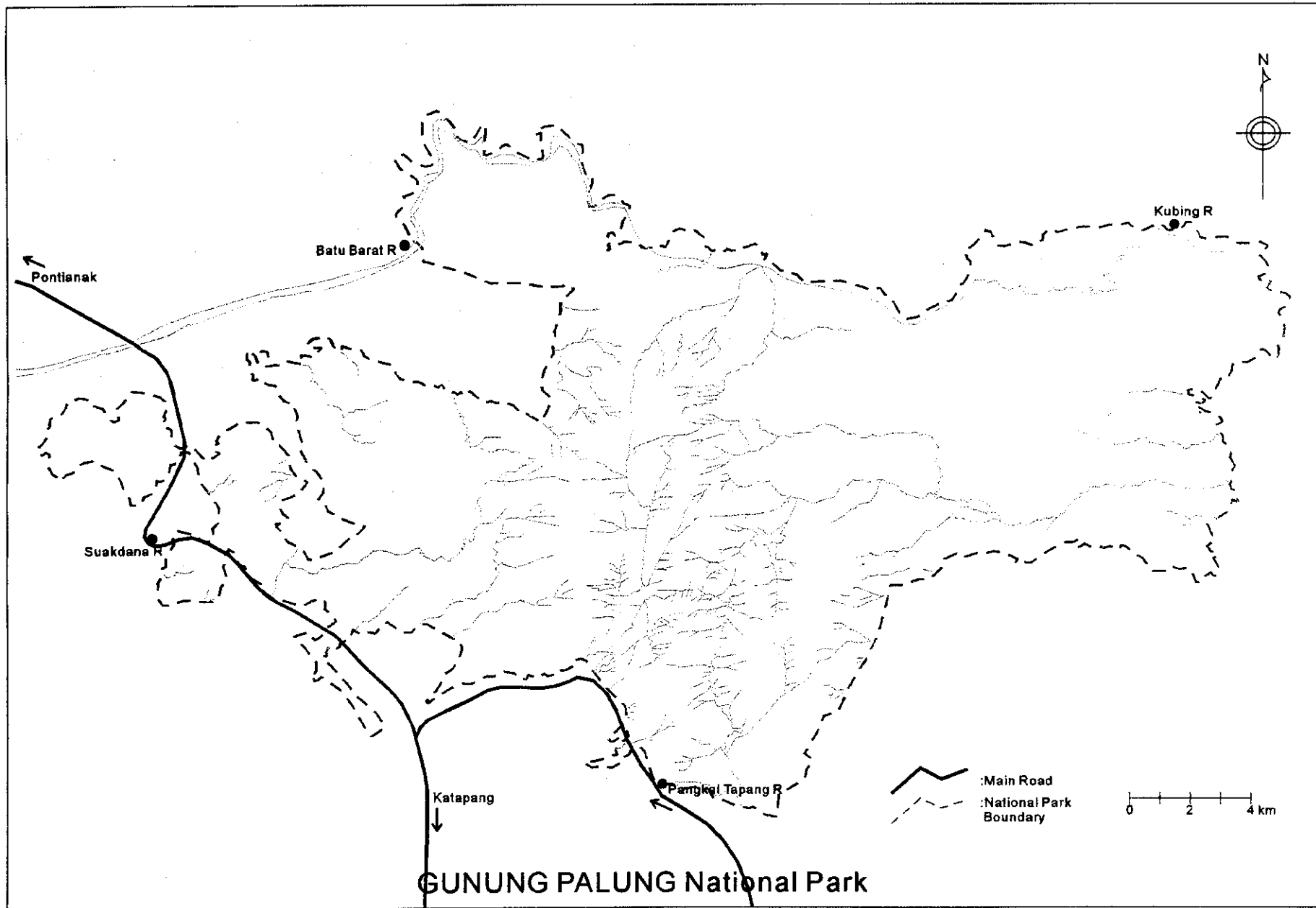
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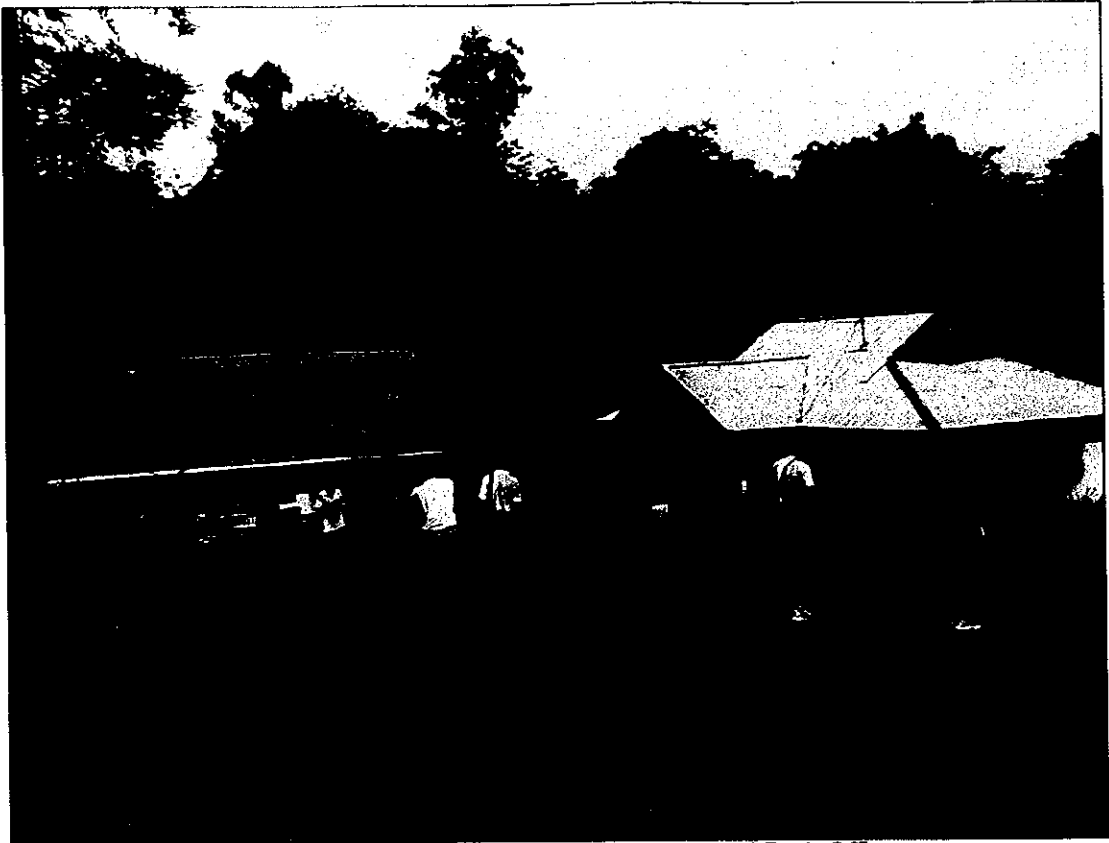




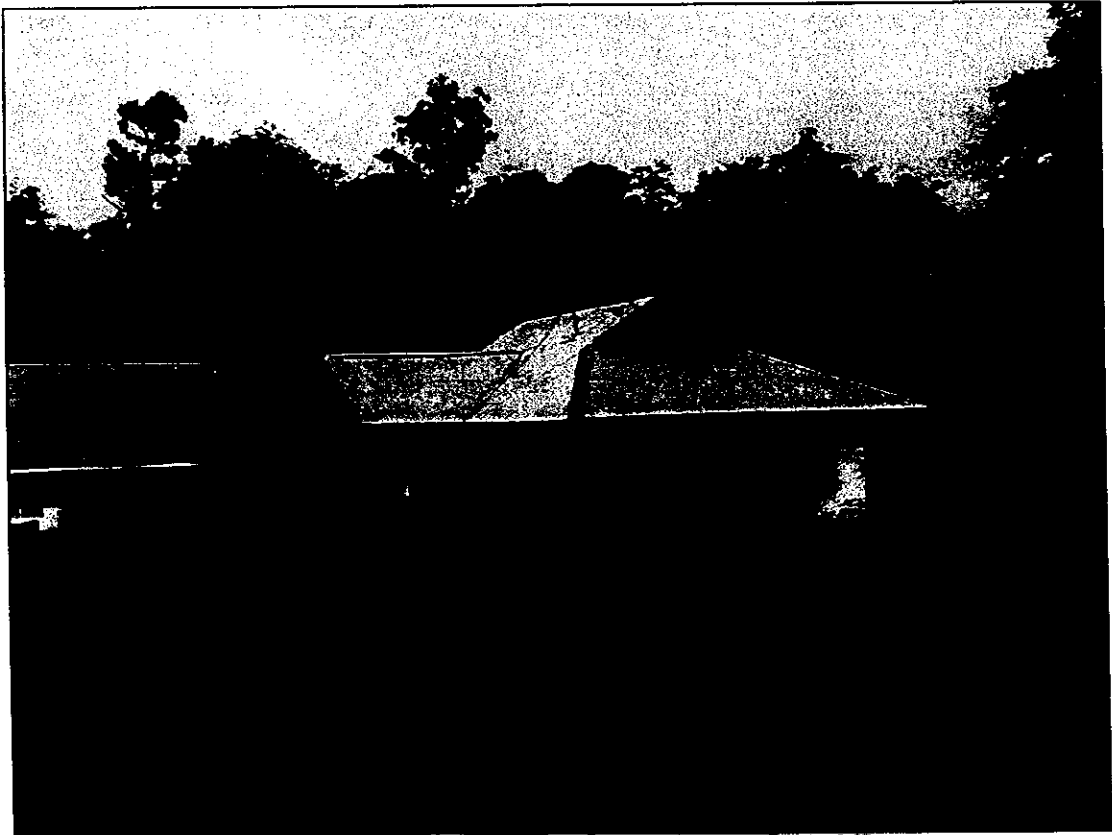


WAY KAMBAS National Park





Prearranged site for Bukit Tiga Puluh National Park Office



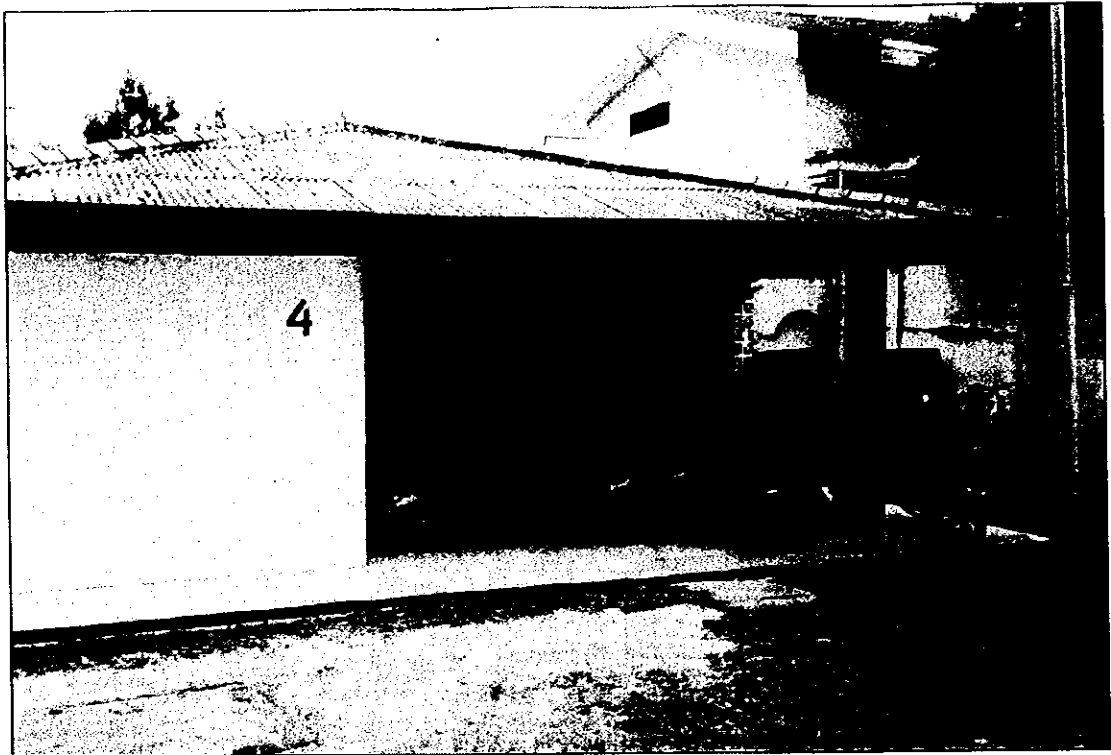
Prearranged site for Bukit Tiga Puluh National Park Office



Observation Platform (under construction)



Granite Resort



Berbak National Park Office



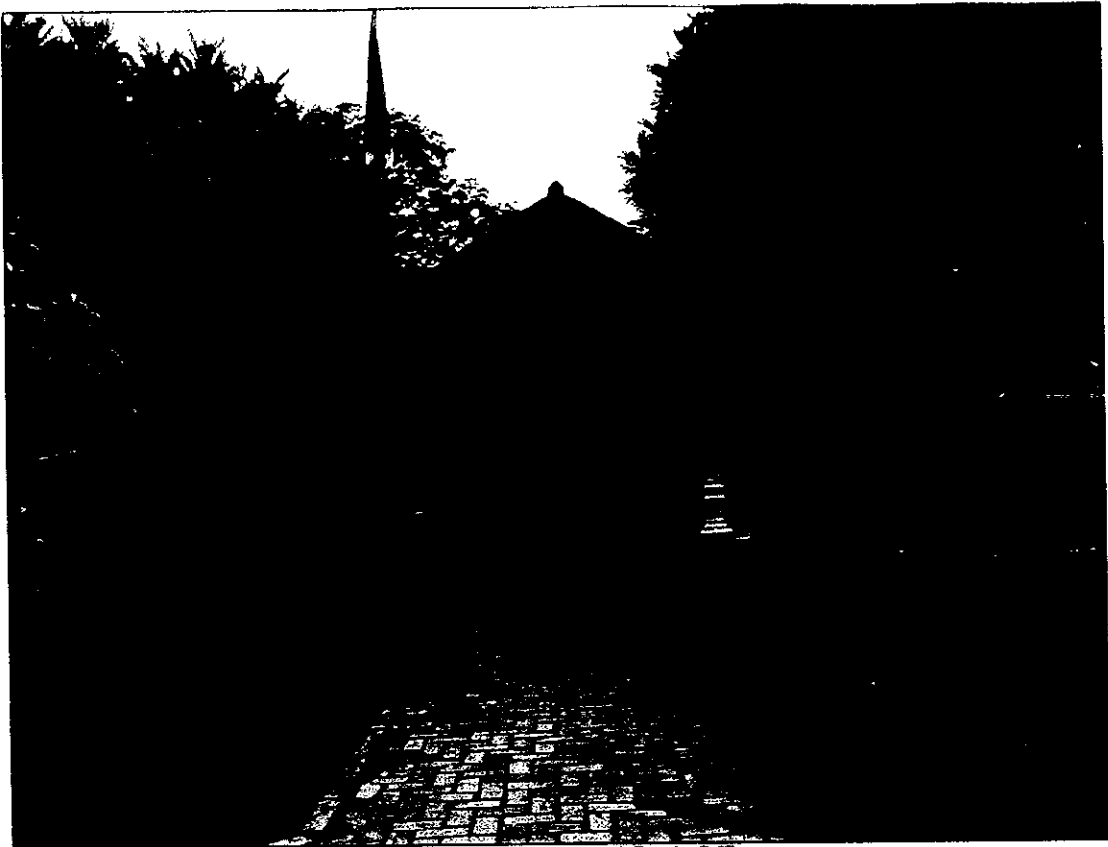
Nipah Panjang Resort



Pulisi Kehutanan Mess



Air Hitam Dalam Resort



Way Kambas National Park Office



Plang Hijan Subsection



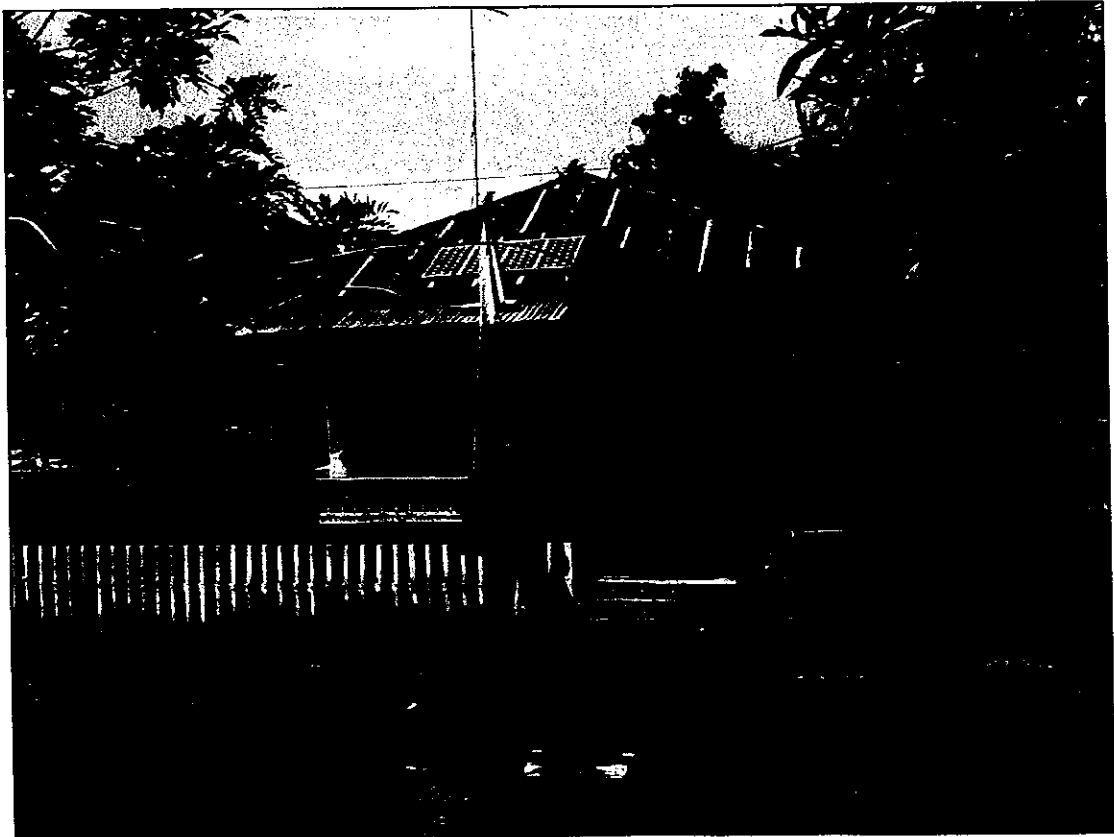
Way Kanan Subsection



Way Kanan Resort



Gunung Palung National Park Office



Sukadana Resort



Batu Barat Resort



Batu Barat Resort

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Chapter 1 Background

In 1994, the entire nation of the Republic of Indonesia suffered colossal damages from extensive forest fire. To prevent a recurrence the nation requires immediate countermeasures against forest fires. From April 1996, the Government of Japan commenced the Project for the Forest Fire Prevention – under the Project-type Technical Cooperation Scheme – which aimed to improve early countermeasures against forest fire at the national level and forest fire prevention and initial fire fighting measures at the regional level.

In 1997, another large-scale forest fire broke out and the resultant smog spread all the way to the surrounding nations of Malaysia and Singapore, creating serious health and economic hazards. This outbreak destroyed a total of 260,000ha including 54,000ha of national parks. Another outbreak in early 1998 destroyed an additional 50,000 hectares. Damages in this region were estimated at 9 trillion rupiah (approximately 13 billion yen) and impact both regional and global environmental conditions (e.g. natural environmental protection and global warming). Consequently, these incidents have attracted a lot of attention from the international society and offers of assistance from international organizations and donor countries have been pouring in.

In response to the above conditions, Japan immediately donated fire fighting equipment and facilities to the Government of Indonesia and dispatched an international emergency support troop twice to help in the fire fighting activities. Japan also implemented a project finding study in relation to forest fire countermeasures from September to October 1998. The study clearly confirmed that the Republic of Indonesia absolutely lacks fire fighting pumps, equipment and facilities, as well as vehicles and communication tools, and recommends the need to provide these equipment and facilities. Acknowledging the recommendation, the Government of Indonesia requested grant aid assistance for the procurement and improvement of equipment and facilities that are essential to monitoring, patrol and supervision, as well as initial fire fighting system.

In reply to this request, the Government of Japan dispatched a Basic Design Study Team from 22 October to 30 November 2000 (40 days) to Indonesia to carry out field surveys and data collection and analysis for the preparation of the basic design study report. It also dispatched another study team in February 2001 to explain the outline of the report and hold discussions with the concerned authorities of the recipient government in order to finalize this report.

Chapter 2 Contents of the Project

2-1 Objectives of the Project

This project targets the 4 national parks (Bukit Tiga Puluh, Berbak, Way Kambas, Gunung Palung) where the [Forest Fire Prevention Plan] – a project type assistance to counter-act forest fire incidents – was carried out in 1995. Under the Japan Grant Aid Scheme, the project aims to provide these national parks with the necessary equipment for the early detection of forest fire, transmission of information, and initial fire fighting activities.

2-2 Basic Concept of the Project

2-2-1 Details of the Final Request

The details of the final request made with regard to this project are as follows:

- 1) Overall Goal: Prevention of forest fire and the spreading of forest fire in the 4 target national parks.
- 2) Objective of the Project: Prevention of forest fire and reinforcement of the initial fire fighting system in the 4 target national parks.
- 3) Results to be expected: The preparation of suitable fire fighting equipment in the target 4 national parks.
- 4) Action and Investment Plan (the details of the request to the Japanese Government): The 4 national parks to be the target of the action and investment plan are as shown below. The equipment for initial fire fighting and early detection/notification for each park are shown in Table 2.4 - Table 2.14.

• Bukit Tiga Puluh National Park (Riau and Jambi provinces)	127,698ha
• Berbak National Park (Jambi Province)	162,000ha
• Way Kambas National Park (Lampung Province)	130,000ha
• Gunung Palung National Park (West Kalimantan Province)	90,000ha

- 5) Obligations of the Government of Indonesia
 - Allocate sufficient budget and reinforce the system to ensure the effective use of the equipment to be procured under the study.
 - Secure a storage area, garage, an anchorage for the safekeeping of the equipment at the national park offices, subsections and/or resorts prior to the delivery of the

equipment.

- Secure a site for the installation of a wireless telecommunications system (including an antenna) at the national park offices, subsection and/or resorts prior to the delivery of the equipment.
- Hold a fire fighting training program regularly for the national park rangers.
- Ensure that the Directorate General of Nature Protection and Conservation shall coordinate with relevant government organizations in Indonesia, e.g. Ministry of Finance, Ministry of Foreign Affairs, Economic Planning Agency, etc., on the following issues: allocation of required budget, E/N, A/P, exemption of study equipment and materials to be imported from taxes, approval for the use and installation of telecommunications facilities.

2-2-2 Basic Concept

(1) Course of Cooperation

- 1) To improve the initial fire fighting skills of the 4 national parks targeted for the Project-type technical cooperation, the equipment necessary for monitoring, observation and the initial fire fighting activities will be procured.
- 2) The Directorate General of Nature Protection and Conservation (DGNPC) of the Ministry of Forestry is the responsible government agency.
- 3) The equipment to be procured under this project shall be stationed at the target 4 national parks and used effectively.
- 4) In accordance with the layout and arrangement plan specified in this report, the equipment will be delivered to every national park offices, subsection and/or resort.
- 5) Wireless telecommunications systems will be installed at the national park offices, subsections and resorts planned.
- 6) The equipment e.g. fire pump, etc., required for the test operations will be placed at the offices of each of the 4 national parks.

(2) Fire Fighting Action Plan for the Basic Design Study

The action plan to counter-act forest fires in Indonesia using the equipment procured under this study is as shown below.

- 1) Patrol and Monitoring System

a) Strengthening Daily Patrol Activities

- Wide scale patrolling and monitoring of the park and nearby villages
- Regular patrol and monitoring of the area under the ranger's jurisdiction
- Monitoring records on villages and area of jurisdiction
- Reporting of trespassing incidents and instructions regarding this issue

b) Collection of Information on Fire Hazards

- Acquisition of hotspot information (through project-type technical cooperation)
- Selection of areas prone to fire hazards
- Collection and analysis of meteorological data
- Confirmation of park boundaries

c) Transmission of Information

- Reporting of patrol and monitoring conditions
- Execution of fire drills and fire warning operations

2) Staff Training Activities

a) Fire fighting theory

b) Training in fire fighting activities

c) Equipment operation and maintenance

d) Countermeasures for the area residents

- Construct a place where the ranger, officials and the village residents can assemble and hold talks, and for the improvement of skills and know-how.
- Prepare a manual on fire fighting activities for the village organizations and provide guidance to these organizations.
- Establish cooperation for fire fighting activities.

3) Establish an Initial Fire Fighting System

- Emergency fire fighting activities that require the rangers in the resort and the residents to use fire extinguishing instruments, e.g. jet shooter, etc.
- Prompt land preparation for installation of pumps and hose for fire fighting.
- Emergency movement of the rangers in the subsections and resorts during fire.
- Emergency haulage of pumps, hoses, tents, water tanks and other equipment and materials during fire.
- Water spraying using the pumps and installation of the knockdown water tank
- Periodical training at the site in pump installation and water spraying activities
- Establishment of an information transmission system
- Daily reporting and communication between the national park office, the subsections and/or the resorts

- Notification and reporting of trespassing, illegal felling and tree gathering activities
- Notification of fire outbreaks
- Construction of fire prevention zones
- Removal of points allowing access to trespassers
- Improvement of roads in the park
- Cleaning of the park, roads and drains

Fig. 2.1 shows the fire fighting activities. The fire fighting flow chart shows the equipment and materials for every fire fighting activity, and the plan for the vehicles and the system for staff evacuation.

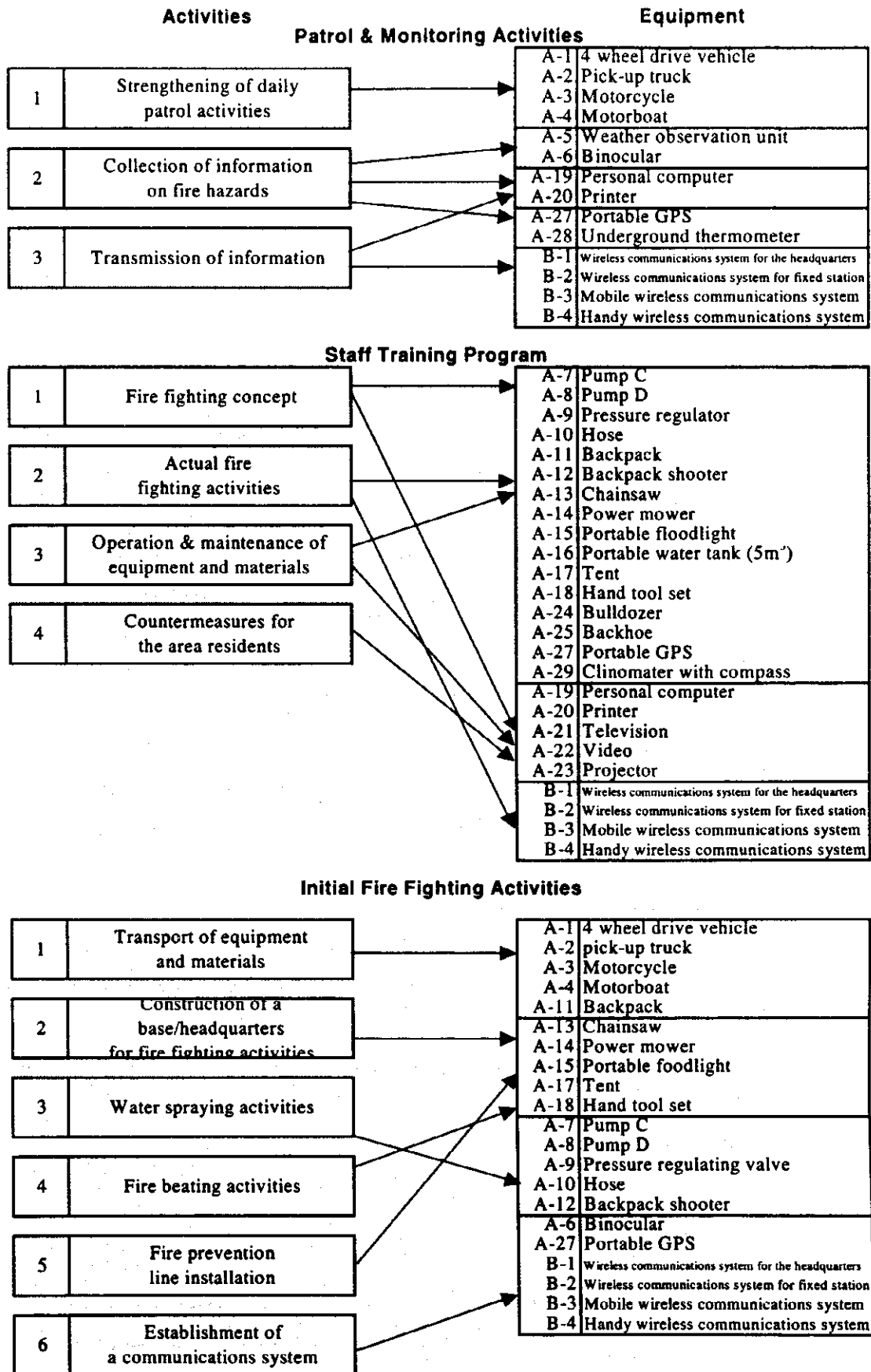


Fig. 2.1 Fire Fighting Activities and Required Equipment and Materials

2-3 Basic Design

2-3-1 Basic Concept

1. Policies for the natural conditions in the project area

(1) Meteorology

- ① As the length of fire fighting activities depends on the climate (sunlight, wind velocity, etc.), a simple floodlight will be planned to allow fire fighting at night.

(2) Topography and Hydraulics

- ① The equipment procurement plan will be prepared with due consideration of the topography (mountain area, peat bogs, swamps, etc.) of the national parks.
- ② The equipment to be planned should be transportable by motorboats and/or motorcycles for topographies inaccessible by vehicles. The transport of stone implements by backpack will be planned for areas that are not easily accessible.
- ③ Patrol/monitoring and fire fighting activities by boat will be planned for parks with many peat bogs and swampy areas.

(3) Rare species

- ① The plan will not include the spraying of fire extinguishing foams so as not to adversely affect the habitat of rare species in the project area.

2. Policies for the social conditions in the project area

- ① The plan will include patrol and monitoring activities with due consideration of the slash-and-burn cultivation, illegal felling, and illegal tree collection activities of the local residents.
- ② The equipment layout plan will be made with due consideration of the best route for the transport of the fire fighting equipment (1 to 2 hours travelling time).
- ③ The equipment procurement plan will be made with due consideration of the electrical conditions in the project area. A generator will be procured for areas without electricity.
- ④ The initial fire fighting plan will target areas about 500m from roads that provides the residents with easy access to the park and/or rivers in the national park in consideration of the surrounding conditions and the people living in the park.

3. Policies regarding coordination with fire fighting countermeasures and other support agencies
 - ① Considerations will be made regarding coordination with other support agencies in fire fighting measures for the national parks.
 - ② The possibility of coordinating with other support agencies involved in fire fighting measures will be examined.

4. Policies on relevant procurement issues
 - ① As a rule, the equipment shall be procured in Japan or Indonesia.
 - ② Equipment with after care services that are generally easy to obtain in Indonesia shall be procured therein.
 - ③ The standards of Japan (JIS) and/or Indonesia shall be adopted for the equipment.

5. Policies for the Operation and Maintenance System
 - ① Equipment that would not incur a high operation and maintenance cost shall be considered.
 - ② The equipment will be basically powered by kerosene, which is inexpensive, or diesel engine.
 - ③ Since they will be used by the residents, easy to handle fire fighting equipment will be selected.
 - ④ The standards used by the local forestry company for budget calculation shall be adopted for the calculation of the operation and maintenance costs.

6. Policies regarding the project schedule
 - ① Under the Japan Grant Aid Scheme, the project will be carried out within a single fiscal year budgetary system.
 - ② Since the sites are dispersed, the equipment to be procured will be delivered collectively by site. Care shall be taken to avoid mistakes in delivery.
 - ③ The installation and trial runs for the wireless communication system will be carried out after the foundation work is completed.

Number of Days Estimated for Equipment & Material Transport to the Sites

Sea Transport from Japan	Customs	Sea Transport to Every Island	Overland Transport	Total
About 30 days	About 7 days	About 14 days	About 3 days	About 54 days (1.8 months)

2-3-2 Basic Design

2-3-2-1 Utilization & Importance of the Equipment and Materials

A. Equipment & Materials for Early Fire Detection and Initial Fire Fighting Activities

A1. 4 Wheel Drive Vehicles

The daily management of every national park is mainly carried out by the local organizations (subsections, resorts, pos) of the park office. The vehicle for this activity will be provided for the exclusive use of the supervisor of every national park office.

At present, the parks have no vehicles exclusively used to carry out the commands of the supervisor. The existing vehicles are also used for the following: staff use, technical staff use, daily monitoring activities of the rangers, communication purposes, patrolling of the subsections and resorts, as well as for local meetings. In order to promptly execute the commands and instructions of the supervisor and the activities of the rangers, as well as to increase the efficiency of these activities, the procurement of a vehicle for such uses is necessary. This vehicle will also be used during emergencies, e.g. fire outbreaks, detection of trespassers, etc.

The vehicles will also be used for the transport of the equipment and materials (television, videos, etc.) for the training of the staff and residents at the site.

A2. Pick-up Truck

The procurement of a pick-up truck is deemed highly necessary for the implementation of the activities (monitoring, patrolling, giving assistance, establishing communication, etc.) of the ranger and the transport/evacuation of the staff and the equipment during emergency, e.g. fire.

As a means of curtailing the cost to be shared for operation and maintenance, and in consideration of how often these equipment and materials will be used in view of the target objectives, subsections and resorts located only about an hour from each other will

generally have to share the same equipment and materials to be procured under this study except in the case of the following (see Table 2.1).

1) Bukit Tiga Puluh National Park

Puntianau resort: this resort is located about 1.5 hours from the Pangkalankasai subsection. Based on the fire records from 1997, this resort is less prone to fire outbreaks and will have difficulty in operating and maintaining the facilities on its own. Therefore, this will be categorized under Group A.

3 Pos within Jambi Province: these areas are located about 2.7 hours from the Kerintan subsection. It has more than 1 full time ranger and will be categorized under Group B in consideration of operation and maintenance and the number of times the vehicle will be used for other purposes.

2) Way Kambas National Park

Cebang resort: this resort is about 4.0 hours from the Bungur subsection. Based on the fire records from, this resort is less prone to fire outbreaks and will be categorized under Group B.

Table 2.1 Distance between National Park Office, Subsections, Resorts and the transportation time required

BUKIT TIGA PUIUH National Park

Pangkalankasai SS													
Seberida Rt	25	0.7											
Siambure Rt	35	1	10	0.3									
Granite Rt	45	1.2	25	0.5	25	0.8							
Sungaiakar Rt	40	1.2	15	0.5	25	0.8	15	0.8					
Kerinteng S.S	50	1.7	10	1	35	1.3	25	1.3	10	0.5			
Puntianau Rt	35	1.5	60	2.2	70	3.2	80	2.7	75	2.7	85	0.5	
	km	hr	km	hr	km	hr	km	hr	km	hr	km	hr	
	Pangkalankasai		Seberida		Siambure		Granite		Sungaiakar		Kerinteng		Puntianau

BERBAK National Park

Suak Kandis Pos													
Air Hitam Dalam Rt	40	1											
Nipah Panjang Rt	70	2	30	1									
Simpang Datuik Rt	100	3	60	2	30	1							
Air Hitam Laut Rt	145	4.5	105	3.5	75	2.5	60	2.5					
Labunhan Pering Rt	185	6	145	5	115	4	100	4	40	1.5			
Sungai Rt	195	6.5	155	5.5	125	4.5	110	4.5	10	2	10	0.5	
	km	hr	km	hr	km	hr	km	hr	km	hr	km	hr	
	Suak Kandis		Air Hitam Dalam		Nipah Panjang		Simpang Datuik		Air Hitam Laut		Labunhan Pering		Sungai

WAY KAMBAS National Park

Kuala Penet S														
Way Kanan S	15	0.8												
Bungur S	60	1.2	75	1.5										
Kuala Penet R	0	0	15	0.5	60	1.2								
Sus Kan Baru R	35	1.2	50	2.2	20	0.5	35	1.2						
Way Kanan R	15	0.8	0	1.8	75	1.7	15	0.8	50	1.5				
Kuala Kambas R	60	2.2	75	3.2	105	3	60	2.2	80	3	75	3.2		
Wako R	90	5.2	105	6.2	135	6	90	5.2	110	6	105	6.2	30	3
Plang Hijau R	30	0.7	45	1.7	75	1.5	30	0.7	50	1.5	45	1.7	30	1.5
Bungur R	60	1.2	75	2.2	0	0	60	1.2	20	0.5	75	2.2	105	3
Cebang R	125	5.2	140	6.2	65	4	125	5.2	85	5	135	6.2	170	7
	km	hr	km	hr	km	hr	km	hr	km	hr	km	hr	km	hr
	Kuala Penet S		Way Kanan S		Bungur S		Kuala Penet R		Sus Kan Baru R		Way Kanan R		Kuala Kambas R	
													Wako R	
													Plang Hijau R	
													Bungur R	
													Cebang R	

GUNUNG PALUNG National Park

Pangkal Tapang Rt						
Sukadana Rt	25	1				
Batu Barat Rt	45	2.5	20	1.5		
Kubing Rt	95	7.5	70	6.5	50	5
	km	hr	km	hr	km	hr
	Pangkal Tapang		Sukadana		Batu Barat	
					Kubing	

Based on the above principles, the subsections and resorts of the 4 national parks were divided into groups, and these groupings are shown in Table 2.2 and Fig. 2.2 ~ Fig. 2.5 (those in red lines).

Table 2.2 Grouping of Every National Park

Bukit Tiga Puluh National Park

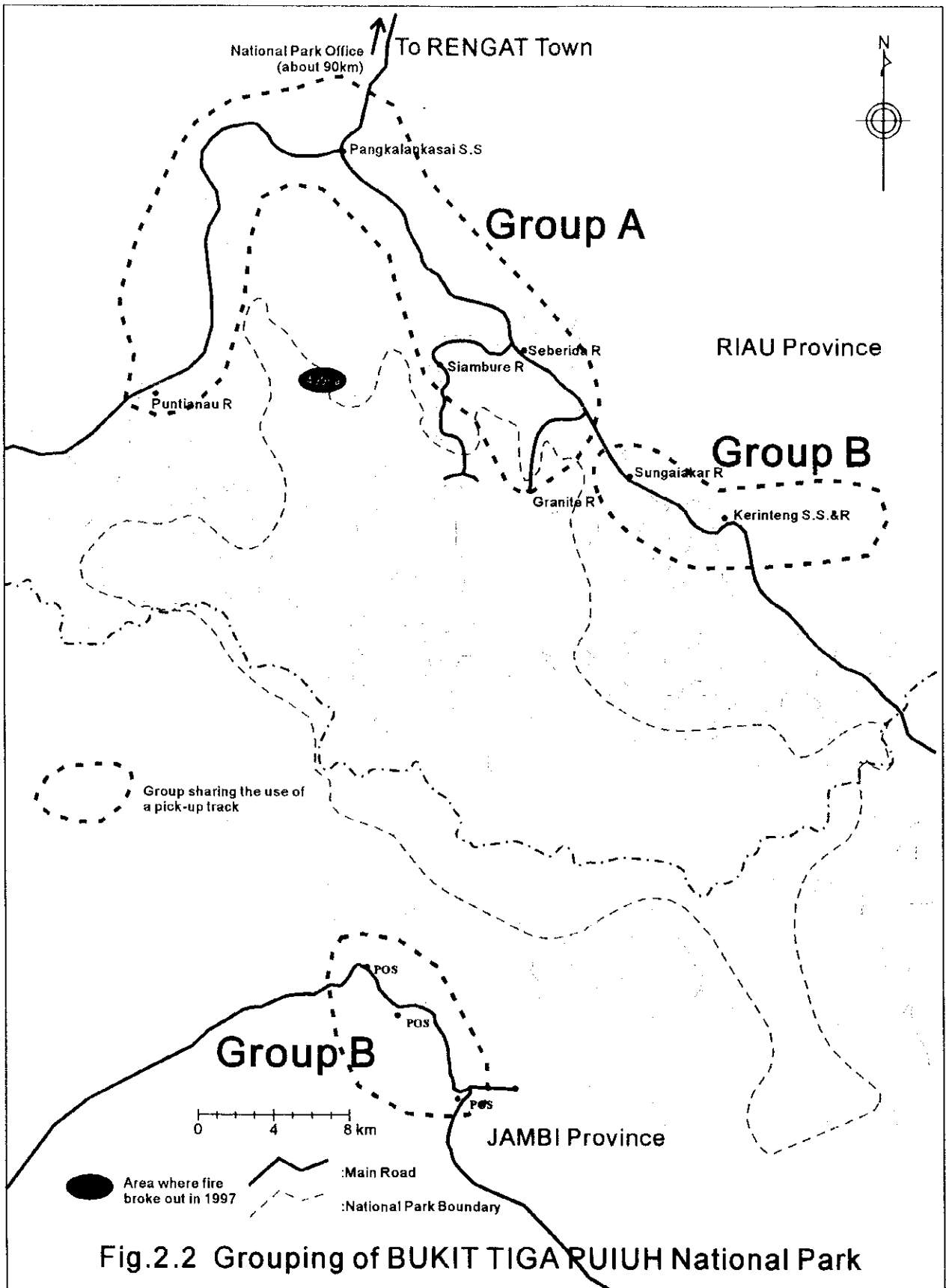
Group	Subsections (SS) and Resorts (Rt)
Group A	Bangkalankasai SS, Puntianau Rt, Siambure Rt, Seberida Rt, Granite Rt
Group B	Kerinteng SS, Sungaiakan Rt, 3 Pos

Way Kambas National Park

Group	Subsections (SS) and Resorts (Rt)
Group A	Kuala Penet SS, Way Kanan SS, Kuala Penet Rt, Way Kanan Rt, Plang Hijau Rt
Group B	Bungur SS, Bungur Rt, Cebang Rt, Sus Kan Rt

Gunung Palung National Park

Group	Subsections (SS) and Resorts (Rt)
Group A	Sukanada Rt, Pangkal Tapang Rt



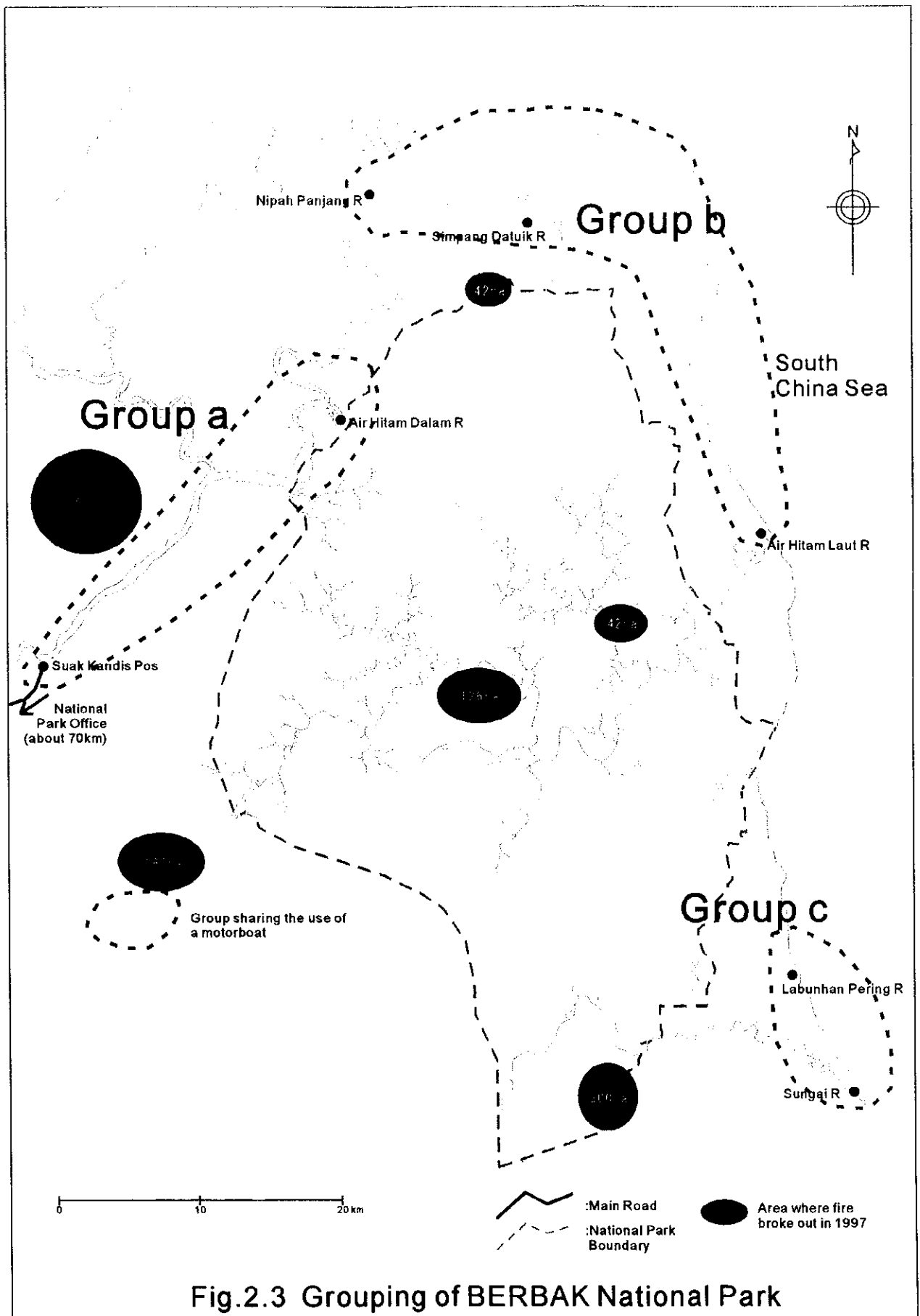


Fig.2.3 Grouping of BERBAK National Park

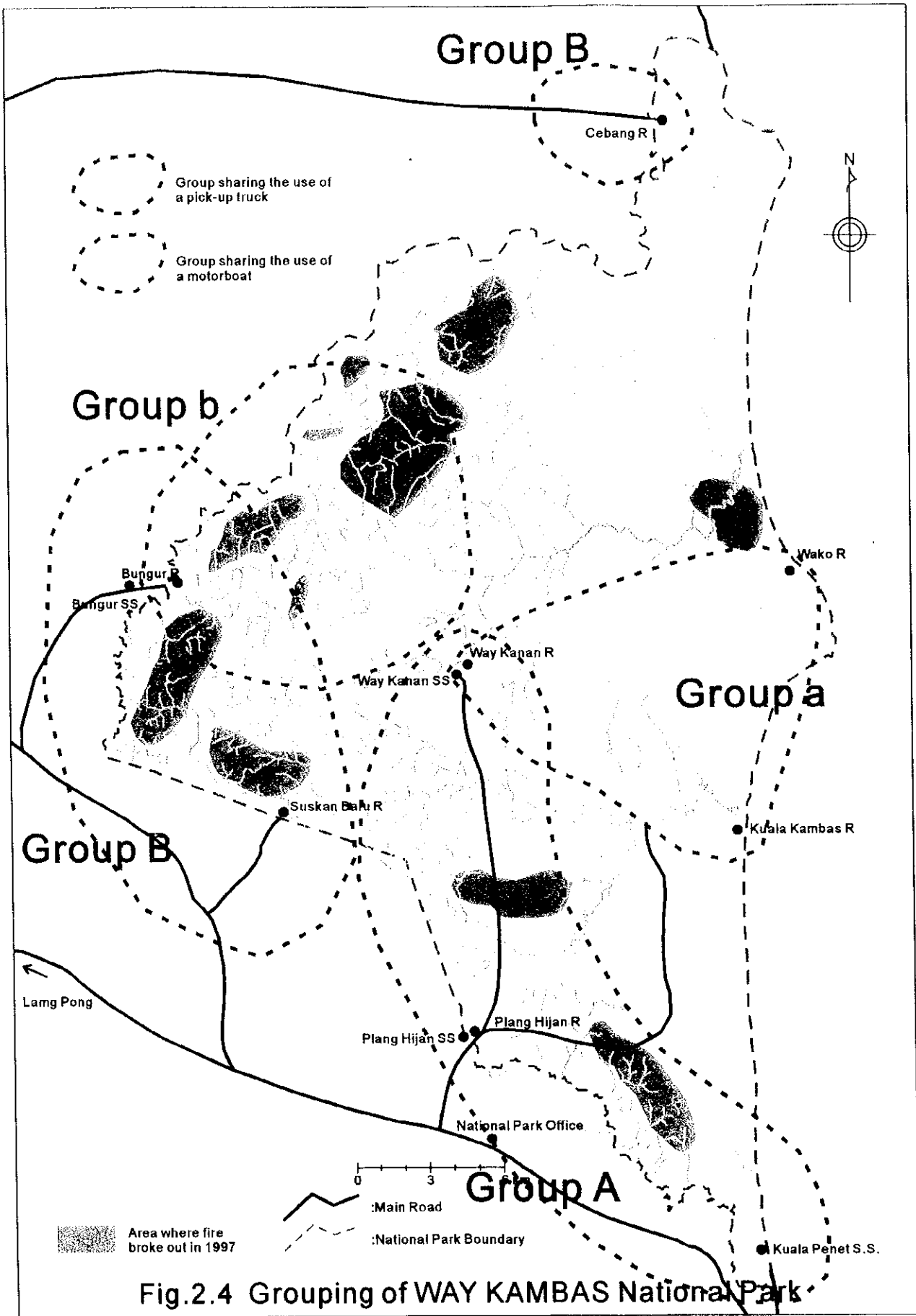


Fig.2.4 Grouping of WAY KAMBAS National Park

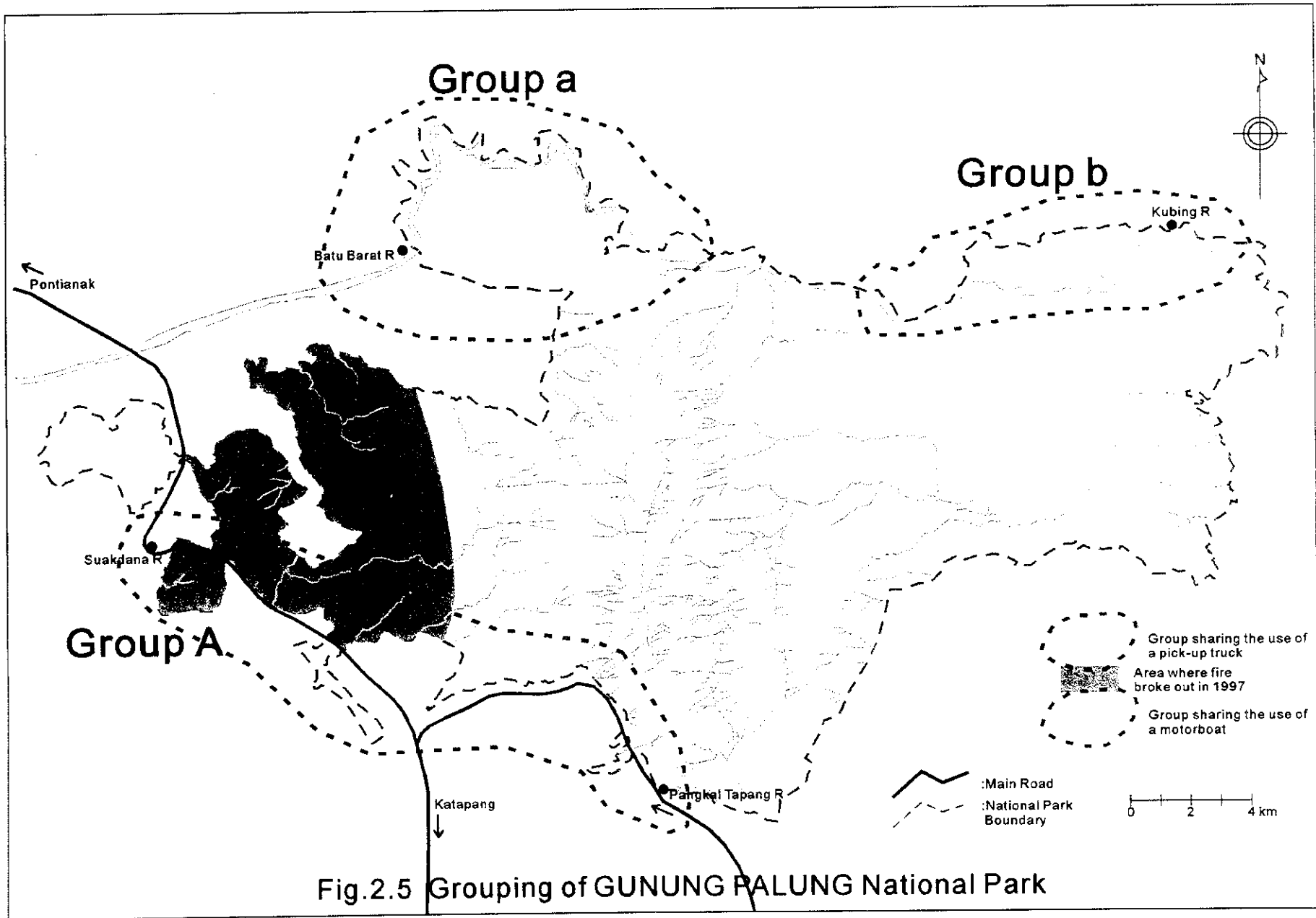


Fig.2.5 Grouping of GUNUNG PALUNG National Park

The allocation of a pick-up truck will be planned for two of the subsections in the Bukit Tiga Puluh National Park (Bangkalankasai SS, Kerinteng SS), two of the subsections in the Way Kambas National Park (Plang Hijan SS, Bungur SS), and one of the resorts in the Gunung Palung National Park (Sukanada Rt). For the Berbak National Park, a pick-up truck will be placed at the park office for the use of the several regular rangers on standby at the national park office.

A3. Motorcycle

The number of motorcycles owned by every national park office is not sufficient in view of the activities proposed under this study. In the subsections and the resorts, most of the motorcycles are privately owned and are used for monitoring and patrol work.

In the Bukit Tiga Puluh National Park, motorcycles will be appropriated for the Siambure SS and Granite SS, where patrol activities are centered.

In the Berbak National Park, motorcycles will be appropriated for the following 3 resorts of Nipah Panjang by the estuary town, Simp-Datuik Rt whose boundary is lined by a number of villages, and Sungai-Bentuh Rt where a lot of trespassing incidents have been observed.

In the Way Kambas National Park, one motorcycle will be appropriated for each of the 5 resorts (Cebang, Kuala Kambas, Kuala Penet, Sus Kan Baru) that are quite far from the subsections.

Since there are no motorcycles in the Gunung Palung National Park for patrol and monitoring activities, one motorcycle will be appropriated to every resort.

A4. Motorboat

The national parks of Berbak, Way Kambas, and Gunung Palung use the river and the sea for transportation. At present, there are several motorboats and these get fully occupied with the park rangers alone who patrol the area.

As a means of curtailing the cost to be shared for operation and maintenance and in consideration of how often the motorboats will be used in view of the target objectives, subsections and resorts only about an hour apart will generally have to share the same equipment and materials to be procured under this study (see Table 2-1).

Based on the above principles, the subsections and resorts of the 4 national parks were divided into groups, and these groupings are shown in Table 2.3 and Fig. 2.2 ~ Fig. 2.5 (those in blue lines).

Table 2.3 Grouping of Every National Park

Berbak National Park

Group	Subsections (SS) and Resorts (Rt)
Group A	Suak Kandis Pos, Air Hitam Dalam Rt
Group B	Nipah Panjang Rt, Simpang Datuik Rt, Air Hitam Laut Rt
Group C	Labunhan Pering Rt, Sungai Rt

Way Kampas National Park

Group	Subsections (SS) and Resorts (Rt)
Group A	Way Kanan SS, Way Kanan Rt, Wako Rt, Kuala Kambas Rt
Group B	Bungur SS, Bungur Rt

Gunung Palung National Park

Group	Subsections (SS) and Resorts (Rt)
Group A	Batu Barat Rt
Group B	Kubing Rt

At the Berbak National Park, a motorboat with two outboard engines for Nipah Panijang Rt and two small motorboats with a single outboard engine for Suak Kandis Rt and Labunhan Pering Rt will be appropriated for patrolling and the transport of fire fighting equipment and materials.

At the Way Kambas National Park, two motorboats with a single outboard engine will be planned for the Way Kanan SS and Bungur SS for patrolling and the transport of fire fighting equipment and materials.

At the Gunung Palung National Park, two motorboats with a single outboard engine will be planned for the Batu Barat Rt and Kubing Rt for patrolling and the transport of fire fighting equipment and materials.

A5. Weather Observation Unit

At present, meteorological observations are not carried out in either of the 4 national parks. Weather conditions affect fire outbreaks and fire fighting activities. The incorporation of meteorological observations in the park management system is, therefore, indispensable. In this regard, one set of meteorological observation instruments will be planned for each park for the measurement of the temperature, humidity, and rainfall/precipitation.

In consideration of the park geography and management conditions, these instruments will be installed at Granite Rt for the Bukit Tiga Puluh National Park, Panjang Rt for the

Berbak National Park, Way Kanan SS for the Way Kambas National Park, and Sukadana Rt for the Gunung Palung National Park.

A6. Binoculars (see Fig. 2.6)

Most of the fire outbreaks in the parks are the result of manmade activities. These incidents usually take place within the vicinity of roads and waterways (rivers). Accordingly, in this study, the target place where fire breaks out will be set at a distance of within 500m from the water source.

At the Bukit Tiga Puluh National Park, 2 binoculars will be provided for the patrol activities of the 9 assisting rangers (one for each of the two subsections). Binoculars will also be provided for the 5 resorts (excluding Panjang) in the Berbak National Park, where monitoring activities are carried out daily. In Way Kambas, one binocular will be provided for each of the 8 park resorts. Each of the 4 resorts in the Gunung Palung National Park will be also provided with one binocular.

A7. Pump C, A.8 Pump D, A.9 Pressure Regulator (see Fig. 2.6)

Pump C will be mainly used for water conveyance, while pump D will be used for water spraying activities. These pumps are planned for use in pair and should be therefore installed in one place.

As previously mentioned, the shared use of the pick-up truck will be considered by grouping. However, each resort will be basically provided with 1 set of pumps in consideration of the outbreak of fire near the resort and to reduce the time required to transport the equipment from resorts that will be appropriated with pick-up trucks. For Way Kambas, however, the allocation of these equipment will be planned for every subsection in view of their favorable locations and the fact that their proximity to the resorts would facilitate the acquisition of staff. On the other hand, resorts that are far from the park and those that are in charge of monitoring areas outside of the park will be excluded from the project.

Of the 6 resorts that encircle the Bukit Tiga Puluh National Park, one pump C and pump D will be installed each only in 5 of these resorts. The Sungaiakar resort, which monitors the villages outside of the park, will be excluded from the plan.

At the Berbak National Park, these equipment will be planned for each of the 5 resorts. The Nipah Panjang resort will be excluded as it is far from the park boundary.

At the Way Kambas National Park, two sets each of pump C and pump D will be installed at each of the 3 subsections that serve as the starting point for the fire fighting activities.

At the Gunung Palung National Park, these pumps will be installed at every resort.

When connected to pumps C and D, the pressure regulator stabilizes the water pressure during conveyance. In this regard, there is a need to procure an equal number of these valves.

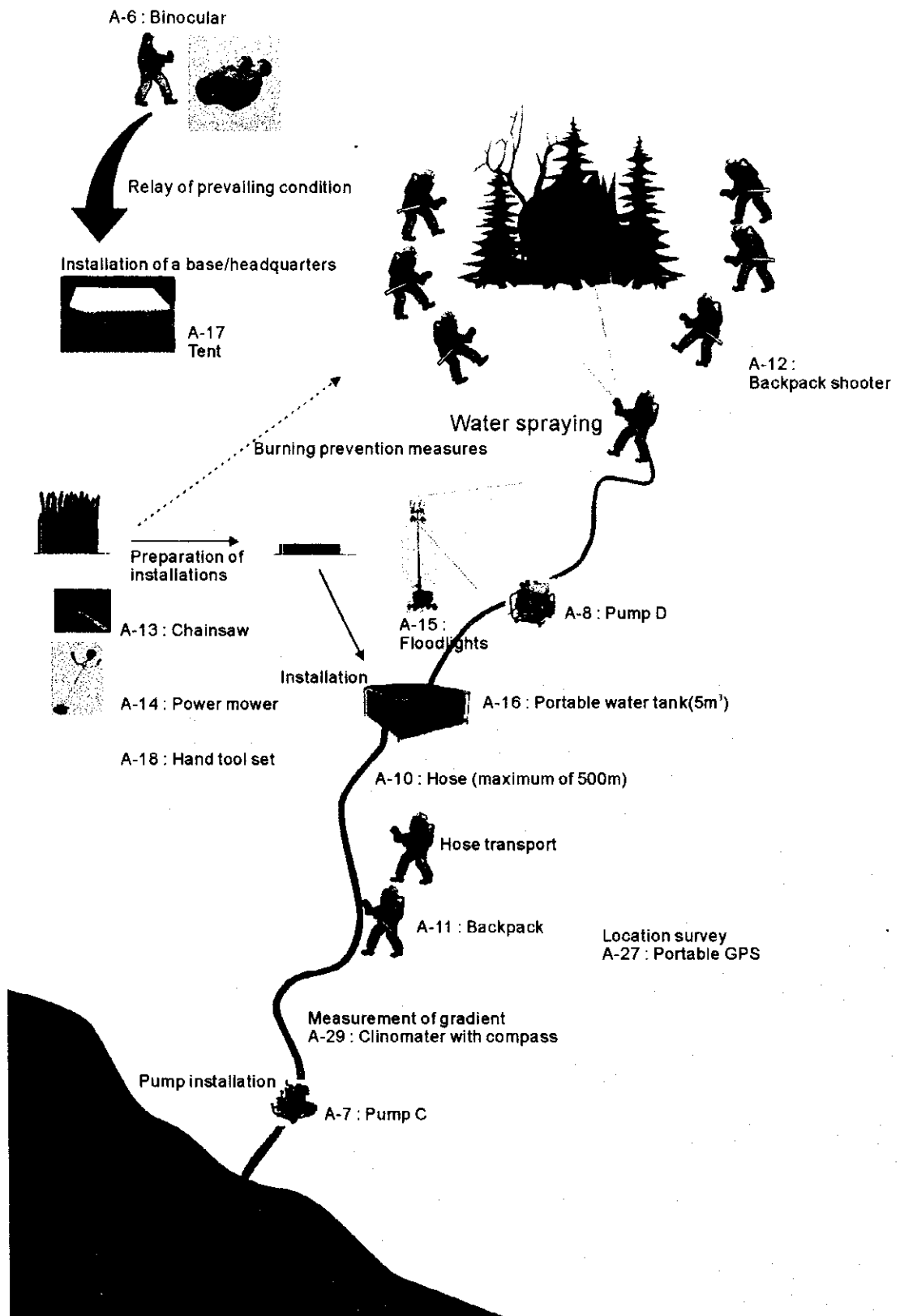


Fig. 2.6 Fire Fighting Activities & Equipment and Materials Required

A10. Fire Fighting Hose (see Fig. 2.6)

Most of the fire outbreaks in the parks are the result of manmade activities. These incidents usually take place within the vicinity of roads and waterways (rivers). Accordingly, in this study, the target place where fire breaks out will be set at a distance of within 500m from the water source.

Normally, a fire fighting hose has a standard length of 20m. If water is discharged 500m from where the pump is, there is a need to connect 25 hoses per pump. Accordingly, the number of hoses to be provided will be calculated as follows:

[Number of C & D pumps per Natural Park x 25 hoses]

A11. Backpack (see Fig. 2.6)

The backpack is used to carry the hose during fire. A hose (20m) weighs approximately 8kg. If a backpack filled with three hoses would only weigh about 30kg, it would be possible for one person to carry a backpack filled with 3 hoses. The number of backpacks required therefore will be determined by dividing the planned number of hoses by 3.

A12. Backpack Shooter (see Fig. 2.6)

To support the water spraying activities during fire, a backpack shooter will be provided for every resort. Five backpack shooters will be provided for every resort. During fire fighting activities, those of the 3 to 9 rangers assigned at every resort that are not using the hose can assist the fire fighting activities through the use of these backpack shooters. These backpack shooters can also be used by rangers from the park office and other subsections, as well as nearby residents who come to assist in the fire fighting activities.

A13. Chain Saw (see Fig. 2.6)

A chain saw will be provided for the construction of a temporary headquarters and a temporary place to store the equipment and materials in case of fire, for pump installation, assembly of the portable knockdown water tank, for making small openings for hose installation and for the cutting of branches. This will also be used in the construction of buffer zones. One chain saw will be appropriated to every resort and subsection to be provided with a pump. The number of chainsaws will be in accordance with the number of pumps to be provided.

A14. Power Mower (see Fig. 2.6)

A power mower will be provided for the construction of a temporary headquarters and a temporary place to store the equipment and materials in case of fire, for pump

installation, assembly of the portable knockdown water tank, for making small openings for hose installation and for the cutting of branches. This will also be used in the construction of buffer zones. One power mower will be appropriated to every resort and subsection to be provided with a pump. The number of power mowers will be in accordance with the number of pumps to be provided.

A15. Portable Floodlights (see Fig. 2.6)

Portable floodlights will be provided for the temporary headquarters to be constructed at the site where fire broke out and to provide light to the resort when the rangers come back. Portable floodlights will be provided to: the southern subsection and the two resorts (Siambure Rt and Granite Rt) of the Bukit Tiga Puluh National Park; the 5 resorts of the Berbak National Park; the 3 resorts of the Way Kambas National Park; and the 3 resorts of the Gunung Palung National Park.

A16. Portable Water Tank (5m³; see Fig. 2.6)

A portable water tank will be installed to store the water for the backpack shooter which will be used to spray water to extinguish fire simultaneous with the water spraying activities using a hose connected to a pump. The number of portable tanks to be provided will be equal to the number of pumps planned for every subsection and resort.

A17. Tents (see Fig. 2.6)

Tents will be provided for use in the construction of a temporary headquarters during fire outbreaks. These will be planned for subsections and resorts for which the pick-up trucks and motorboats will be provided.

A18. Hand Tool Set (see Fig. 2.6)

Since this comes really handy either when patrolling or setting off the fire alarm, each subsection and resort will be provided with one set.

A19. Personal Computer, A.20 Printer (see Fig. 2.6)

These will be provided for hotspot observation and analysis, and for the system that determines fire prone areas (a software to analyze how prone areas are to fire outbreaks based on meteorological data have already been introduced through the Project-type technical cooperation. At present these data are sent by facsimile, but after installation of these equipment these data will be sent by e-mail). These equipment will also be used for the preparation and storage of data on training activities and daily management data. Accordingly, every park office will be provided with each of these equipment.

A21. Television, A.22 Video, A.23 Projector

At present, the rangers of the target national parks are trained by the Forest Training Center of Indonesia, by the Project-type technical cooperation, and by other support organizations. These training programs mainly use videos and slides (including digitized data). One training program usually involves 1 to 2 rangers. In order to disseminate the information and skills that they have learned to other rangers, the trained rangers have to borrow these equipment or reproduce the materials used and bring them to each of the national park. To train the other rangers of the national parks using these materials, the provision of a television set, a video and a projector would be necessary.

As these equipment will be used to train the rangers and to disseminate relevant information to the area residents, every national park office will be provided with each of these equipment.

A24. Bulldozer, A.25 Backhoe

The Bukit Tiga Puluh national park is situated in a mountain area. A road encircles the park area, and another 35km road has been constructed within the park for the transport of timber. In order to prevent vehicles from passing through the road within the park, the bridge was removed and a ditch was dug perpendicular to the road also to prevent illegal logging. However, the road surrounding the park creates many sections of entry (corridors) for trespassers, allowing these trespassers to repeatedly carry out illegal felling and collection of trees. Suspected cases of fire at the side of the road have also been increasing. To immediately realize a monitoring system for the entire park area and to establish a sustainable operation and maintenance system, a bulldozer and a backhoe are required to destroy these corridors, reconstruct a monitoring road or pathway, and to construct a fire prevention zone.

A bulldozer and a backhoe will be provided for the improvement of roads within the park and the construction of a fire prevention zone.

A26. Generator

Subsections and resorts that have no constant supply of electricity will be provided with a small generator for the wireless communications system and small-scale lighting.

A27. Portable GPS (see Fig. 2.6)

The location of areas for monitoring and patrol will be confirmed using the hotspot data from the project-type technical cooperation scheme. The provision of a portable GPS will be planned to determine the areas where fire breaks out. This equipment is very important as it helps in establishing accurate contact with related officials regarding the

areas where fire breaks out. The provision of this equipment will be, therefore, planned for all the resorts that would serve as a frontline for patrol and monitoring activities.

A28. Underground Thermometer

In some parts of the national parks, fire outbreaks occur in areas where peat makes up the underground geology or covered by peat soil. Measuring the temperature below the ground could help detect fire outbreaks in advance. In this regard, an underground thermometer will be procured for every national park. However, 3 will be provided to the Berbak National Park, which is geologically made up of many peat layers.

A29. Clinometer with Compass

Understanding the gradient and angles of the water conveyance route is very important in determining the water conveyance distance for fire fighting activities. In this regard, a clinometer with a compass will be planned for every subsection and resort that will be provided with fire extinguishing pumps.

A30. Locker, A.31 Steel Shelf

The subsections and resorts were found to have enough space to store the equipment and facilities to be provided under this project, but have no shelves and lockers that are necessary to store these things in an organized order. Since only a minimum time is allocated to prepare for fire fighting activities, these equipment and materials should be arranged in order. Accordingly, lockers and steel shelves will be planned for every subsection and resort, and the quantity will be determined in accordance with the quantity of the equipment and materials.

B. Telecommunications Equipment & Materials

Due to underdeveloped telecommunications system, the immediate relay of detected fire outbreaks in the national parks is impossible. Under this project, the park offices, subsections and resorts will be provided with the minimum required means of communication to allow contact with each other. Accordingly, these places will be provided with a fixed station (one area of every park will be provided with a repeater station). Further, the plan will also consider providing a unit for the vehicles and the motor boats used by the rangers for monitoring and patrol activities. A portable wireless communications system will also be planned for use to facilitate communication between the fixed station and the vehicles and motorboats.

See Table 2.4 ~ Table 2.14 for the list of equipment and facilities, and Fig. 2.7 ~ Fig. 2.10 for the layout of the main equipment and facilities.

Table 2.4 Overall List of Equipment and Materials

Code	Item	Bukit Tiga Puluh	Berbak	Way Kambas	Gunung Palung	Total
A.For early fire detection and initial fire-fighting						
A-1	Wagon type vehicle 4X4	1	1	1	1	4
A-2	Pick up 4X4	2	1	2	1	6
A-3	Motor bike	2	3	5	4	14
A-4	Motor boat	0	3	2	2	7
A-5	Weather observation unit	1	1	1	1	4
A-6	Binocular	4	5	8	4	21
A-7	Portable pump (C class)	5	5	6	4	20
A-8	Portable pump (D class)	5	5	6	4	20
A-9	Pressure regulator	5	5	6	4	20
A-10	Hose	125	125	150	100	500
A-11	Back pack	45	45	51	36	177
A-12	Back pack shooter	30	30	40	20	120
A-13	Chain saw	5	5	6	4	20
A-14	Power mower	5	5	6	4	20
A-15	Portable Floodlight	3	3	3	3	12
A-16	Portable water tank (5,000 L)	5	5	6	4	20
A-17	Tent	3	3	3	3	12
A-18	Hand tool set	6	7	11	4	28
A-19	Personal computer	1	1	1	1	4
A-20	Printer	1	1	1	1	4
A-21	Television	1	1	1	1	4
A-22	Video	1	1	1	1	4
A-23	Projector	1	1	1	1	4
A-24	Bulldozer	1	0	0	0	1
A-25	Backhoe	1	0	0	0	1
A-26	Generator	6	6	9	3	24
A-27	Portable GPS	6	7	8	4	25
A-28	Underground thermometer	1	3	1	1	6
A-29	Clinometer with compass	5	5	6	4	20
A-30	Locker	14	12	18	9	53
A-31	Steer shelf	10	10	12	8	40
B.For communication						
B-1	Fixed radio unit (repeat station)	1	1	1	1	4
B-2	Fixed radio unit (station)	8	7	10	4	29
B-3	Mobile radio unit(for the car)	3	2	3	2	10
B-4	Mobile radio unit(for the motor boat)	0	3	2	2	7
B-5	Portable radio unit	9	13	13	9	44

Table 2.5 List of Equipment and Materials for Bukit Tiga Puluh National Park

Code	Item	Arrangement Plan			Total
		Ofc.	SS-2	R-6	
A.For early fire detection and initial fire-fighting					
A-1	Wagon type vehicle 4X4	1			1
A-2	Pick up 4X4		2		2
A-3	Motor bike			2	2
A-4	Motor boat				
A-5	Weather observation unit			1	1
A-6	Binocular	2	2		4
A-7	Portable pump (C class)			5	5
A-8	Portable pump (D class)			5	5
A-9	Pressure regulator			5	5
A-10	Hose			125	125
A-11	Back pack			45	45
A-12	Back pack shooter			30	30
A-13	Chain saw			5	5
A-14	Power mower			5	5
A-15	Portable Floodlight			3	3
A-16	Portable water tank (5,000 L)			5	5
A-17	Tent			3	3
A-18	Hand tool set			6	6
A-19	Personal computer	1			1
A-20	Printer	1			1
A-21	Television	1			1
A-22	Video	1			1
A-23	Projector	1			1
A-24	Bulldozer			1	1
A-25	Backhoe			1	1
A-26	Generator			6	6
A-27	Portable GPS			6	6
A-28	Underground thermometer			1	1
A-29	Clinometer with compass			5	5
A-30	Locker	1	2	11	14
A-31	Steer shelf			10	10
B.For communication					
B-1	Fixed radio unit (repeat station)	1			1
B-2	Fixed radio unit (station)		2	6	8
B-3	Mobile radio unit(for the car)	1	2		3
B-4	Mobile radio unit(for the motor boat)				
B-5	Portable radio unit	1	2	6	9

Table 2.6 Equipment and Materials Layout Plan (Bukit Tiga Puluh Subsection)

Code	Item	Arrangement Plan		Total
		Pangkalankasai	Kerinteng	
A.For early fire detection and initial fire-fighting				
A-1	Wagon type vehicle 4X4			
A-2	Pick up 4X4	1	1	2
A-3	Motor bike			
A-4	Motor boat			
A-5	Weather observation unit			
A-6	Binocular	1	1	2
A-7	Portable pump (C class)			
A-8	Portable pump (D class)			
A-9	Pressure regulator			
A-10	Hose			
A-11	Back pack			
A-12	Back pack shooter			
A-13	Chain saw			
A-14	Power mower			
A-15	Portable Floodlight			
A-16	Portable water tank (5,000 L)			
A-17	Tent			
A-18	Hand tool set			
A-19	Personal computer			
A-20	Printer			
A-21	Television			
A-22	Video			
A-23	Projector			
A-24	Bulldozer			
A-25	Backhoe			
A-26	Generator			
A-27	Portable GPS			
A-28	Underground thermometer			
A-29	Clinometer with compass			
A-30	Locker	1	1	2
A-31	Steer shelf			
B.For communication				
B-1	Fixed radio unit (repeat station)			
B-2	Fixed radio unit (station)	1	1	2
B-3	Mobile radio unit(for the car)	1	1	2
B-4	Mobile radio unit(for the motor boat)			
B-5	Portable radio unit	1	1	2

Table 2.7 Equipment and Materials Layout Plan (Bukit Tiga Puluh Resort)

Code	Item	Arrangement Plan						Total
		(1)	(2)	(3)	(4)	(5)	(6)	
A. For early fire detection and initial fire-fighting								
A-1	Wagon type vehicle 4X4							
A-2	Pick up 4X4							
A-3	Motor bike			1	1			2
A-4	Motor boat							
A-5	Weather observation unit				1			1
A-6	Binocular							
A-7	Portable pump (C class)	1	1	1	1		1	5
A-8	Portable pump (D class)	1	1	1	1		1	5
A-9	Pressure regulator	1	1	1	1		1	5
A-10	Hose	25	25	25	25		25	125
A-11	Back pack	9	9	9	9		9	45
A-12	Back pack shooter	5	5	5	5	5	5	30
A-13	Chain saw	1	1	1	1		1	5
A-14	Power mower	1	1	1	1		1	5
A-15	Portable Floodlight			1	1		1	3
A-16	Portable water tank (5,000 L)	1	1	1	1		1	5
A-17	Tent			1	1		1	3
A-18	Hand tool set	1	1	1	1	1	1	6
A-19	Personal computer							
A-20	Printer							
A-21	Television							
A-22	Video							
A-23	Projector							
A-24	Bulldozer				1			1
A-25	Backhoe				1			1
A-26	Generator	1	1	1	1	1	1	6
A-27	Portable GPS	1	1	1	1	1	1	6
A-28	Underground thermometer				1			1
A-29	Clinometer with compass	1	1	1	1		1	5
A-30	Locker	2	2	2	2	1	2	11
A-31	Steer shelf	2	2	2	2		2	10
B. For communication								
B-1	Fixed radio unit (repeat station)							
B-2	Fixed radio unit (station)	1	1	1	1	1	1	6
B-3	Mobile radio unit (for the car)							
B-4	Mobile radio unit (for the motor boat)							
B-5	Portable radio unit	1	1	1	1	1	1	6

Resort name: (1) Puntianau (2) Seberida (3) Siambure (4) Granite (5) Sungaiakar (6) Kerinteng

Table 2.8 List of Equipment and Materials for Berbak National Park

Code	Item	Arrangement Plan			Total
		Ofc.	SS-0	R-6	
A.For early fire detection and initial fire-fighting					
A-1	Wagon type vehicle 4X4	1			1
A-2	Pick up 4X4	1			1
A-3	Motor bike			3	3
A-4	Motor boat			3	3
A-5	Weather observation unit			1	1
A-6	Binocular			5	5
A-7	Portable pump (C class)			5	5
A-8	Portable pump (D class)			5	5
A-9	Pressure regulator			5	5
A-10	Hose			125	125
A-11	Back pack			45	45
A-12	Back pack shooter			30	30
A-13	Chain saw			5	5
A-14	Power mower			5	5
A-15	Portable Floodlight			3	3
A-16	Portable water tank (5,000 L)			5	5
A-17	Tent			3	3
A-18	Hand tool set			7	7
A-19	Personal computer	1			1
A-20	Printer	1			1
A-21	Television	1			1
A-22	Video	1			1
A-23	Projector	1			1
A-24	Bulldozer				
A-25	Backhoe				
A-26	Generator			6	6
A-27	Portable GPS	1		6	7
A-28	Underground thermometer			3	3
A-29	Clinometer with compass			5	5
A-30	Locker	1		11	12
A-31	Steer shelf			10	10
B.For communication					
B-1	Fixed radio unit (repeat station)	1			1
B-2	Fixed radio unit (station)			7	7
B-3	Mobile radio unit(for the car)	2		0	2
B-4	Mobile radio unit(for the motor boat)			3	3
B-5	Portable radio unit	3		10	13

*1 One of these item is middle size.

Table 2.9 Equipment & Materials Layout Plan (Berbak Resort)

Code	Item	Arrangement Plan							Total	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)		
A. For early fire detection and initial fire-fighting										
A-1	Wagon type vehicle 4X4									
A-2	Pick up 4X4									
A-3	Motor bike		1	1				1		3
A-4	Motor boat		1				1		1	3
A-5	Weather observation unit		1							1
A-6	Binocular	1		1	1	1	1	1		5
A-7	Portable pump (C class)	1		1	1	1	1	1		5
A-8	Portable pump (D class)	1		1	1	1	1	1		5
A-9	Pressure regulator	1		1	1	1	1	1		5
A-10	Hose	25		25	25	25	25	25		125
A-11	Back pack	9		9	9	9	9	9		45
A-12	Back pack shooter	5	5	5	5	5	5	5		30
A-13	Chain saw	1		1	1	1	1	1		5
A-14	Power mower	1		1	1	1	1	1		5
A-15	Portable Floodlight	1	1					1		3
A-16	Portable water tank (5,000 L)	1		1	1	1	1	1		5
A-17	Tent	1	1					1		3
A-18	Hand tool set	1	1	1	1	1	1	1	1	7
A-19	Personal computer									
A-20	Printer									
A-21	Television									
A-22	Video									
A-23	Projector									
A-24	Bulldozer									
A-25	Backhoe									
A-26	Generator	1	1	1	1	1	1	1		6
A-27	Portable GPS	1	1	1	1	1	1	1		6
A-28	Underground thermometer			1	1			1		3
A-29	Clinometer with compass	1		1	1	1	1	1		5
A-30	Locker	2	1	2	2	2	2	2		11
A-31	Steer shelf	2		2	2	2	2	2		10
B. For communication										
B-1	Fixed radio unit (repeat station)									
B-2	Fixed radio unit (station)	1	1	1	1	1	1	1	1	7
B-3	Mobile radio unit (for the car)									0
B-4	Mobile radio unit (for the motor boat)		1				1		1	3
B-5	Portable radio unit	2	2	1	1	1	2	1	1	10
Resort name: (1) Air Hitam Dalam (2) Nipah Panjang (3) Simpang Datuk (4) Air Hitam Laut										
(5) Labuhan Pering (6) Sungai										
Pos name: (7) Suak										

Table 2.10 List of Equipment and Materials for Way Kambas National Park

Code	Item	Arrangement Plan			Total
		Ofc	SS-3	Rt-8	
A.For early fire detection and initial fire-fighting					
A-1	Wagon type vehicle 4X4	1			1
A-2	Pick up 4X4		2		2
A-3	Motor bike			5	5
A-4	Motor boat		2		2
A-5	Weather observation unit		1		1
A-6	Binocular			8	8
A-7	Portable pump (C class)		6		6
A-8	Portable pump (D class)		6		6
A-9	Pressure regulator		6		6
A-10	Hose		150		150
A-11	Back pack		51		51
A-12	Back pack shooter			40	40
A-13	Chain saw		6		6
A-14	Power mower		6		6
A-15	Portable Floodlight		3		3
A-16	Portable water tank (5,000 L)		6		6
A-17	Tent		3		3
A-18	Hand tool set		3	8	11
A-19	Personal computer	1			1
A-20	Printer	1			1
A-21	Television	1			1
A-22	Video	1			1
A-23	Projector	1			1
A-24	Bulldozer				
A-25	Backhoe				
A-26	Generator		1	8	9
A-27	Portable GPS			8	8
A-28	Underground thermometer		1		1
A-29	Clinometer with compass		6		6
A-30	Locker	1	9	8	18
A-31	Steer shelf		12		12
B.For communication					
B-1	Fixed radio unit (repeat station)	1			1
B-2	Fixed radio unit (station)		3	7	10
B-3	Mobile radio unit(for the car)	1	2		3
B-4	Mobile radio unit(for the motor boat)		2		2
B-5	Portable radio unit	1	5	7	13

Table 2.11 Equipment and Material Layout Plan (Way Kambas Subsection)

Code	Item	Arrangement Plan			Total
		Bungur	Wav Kanan	Plang Hijan	
A.For early fire detection and initial fire-fighting					
A-1	Wagon type vehicle 4X4				
A-2	Pick up 4X4	1		1	2
A-3	Motor bike				
A-4	Motor boat	1	1		2
A-5	Weather observation unit		1		1
A-6	Binocular				
A-7	Portable pump (C class)	2	2	2	6
A-8	Portable pump (D class)	2	2	2	6
A-9	Pressure regulator	2	2	2	6
A-10	Hose	50	50	50	150
A-11	Back pack	17	17	17	51
A-12	Back pack shooter				
A-13	Chain saw	2	2	2	6
A-14	Power mower	2	2	2	6
A-15	Portable Floodlight	1	1	1	3
A-16	Portable water tank (5,000 L)	2	2	2	6
A-17	Tent	1	1	1	3
A-18	Hand tool set	1	1	1	3
A-19	Personal computer				
A-20	Printer				
A-21	Television				
A-22	Video				
A-23	Projector				
A-24	Bulldozer				
A-25	Backhoe				
A-26	Generator			1	1
A-27	Portable GPS				
A-28	Underground thermometer		1		1
A-29	Clinometer with compass	2	2	2	6
A-30	Locker	3	3	3	9
A-31	Steer shelf	4	4	4	12
B.For communication					
B-1	Fixed radio unit (repeat station)				
B-2	Fixed radio unit (station)	1	1	1	3
B-3	Mobile radio unit(for the car)	1		1	2
B-4	Mobile radio unit(for the motor boat)		1	1	2
B-5	Portable radio unit	2	2	1	5

Table 2.12 Equipment and Material Layout Plan (Way Kambas Resort)

Code	Item	Arrangement Plan								Total
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
A.For early fire detection and initial fire-fighting										
A-1	Wagon type vehicle 4X4									
A-2	Pick up 4X4									
A-3	Motor bike	1		1	1	1			1	5
A-4	Motor boat									
A-5	Weather observation unit									
A-6	Binocular	1	1	1	1	1	1	1	1	8
A-7	Portable pump (C class)									
A-8	Portable pump (D class)									
A-9	Pressure regulator									
A-10	Hose									
A-11	Back pack									
A-12	Back pack shooter	5	5	5	5	5	5	5	5	40
A-13	Chain saw									
A-14	Power mower									
A-15	Portable Floodlight									
A-16	Portable water tank (5,000 L)									
A-17	Tent									
A-18	Hand tool set	1	1	1	1	1	1	1	1	8
A-19	Personal computer									
A-20	Printer									
A-21	Television									
A-22	Video									
A-23	Projector									
A-24	Bulldozer									
A-25	Backhoe									
A-26	Generator	1	1	1	1	1	1	1	1	8
A-27	Portable GPS	1	1	1	1	1	1	1	1	8
A-28	Underground thermometer									
A-29	Clinometer with compass									
A-30	Locker	1	1	1	1	1	1	1	1	8
A-31	Steer shelf									
B.For communication										
B-1	Fixed radio unit (repeat station)									
B-2	Fixed radio unit (station)	1	1	1	1	1		1	1	7
B-3	Mobile radio unit(for the car)									
B-4	Mobile radio unit(for the motor boat)									
B-5	Portable radio unit	1	1	1	1	1		1	1	7

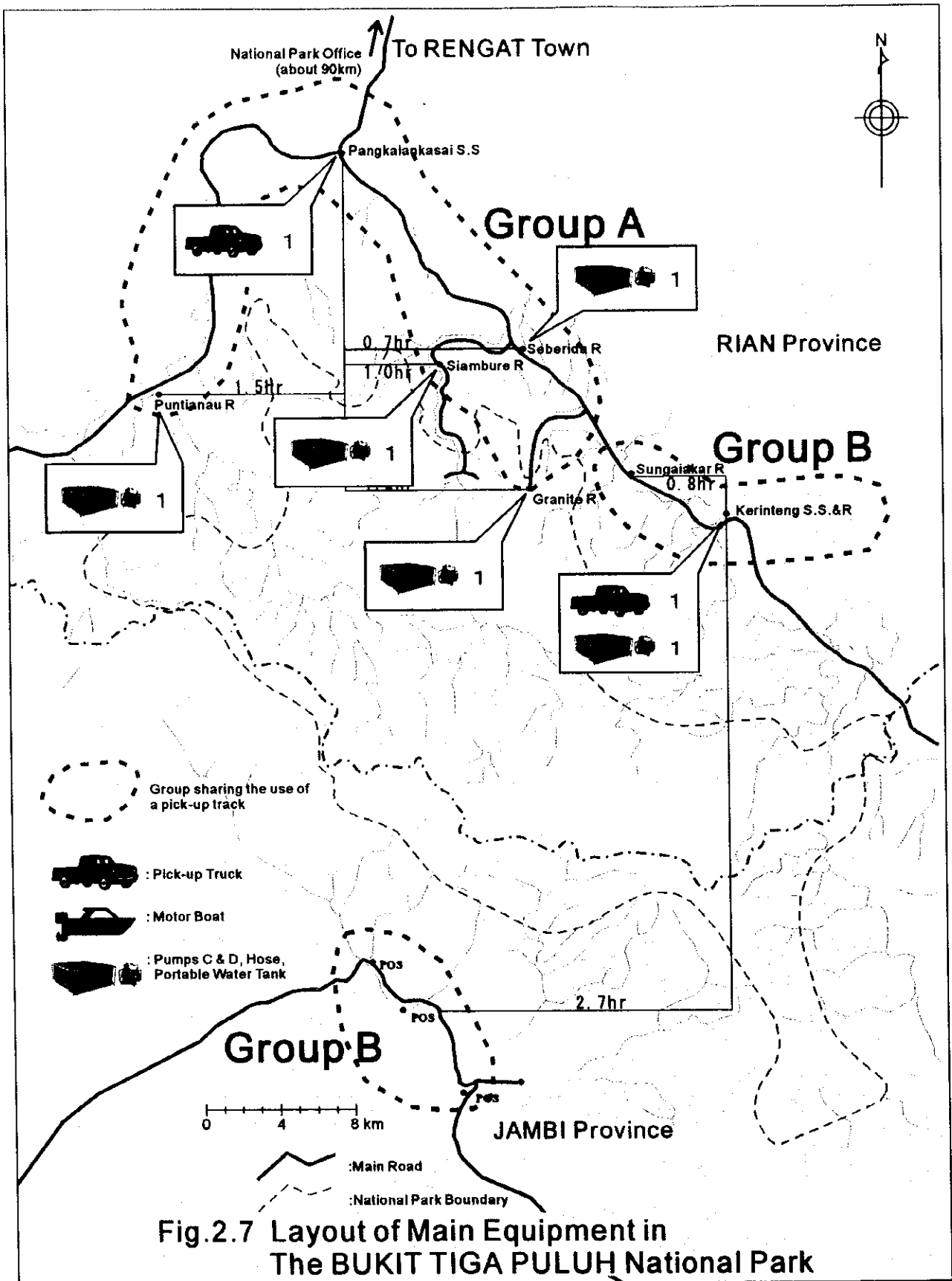
Resort name: (1) Cebang (2) Bungur (3) Kuala Kambas (4) Wako (5) Kuala Penet (6) Way Kanan (7) Plang Hijan (8) Sus Kan Baru

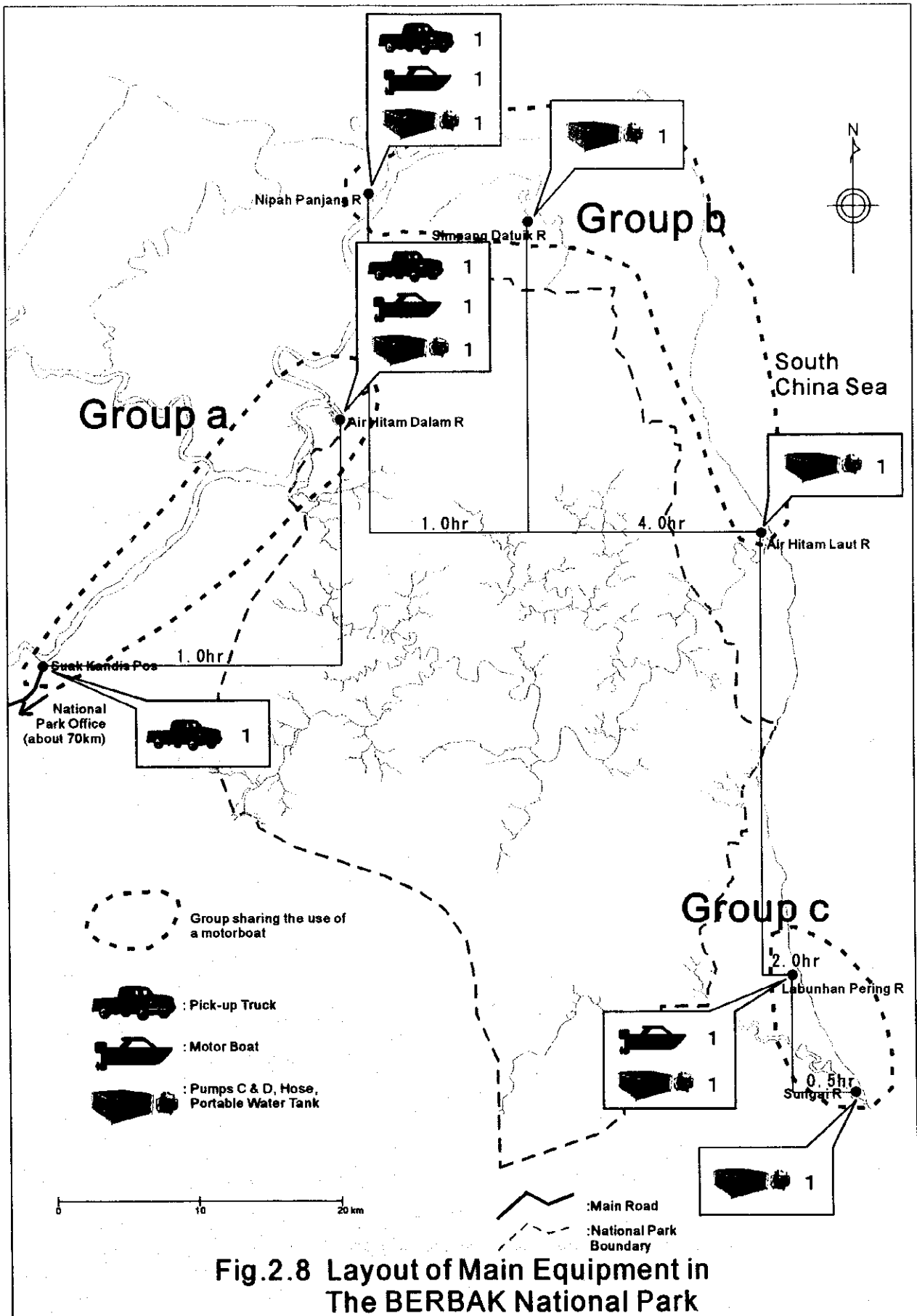
Table 2.13 List of Equipment and Materials for Gunung Palung National Park

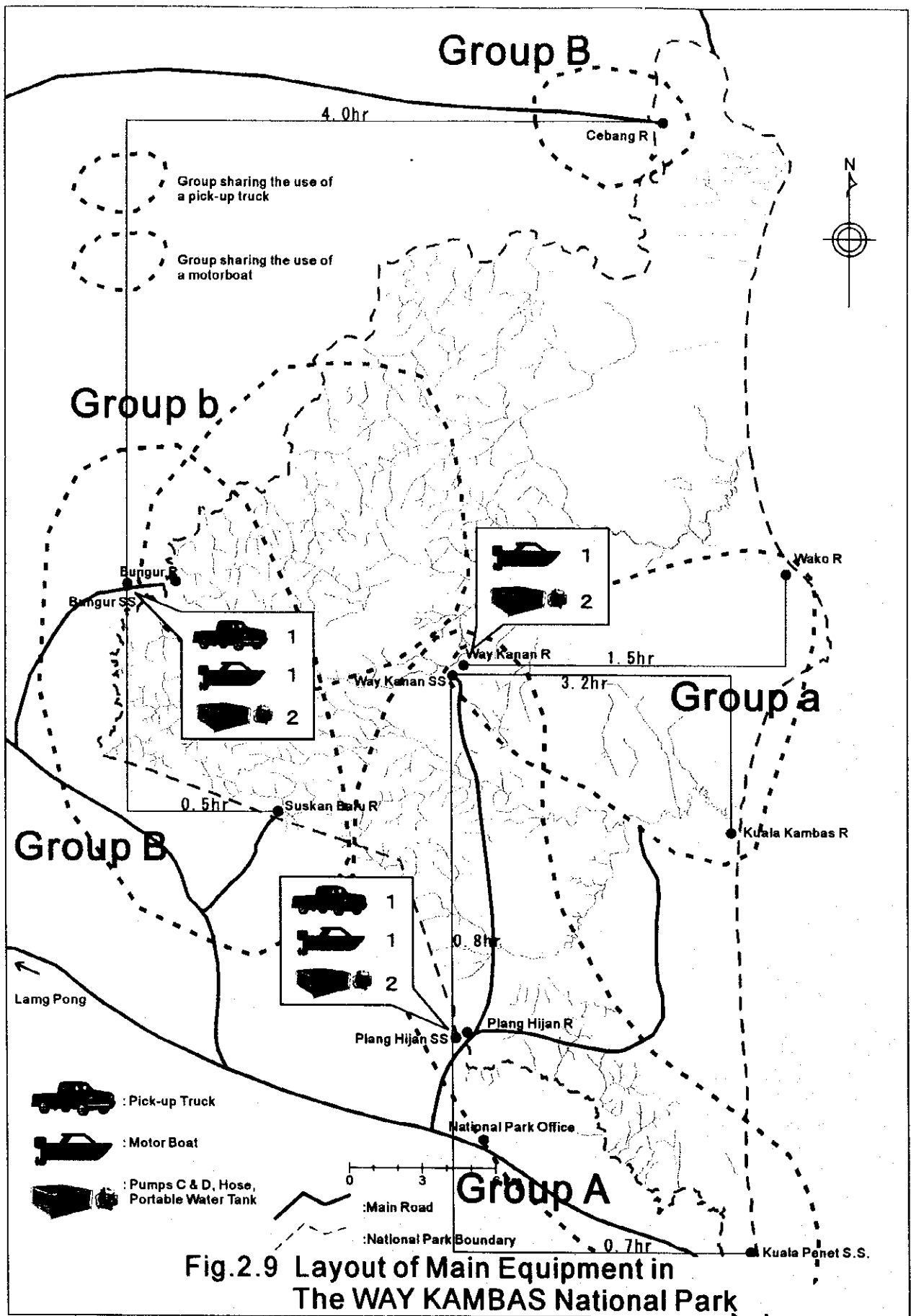
Code	Item	Arrangement Plan			Total
		Ofc.	SS-0	R-4	
A.For early fire detection and initial fire-fighting					
A-1	Wagon type vehicle 4X4	1			1
A-2	Pick up 4X4			1	1
A-3	Motor bike			4	4
A-4	Motor boat			2	2
A-5	Weather observation unit			1	1
A-6	Binocular			4	4
A-7	Portable pump (C class)			4	4
A-8	Portable pump (D class)			4	4
A-9	Pressure regulator			4	4
A-10	Hose			100	100
A-11	Back pack			36	36
A-12	Back pack shooter			20	20
A-13	Chain saw			4	4
A-14	Power mower			4	4
A-15	Portable Floodlight			3	3
A-16	Portable water tank (5,000 L)			4	4
A-17	Tent			3	3
A-18	Hand tool set			4	4
A-19	Personal computer	1			1
A-20	Printer	1			1
A-21	Television	1			1
A-22	Video	1			1
A-23	Projector	1			1
A-24	Bulldozer				
A-25	Backhoe				
A-26	Generator			3	3
A-27	Portable GPS			4	4
A-28	Underground thermometer			1	1
A-29	Clinometer with compass			4	4
A-30	Locker	1		8	9
A-31	Steer shelf			8	8
B.For communication					
B-1	Fixed radio unit (repeat station)	1		0	1
B-2	Fixed radio unit (station)			4	4
B-3	Mobile radio unit(for the car)	1		1	2
B-4	Mobile radio unit(for the motor boat)			2	2
B-5	Portable radio unit	2		7	9

Table 2.14 Equipment and Material Layout Plan (Gunung Palung Resort)

Code	Item	Arrangement plan				Total
		Sukadana	Pangkal Tapang	Batu Barat	Kubing	
A.For early fire detection and initial fire-fighting						
A-1	Wagon type vehicle 4X4					0
A-2	Pick up 4X4	1				1
A-3	Motor bike	1	1	1	1	4
A-4	Motor boat			1	1	2
A-5	Weather observation unit	1				1
A-6	Binocular	1	1	1	1	4
A-7	Portable pump (C class)	1	1	1	1	4
A-8	Portable pump (D class)	1	1	1	1	4
A-9	Pressure regulator	1	1	1	1	4
A-10	Hose	25	25	25	25	100
A-11	Back pack	9	9	9	9	36
A-12	Back pack shooter	5	5	5	5	20
A-13	Chain saw	1	1	1	1	4
A-14	Power mower	1	1	1	1	4
A-15	Portable Floodlight	1		1	1	3
A-16	Portable water tank (5,000 L)	1	1	1	1	4
A-17	Tent	1		1	1	3
A-18	Hand tool set	1	1	1	1	4
A-19	Personal computer					
A-20	Printer					
A-21	Television					
A-22	Video					
A-23	Projector					
A-24	Bulldozer					
A-25	Backhoe					
A-26	Generator		1	1	1	3
A-27	Portable GPS	1	1	1	1	4
A-28	Underground thermometer	1				1
A-29	Clinometer with compass	1	1	1	1	4
A-30	Locker	2	2	2	2	8
A-31	Steer shelf	2	2	2	2	8
B.For communication						
B-1	Fixed radio unit (repeat station)					
B-2	Fixed radio unit (station)	1	1	1	1	4
B-3	Mobile radio unit(for the car)	1				1
B-4	Mobile radio unit(for the motor boat)			1	1	2
B-5	Portable radio unit	2	1	2	2	7







The space required to house all these equipment and materials is as shown in Table 2.15.

Table 2.15 Space Planning for Equipment and Material Storage

(BUKIT TIGA PUTUH : Park Office and Subsection)

The space for the equipment	Park Office	Pangkalankasai	Kerinteng
The garage	1	1	1
The warehouse	6m	5m	5m
The desk	2	1	1
The anchorage area	—	—	—
The space for the antenna	200m ²	200m ²	200m ²

(BUKIT TIGA PUTUH : Resort)

The space for the equipment	(1)	(2)	(3)	(4)	(5)	(6)
The garage	—	—	—	2(for heavy machine)	—	—
The warehouse	10m	10m	10m	10m	5m	10m
The desk	1	1	1	1	1	1
The anchorage area	—	—	—	—	—	—
The space for the antenna	200m ²	200m ²	200m ²	200m ²	200m ²	200m ²

Resort name: (1)Puntianau (2)Seberida (3)Siambure (4)Granite (5)Sungaiakar (6)Kerinteng

(BERBAK : Park Office and Resort)

The space for the equipment	Park Office	(1)	(2)	(3)	(4)	(5)	(6)	(7)
The garage	3	—	—	—	—	—	—	—
The warehouse	5m	10m	5m	10m	10m	10m	10m	1m
The desk	2	1	1	1	1	1	1	1
The anchorage area	—	1	1	—	—	—	1	—
The space for the antenna	200m ²	200m ²	200m ²	200m ²	200m ²	200m ²	200m ²	200m ²

Resort name : (1)Air Hitam Dalam (2)Nipah Panjang (3)Simpang Datuik (4)Air Hitam Laut (5)Labunhan Pering (6)Sungai

Pos name : (7)Suak Kandis

(WAY KAMBAS : Park Office and Subsection)

The space for the equipment	Park Office	Bungur	Way Kanan	Kuala Penet
The garage	1	1	1	1
The warehouse	5m	15m	15m	15m
The desk	2	1	1	1
The anchorage area	—	1	1	—
The space for the antenna	200m ²	200m ²	200m ²	200m ²

(WAY KAMBAS : Resort)

The space for the equipment	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
The garage	—	—	—	—	—	—	—	—
The warehouse	5m	5m	5m	5m	5m	5m	5m	5m
The desk	1	1	1	1	1	1	1	1
The anchorage area	—	—	—	—	—	—	—	—
The space for the antenna	200m ²	200m ²	200m ²	200m ²	200m ²	200m ²	200m ²	200m ²

Resort name: (1)Cebang (2)Bungur (3)Kuala Kambas (4)Wako (5)Plang Hijan (6)Way Kanan (7)Kuala Penet (8)Sus Kan Baru

(GUNUNG PALUNG : Park Office and Resort)

The space for the equipment	Park Office	Sukadana	Pangkal Tapang	Batu Barat	Kubing
The garage	1	1	—	1	1
The warehouse	5m	10m	10m	10m	10m
The desk	2	1	1	1	1
The anchorage area	—	—	—	—	—
The space for the antenna	200m ²	200m ²	200m ²	200m ²	200m ²

2-3-2-2 Examination of the Specifications of Required Equipment & Materials

A. Early Detection and Fire Fighting Equipment and Materials

A1. 4 Wheel Drive Vehicle

A 4 wheel drive vehicle will be planned for the patrol of the national park grounds starting from the national park office, and the use of the person in command during fire emergency. Because the vehicle will be used to transport staff, it will have an 7 passenger capacity and a displacement of about 2,800cc to allow transport over bad road conditions and steep slopes.

A2. Pick-up Truck

A pick-up truck enables the loading of light cargo on the back section. Pick-up trucks either have two or 4 back wheels. However, in consideration of travelling on bad road conditions and steep slopes, the procurement of a the latter is recommended. This type of vehicle is operated either by diesel or gasoline. Generally, the diesel type engine is inferior to the latter in terms of instant engine power, but is superior in terms of fuel expenses and staying power.

Pick-up trucks have either a single cabin that allows 2 to 3 passengers or a double cabin with a 4 to 5 passenger capacity. In this project, a pick-up truck with 4 back wheels, a loading capacity of approximately 0.8 ton, double cabin structure and a diesel engine will be procured. The table below shows the weight of the equipment and materials to be loaded onto the truck and the space these will take.

Equipment & Material	Weight (kg)	Area (m ²)
Pump (C class)	90	0.3
Pump (D class)	55	0.2
Pressure Regulator	5	0.0
Hose (8kg x 20 sets)	160	1.0
Backpack (3.0kg x 7 sets)	21	1.5
Backpack Shooter (4kg x 5 sets)	4	
Chainsaw	4	
Power Mower	8	
Portable Floodlight	65	
Portable Water Tank (5m ³)	43	
Tent	50	
Generator	60	0.2
Total	565	3.2

A3. Motorcycle

The different types of motorcycles are: sports type, off-road type, or the ordinary type. For use in poor road conditions, the off-road type is considered most suitable for use, especially as it is also widely used in Indonesia and spare parts would not be difficult to obtain. A motorcycle with about 125cc displacement will be selected for maneuverability especially in difficult road conditions.

A4. Motorboat

Motorboats will be used for patrol and monitoring activities and the transport of equipment and materials in case of fire. There are different types of boats: wooden, steel, and FRP made boats. The boat to be procured under this project will be made of FRP because it is comparatively more durable and lightweight. It will have a kerosene fueled engine, instead of a gasoline fueled or light oil fueled-engine, in consideration of the maintenance cost. The size of the boat will be 20ft for use in open seas and 17ft for use in rivers; the former will be powered with two engines.

A5. Weather Observation Unit

Simple meteorological instruments, such as instrument for measuring humidity, a rainfall gage, wind direction/velocity meter, and instrument screen, will be planned for procurement to monitor constant changes in the climate and for the analysis of fire hazards.

A6. Binoculars

This will be used to monitor fire outbreaks and gather information during fire incidents. The quantity to be planned will be 7 times more than to be used for this purposes alone. Water resistant binoculars will be procured to allow use even on rainy days.

A7. Pump C

Pump C will be mainly used to direct water from the source for fire extinguishing activities. A portable pump with the following specifications will be taken into consideration: a weight of about 50kg and a 5kg/cm² minimum water conveyance pressure.

The water spraying potential difference in elevation for pump C (5kg/cm² conveyance pressure) using a hose with a 65mm opening and for pump D, which will spray water (3kg/cm²) at a point 500m from the water source using a 12mm nozzle, that is under the assumption that 10% of the water will be lost during conveyance, is about 40m as shown in Table 2.16.

Potential Defiance Elevation (pump procure - Hose long - loss of noggle, pressure x 10)

Table 2.16 Number of Connecting Hoses and Potential Difference in Elevation During Water Conveyance

Number of Hoses	FL (Hose loss)	PP – discharge pressure	Potential Difference in Elevation BP*10
25	0.72	4.99	42.8m
24	0.69	4.99	43.1m
23	0.66	4.99	43.4m
22	0.63	4.99	43.6m
21	0.60	4.99	43.9m
20	0.57	4.99	44.2m
19	0.54	4.99	44.5m
18	0.52	4.99	44.8m
17	0.49	4.99	45.1m
16	0.46	4.99	45.4m
15	0.43	4.99	45.6m
14	0.40	4.99	45.9m
13	0.37	4.99	46.2m
12	0.34	4.99	46.5m

A8. Pump D

This pump will be used mainly to spray water. This pump will be portable and with the following specifications: D type, about 20kg in weight, and with a minimum water conveyance pressure of 3kg/cm².

A9. Pressure Regulator

Abnormal high pressure usually results when two pumps are connected with a hose for water conveyance and/or spraying, or when water spraying is terminated or restarted. This not only causes damage to the equipment but could also put the ranger at risk. To prevent such incidents from taking place, the pressure should be regulated. In this regard, the procurement of a pressure regulator valve will be planned for use when connecting pumps C and D.

A10. Fire Extinguishing Hose

There are two different types of hose used for fire extinguishing: the wet hose (leaking is allowed to maintain dampness) and rubber hose (do not leak). Assuming that a hose with a maximum length of 500m will be required, the selection will give priority to transportability. Due to limited water sources, water loss is also another main factor for the selection. Accordingly, the rubber hose will be planned for procurement. The target

utilization pressure will be about 13kg/cm².

A11. Backpack

A bag will be used to carry the hose. It will either be a bag slung on the shoulder or a backpack. A backpack will be procured in this study in view of ease in haulage in unstable ground conditions. The backpack will have an aluminum frame for support in the hauling of 3 hoses weighing about 25kg.

A12. Backpack Shooter

A backpack shooter is easy to use because it is lightweight and can be carried on one's back. However, it needs frequent supply of water because the tank has a small capacity. There are two types of tank: jacket type and tank type. In view of facilitating the supply of water and in consideration of the spillage during the supply of water, the tank type will be selected. The tank capacity will be about 18 liters in view of the fact that it will be carried around on a person's back.

A13. Chainsaw

This will be used for the preparation of temporary installations during fire outbreaks, and for the construction of a fire prevention zone. A small chainsaw will be procured in view of its use in the forest plains (about 14 inch teeth).

A14. Power Mower

This will be used in the preparation of temporary installations during fire outbreaks, and the construction of a fire prevention zone. A small power mower with an engine of about 30cc will be procured in view of its use in the forest plains. The engine of the power mower will be contained in the main body to prevent any possible danger that could ensue from separation as may be the case if the engine is separate from the main body of the machine.

A15. Portable Floodlight

Small portable floodlights will be procured to provide illumination at night during fire fighting activities (1 bulb; with generator).

A16. Portable Water Tank

This will be used mainly to supply water to the backpack shooter. Since the backpack shooter tank will have a capacity of 18 liters, the tank shall have a 5,000 liter capacity according to the following calculation: 5 backpack shooters x 50 (number of use). A square

water tank will be procured instead of a circular water tank in consideration of ease in assembling the tank.

A17. Tent

Tents will be procured for use as frontline base during fire incidents. The tent will be made of cloth just in case it will be used for sleeping and will have a square structure once installed. Since it might also be used to house the equipment and facilities, the tent will be about 3m x 5m in dimension.

A18. Hand Tool Set

This will be used mainly to prepare temporary installations during fire and to construct fire prevention zones. However, since it will be used in forest plains, the hand tool set will consist of simple tools like hoes, sickles, etc.

A19. Personal Computer

At present, hotspot information under the project-type technical cooperation is distributed or accessible by mail. A computer with a capacity that can provide the comfortable use of software (Arcview, Office, etc.) for the management of these information and the analysis of fire hazards will be provided under this study. Windows 98 will be used as the operating system.

A20. Printer

A color printer will be procured to print out the data (including the printing in the desired color of materials for training program) entered into the personal computer to be provided as above mentioned. There are two types of color printer: a laser and an ink jet printer. The latter will be provided as the former is costly to maintain and difficult to procure and introduce.

A21. Television Set

A 24 inch television set will be used in the training of the rangers (about 20) and the dissemination activities for the area residents.

A22. Video

A video will be used in the training of the rangers and the dissemination activities for the area residents. A multi-functional video will be provided in consideration of the use of software from Japan (including those by the project-type technical cooperation), England, and the United States.

A.23. Projector

A projector will be provided for the training of the rangers and the dissemination activities for the area residents. In consideration of the use of materials for an overhead projector (OHP), and OHP will be provided.

A.24 Bulldozer

A small bulldozer (operating weight: about 6.5t, 80HP with diesel engine) will be planned for procurement. The driving method will be crawler type. The transportation for this equipment was note requested by Indonesia. It will prepare by Indonesia as necessary.

A.25 Backhoe

A small backhoe (bucket capacity: about 0.1) will be planned for procurement. The driving method will be crawler type. The transportation for this equipment was note requested by Indonesia. It will prepare by Indonesia as necessary.

A.26 Generator

A small generator will be procured to supply energy for the wireless communications system and the lights.

A.27 Portable GPS

A portable GPS will be provided for use by the rangers at the site.

A.28 Underground Thermometer

A thermometer that can take measurements 1m below the ground will be procured.

A.29 Clinometer with a Compass

A handy and easy to use clinometer with a compass will be procured.

A.30 Locker

A steel locker with a lock will be provided.

A.31 Steel Shelf

A steel shelf that will not require a lock will be provided.