(b) Costs and Benefits of the Programs

Investment costs of machinery and equipment for (1), (2), (3), (4), (5) and (7) may amount to Rp.1,850,000, while those for (6) to Rp.20,000,000. Investment costs for factory buildings and land should not be entered into this program since they will be financed by the beneficiaries.

As for benefits in terms of gross revenue, the projects except the charcoal making project will receive only processing charges as sales revenue when raw materials are handed in and taken out as processed products by their owners. The charcoal making project is different from the above projects. They buy raw materials, process them and sell their final products.

On these assumptions, annual gross product per project is estimated as follows:

	Gross Output per Project
The Projects except the Charcoal Making Project	Rp.700,000
The Charcoal Making Project	Rp.9,500,000

11.5.3 Limestone Processing Project

(a) Location of the Project

The project locations are proposed at two sites, Gamping in KB Tulungagung and Kanigoro in KB Blitar. The Gamping project is more advantageous than the Kanigoro project since Tulungagung has already the national marble project and its well-developed physical facilities and human resources.

(b) Costs and Benefits of the Project

Benefits from the project can be calculated on the folloiwng two assumptions:

(1) One ton of active lime is Rp.20,000; and
(2) Production continues, without any break, 365 days a year.

The gross revenues are Rp.73,000,000 and Rp.219,000,000 for a 10-ton capacity plant and a 30-ton capacity plant, respectively, while total investment costs are Rp.500 million for a 10-ton project and Rp.880 million for a 30-ton project.

11.5.4 Marble Tile and Artistic Marble Product Project

(a) Location of the Project

The artistic marble product project is proposed either at Besole in KB Tulungagung or at Panggul in KB Trenggalek, while the marble tile project can only be proposed at Panggul.

(b) Costs and Benefits of the Project

The artistic marble product project entails relatively small investment costs since the project requires small machinery and equipment to cut and polish marble. Total investment costs for 100 tool sets, 5 cutting machines, 5 polishing machines, and other machinery and equipment are estimated at Rp.30,000,000. As the project may not require substantial costs for land and buildings, this figure may be regarded as the grand total investment costs.

As for the marble tile project, costs for machinery and equipment for a capacity of 2,000 pieces per day are estimated at Rp.218,750,000. The total costs of the project, which includes costs of machinery, equipment, buildings and land, would be approximately Rp.440,000,000. Benefits in terms of gross production per year for the artistic marble project produced by 100 workers at the site are approximately Rp.22,500,000. Benefits for the marble tile project are Rp.200,000,000.

11.5.5 Ceramic Research Center Project

(a) Location of the Project

From viewpoint of the future developmental potentials and geographical convenience, it is appropriate to locate this center in or around Kota Tulungagung.

(b) Costs of the Project

Investment costs for machinery and equipment, buildings and land are tentatively estimated as follows:

Machinery and Equipment	Rp.62,500,000
Building (400 m^2)	Rp.7,200,000
Land (800 m^2)	Rp.1,600,000
Total	Rp.71,300,000

(c) Size of the Center

The center would have approximately 20 staff members (7 skilled members for the raw material research and development section, 7 for the ceramic product research and development section, and the remaining 6 for the general affairs and planning section).

11.5.6 Ready-made Garment Project

(a) Location of the Project

This project intends to reorganize several one-man type tailors, who are assigned as initiators of the project, into one more efficient and larger tailor shop in Kota Ponorogo, Kota Trenggalek and Kota Tulungagung. The new shop will primarily produce such items as school uniforms and public uniforms for public procurement.

(b) Costs and Benefits of the Project

Investment costs for machinery and equipment, buildings and land are estimated as follows:

20 Sewing Machines, and Other Machinery Equipment	Rp.2,500,000
Building (200 m^2)	Rp.3,600,000
Land (300 m^2)	Rp.600,000
Total	Rp.6,700,000

The project creates at least 20 new employment opportunities in addition to the initiators, of which 15 are skilled tailors. The annual gross revenue of ready-made garments would be Rp.8.5 million, of which 70% is deducted as costs of raw materials.

11.5.7 Bamboo Crafts Sub-contracting Project

This project organizes village home industrialists systematically as sub-contractees. The middleman's role is played by a newly formed producer cooperative headed by a selected bamboo industrialist who manages a bamboo processing industrial unit to be constructed at the community center of a village, with the direct help of a technical staff of Dinas Perindustrian at the kabupaten level who takes care of technical as well as marketing aspects. The bamboo processing unit processes bamboo to a stage of intermediate products, which is, then distributed to village households for finishing.

(a) Location of the Project

Three pilot projects planned to be implemented at the nearest villages with abundant bamboo resource to Kota Pacitan, Kota Trenggalek and Kota Blitar.

(b) Costs and Benefits of the Project

The construction of a bamboo processing unit at the village community center uses up most of the investment budget of the project. Since bamboo products are usually produced by villagers with simple handtools, costs for new handtools are almost negligible. The breakdown of the investment costs is as follows:

Machinery and Equipment and 2 Motorcycles	Rp.2,500,000
Building (50 m^2)	Rp.900,000
Land (75 m^2)	Rp.150,000
Total	Rp.3,550,000

The bamboo processing unit requires two new permanent employees; one skilled and the other semi-skilled. The project would also involve 20 to 30 households of a village. The annual gross output of various kinds of bamboo products is estimated at Rp.5.0 million, of which 50 to 60% goes to purchasing of raw materials.

CHAPTER XII

WATER RESOURCES

12.1 Development Effort in the Past

Major activities of water resource development in the Study Area are categorized into six types: (1) new irrigation projects, (2) flood control works including river dredging and embankment, (3) rehabilitation of irrigation systems, (4) debris control works, (5) hydropower development and (6) drinking water supply works. Through Repelita I and II, considerable efforts were made to expand the irrigated areas and to rehabilitate the irrigation systems. Flood control works were implemented by constructing several dams, but still they are not enough to prevent notorious flood damage in the Brantas River course. Debris control works of Mt. Kelut are also short of the desirable requirement. After the eruption in 1966, it is reportedly said that only about 60% of the lahar was controlled so far and the remaining 40% is expected to be controlled in the immediate future. Hydropower development in the Study Area dominates mainly in the upper Brantas Basin, i.e., Karangkates and Wlingi. As for drinking water supply, a supply system in Malang City is now being planned. And several rural water supply projects were implemented by the joint budgets of APBN and INPRES.

The actual budget allocation by sector and by region during Repelita II indicates that the budget share of water resource development in the Study Area is decreasing in comparison with the other sectors and regions.

12.2 On-going Projects

12.2.1 Brantas River Multipurpose Development Project

Major activities in the upper Brantas Basin are the construction of flood control works, irrigation systems and hydropower plants. The beneficiaries of flood control and irrigation are located in the alluvial area of Brantas River, and most of the generated electrical power is transmitted to the urban and industrial areas of Surabaya. In the Study Area, there are three on-going projects as shown below:

(1) Middle reaches improvement (1978-1990)

Specifications: 93 km from Kediri to New Lengkong Dam;
total quantity of dredging, 16.6 million m^3; and
total quantity of embankment, 1.6 million m^3.

Costs: Rp.60 billion for eleven years.

Benefits: preventing the average annual damage of Rp.9.4 billion.

(2) Lodoyo Dam (afterbay) (1978-1980)

Specifications: live storage of 5 million m^3 with nine movable gates of 121 m length.

Costs: Rp.3,300 million plus a foreign loan of ¥900 million.

Benefits: 4,500 kW.

(3) Tulungagung area flood and drainage control project (1979-1983)

The project is undergoing a feasibility study financed by the Asian Development Bank for a purpose of drainage and flood control in the swamp area between Tulungagung and Neyama Tunnel. The following figures are crude and tentative ones:

Costs:	about US$60 x 10^6
Benefits:	about 3,000 ha newly irrigated area.

12.2.2 Mt. Kelut Debris Control Project

The project, which includes construction of sandpockets, sobo-dams and checkdams, is confined within northern Blitar and eastern Kediri on the slope between Mt. Kelut and Brantas River. Consistent with the Brantas River development plan (improvement of middle reaches), the debris control works in the area are expected to deal with about 150 to 200 million m^3 of debris by constructing sandpockets and other structures.

12.2.3 Lodoyo Irrigation Project

The water (11 m^3/s) from Wlingi Reservoir irrigates total area of 15,000 ha, of which 13,000 ha are located in KB Tulungagung and the rest in KB Blitar. The project is planned to be completed in 1982 and at the end of 1978, about 2,600 ha are bestowed by the project.

12.2.4 PROSIDA Madiun Project

The project covers five kabupatens in Madiun River alluvial basin. The project, financially supported by the International Development Association (the World Bank), aims at rehabilitating the irrigation system for the area of 140,000 ha, of which 38,000 ha belong to KB Ponorogo. The construction includes rural roads, main canals and tertiary canal systems. The project started in 1977 and will end in 1983. The total project costs including consultant fees, salaries and operating expenses, amount to Rp.35 billion.

As to development activities of this basin, the planning and implementation of irrigation are done by PROSIDA Office, and some dam projects in the basin are planned by the

Office of Bengawan Solo Project. It is imperative that these institutions closely cooperate with each other, even though they have a good channel of information.

12.2.5 Kediri-Nganjuk Ground Water Development Project

The project area is located in KB Kediri, KB Nganjuk, a small part of KB Tulungagung, KB Blitar and KB Jombang. About 90% of the project area belongs to the Study Area. The project started in 1969 with aims of supplying groundwater for irrigation in both wet and dry seasons. The project includes agricultural extension services, i.e., water management and cropping pattern guidance. So far, the beneficiaries of the project are about 7,000 village farmers in the Study Area.

The ultimate scale of development in this project will reach to approximately 37,000 ha in next 5 to 10 years. According to the data obtained, the project will be very profitable as shown below:

Benefits: the range of incremental farm earnings from Rp.176,000 to Rp.235,000/ha/year at 1977 prices.

Costs: Rp.39,000/ha/year plus canal maintenance and labor input.

Table 12.1 APBN On-going Project Program in the Study Area (79/80-83/84)

(Unit: Rp.10^9)

	78/79	79/80	80/81	81/82	82/83	83/84	Remarks
Lodoyo Irrigation Project 15,000 ha	Construction →				Operation/maintenance →		
	1.7	3.3	3.8	3.3			Plus foreign loan, but the amount not available
Kediri-Nganjuk G.W. Development Phase 1,2: 3,300 ha, IRR 20% Phase 3 : 30,000 ha 90% of the project area belongs to the Study Area.	Phase 1 & 2	Restudy of water balance →		Full scale development phase 3 →			
		0.8	0.8	2.8	2.8	2.8	Plus foreign loan of ¥11.7 million
Mt. Kelut Debris Control The benefit increases continously in proportion to the capital investment given to the influential area of Mt. Kelut eruption.	Continues investigation, design and construction →						
	0.6	0.9	0.9	1.0	1.0	1.2	
PROSIDA Madiun Rehabilitation of 140,000 ha, 30% of the project area belongs to the Study Area.	Rehabilitation of main & tertiary canals →				Operation/maintenance →		
	6.0	8.0	9.0	7.6	6.3		
K. Brantas Multipurposes Development	Planning & implementation of several projects →						
	15.9	24.1	26.0	38.9	24.7	17.3	
a. Middle Reaches Dredging & Embankment: dredging, 15.6 Mm^3 embankment, 1.6 Mm^3	0.2	0.3	1.7	2.9	4.2	5.5	Plus foreign loan of ±¥9.4 billion
b. Lodoyo After Bay: 9 gates, L=121 m; effective storage volume, 5 Mm^3	(n.a.)						
c. Tulungagung Area Flood Control & Drainage Project				← about 30 →			Plus foreign loan of about US$60 million
d. Hydropower Development Sengguruh and Kasamben Projects				← about 11 →			Plus foreign loan of about US$45 million

Source: BAPPENAS, BAPEDA, Project Offices.

12.3 Development Perspectives and Strategies

12.3.1 Brantas Basin

Since the present development efforts are mainly focused upon the economically high potential parts of the Brantas Basin in the Study Area, the investment for anti-disaster such as Mt. Kelut debris control works and middle reaches improvement projects should be promoted extensively as planned during Repelita III, in order to protect the past and present investments. After the completion of the middle reaches dredging and embankment project in 1990, it is reported that the River will stand against a probable flood of the ten year return period, provided that Mt. Kelut debris control works can prevent additional inflow of the debris into the Brantas River from the next possible eruption.

Groundwater development in the alluvial area in the middle reaches seems to be vital and feasible. It will be expanded to supply water to about 40,000 ha in the coming five to eight years. The lessons from this project can be applied to other potential areas of groundwater in tributary basins or the southern coastal basins.

In the field of hydropower development, there are still possible sites in the upper Brantas River area. They are Sengguruh (10 km upstream of Karangkates Dam) and Kasamben (11 km downstream of Karangkates Dam), whose generating capacities are estimated to be 29,000 kW and 15,000 kW, respectively.

12.3.2 Tributary Basins

There still exist potential tributary basins which require further development, namely the Ngasinan (Ngrowo) River in the Brantas River Basin, and the Madiun River in the Solo River Basin. The future development of the Ngasinan River, if it is done on a large scale, would play a key role to develop the swampy area of Tulungagung. The Tulungagung flood control and

drainage project shall be coordinated with an overall development concept of the Ngasinan River.

In Madiun River Basin, there are two prospective big dam sites which are conceived in the Master Plan of Bengawan Solo (OTCA, 1974). They are Bendo Dam and Badegan Dam. As for the Bendo Dam, a crude feasibility study was undertaken by PROSIDA, and the study indicates that its IRR is estimated to be 9%, with construction costs of $40 million. The Badegan Dam Project was also given a high priority in the Master Plan. In addition to Bendo and Badegan, there may be other possible dam sites for the purposes of flood control, irrigation, and hydropower development in the Madiun River Basin. For these reasons, it is recommended that an overall review of the Madiun River Basin development should be carried out in order to plan a sequence of dam construction in the basin as a whole.

Groundwater development is now underway in the certain alluvial area in KB Ponorogo. A success of the Kediri-Nganjuk groundwater project shall be applied in this area. In addition, technical guidance of tertiary canal maintenance and cropping pattern should be strengthened, and also know-how of water management should be developed in this area.

12.3.3 Southern Coastal Basins

The southern coastal basins consist of many small comb-shaped rivers flowing into the Indonesian Ocean. Among these, major rivers are, from west to east, Grindulu, Loroq, Panggul, Wringin, and Penguluran whose catchment areas vary from approximately 100 km^2 to 700 km^2. It was thought that the areas were poor from an economic point of view, but the investment in several small scale water projects in these areas shows that they will be economically profitable. For example, Pakis Baru Project in the highland area of Pacitan,

shows that integrated efforts of reforestation, dam construction, and canal improvement seem successful.

Among several rivers in Southern Coast, the Grindulu River has the most potential for development. Investigation and planning of this river are worthwhile as an immediate action.

If an integrated approach (i.e., good watershed management) is applied to this southern coastal area, the projects can expect a high rate of economic return as well as upgrade indirectly the facilities which provide basic human needs to the local people in these areas.

12.4 Proposed Projects

After assessment of the on-going projects and the strategy of water resource development planned with identification of the prevailing problems and constraints, and the national and regional development objectives, the following planning actions and projects have been formulated for next 5 to 10 years. The justification of the projects are mentioned in Section 12.3. Since it is difficult to give them a quantitative evaluation at the present stage of the study, a further discussion and a detailed study through master planning of the respective basins are required for all the following projects.

(a) Tributary Development

There are two works for master planning and five conceivable dam projects as shown in Table 12.2. The development priorities can be given by reviewing the overall development concepts derived in each master plan and detailed feasibility analyses. However, the Bagong and Bendo projects are already well-formulated so that they can be implemented earlier than others. The estimated sizes and costs given in Table 12.2 are based on very crude calculations.

Table 6.3 List of Proposed Projects in Tributaries

	79/80	80/81	81/82	82/83	83/84
Ngashinan River Basin					
1. Master Plan for the Ngashinan River Basin Costs : Rp. 200 mill.	———				
2. Bagong Dam (Trenggalek) Scale : H=40 m, L=300 m Costs : Rp. 4,000 mill. Benefits: 1,500 ha irrigation & flood controls	F/S	D/D	S/T	Const.	
3. Tugu Dam (Trenggalek) Scale : H=5 m, L=1,200 m Costs : Rp. 500 mill.		F/S	D/D	S/T	Const.
4. Kampak Dam (Trenggalek) Scale : H=5 m, L=800 m Costs : Rp. 400 mill.	F/S	D/D	S/T	Const.	
Madiun River Basin					
5. Master Plan for the Madiun River Basin Costs : Rp. 300 mill.	———				
6. Bendo Dam (Ponorogo) Scale : H=80.5 m, L=420 m, rockfill Costs : Rp. 24,000 mill. Benefits: 3,000 ha irrigation and 3,500 kW hydropower			D/D, S/T	Const.	
7. Badegan Dam (Ponorogo) Scale : H=60.5 m, L=1,700 m, rockfill Costs : Rp. 48,000 mill. Benefits: 4,800 ha irrigation 6,000 kW hydropower		F/S	D/D	S/T	Const.

Note: Abbreviations are as follows: H=Height, L=Length, F/S=Feasibility Study, D/D=Detailed Design, S/T=Specification & Tender, Const.=Construction

(b) Southern Coastal Basins

In Section 12.3.3, an integrated approach is recommended for the economic and social stability in this area. As shown in Table 12.3, our field inspection has produced an impression that there would be possible project sites for multipurpose development, and that they seemed to be economically feasible as well as socially desirable. The Study proposes a new institutional set-up that aims at integrated or multipurpose development of the southern coastal areas. It may be called "Master Plan for Small Scale Integrated Development Project in Southern Coastal Region", and it deals with:

(1) An overall survey of watersheds which will indicate present and future land use patterns, and identify the potential areas and depressed areas where immediate development is needed. Also an aero-photo survey should be undertaken if it is required.

(2) A master plan of the area which shows possible development locations and sizes, and which outlines time schedules for development.

(3) Investigation of reforestation and tree cropping possibilities, suitable dry land crops, and proper extension service systems.

(4) Design of proper structures including land erosion control works, small-scale dams, irrigation systems, mini-hydro electric plants and their distribution systems, drinking water supply systems and facilities for groundwater exploitation. These structures should be treated in an integrated manner so that a catchment (watershed) area or a rural community can be systematically developed.

(5) Implementation and maintenance of the above-mentioned works and the transfer of the operational and maintenance know-how to village officials.

The necessary structures can be constructed by local contractors and unskilled labor through the guidance of skilled engineers provided by the new institution.

12.5 Recommendation

Recommended projects in the Study Area are shown in Tables 12.2 and 12.3, in which the Bendo Dam project and the small-scale integrated development projects in the southern coastal basins are emphasized. This sector study gives a top priority to the latter.

A plan for the small-scale integrated development project requires: (1) map preparation (1:25,000-1:3,000), hydrological studies, geological surveys, land-use map preparation, vegetation surveys and socio-economic surveys; (2) site selection for watershed management (checkdams) which includes structure's dimensions, actions needed, estimation of direct costs and benefits, and assessment of intangible benefits for the people concerned; and (3) policy recommendations, budget requirements, and institutional arrangements.

Talbe 12.3 List of Proposed Projects in Southern Coastal Basins

	79/80	80/81	81/82	82/83	83/84
1. Master Plan for the Small Scale Integrated Development Project in Coastal Area Costs : Rp.200 million	├────	──┤			
2. Proposed Projects					
- Tinatar Dam (Pacitan) Scale : H=45 m, L=200 m Costs : Rp.3,800 million Benefits: 1,400 ha irrigation & flood retention		F/S	D/D	S/T	Const.
- Lorog Dam (Pacitan) Scale : H=15 m, L=200 m Costs : Rp.800 million Benefits: 450 ha irrigation & flood retention		F/S	D/D	S/T	Const.
3. The following projects shall be studied in the Master Plan					
- Grindle Dam (Pacitan)		F/S	D/D	S/T	Const.
- Panggul Dam (Trenggalek)		F/S	D/D		Const.
- Wiringin Dam (Blitar)		F/S	D/D	S/T	Const.
- Penguluran Dam (Malang)		F/S	D/D		Const.

- Small Check Dams for Watershed Management
  - Standard type: scale : H=5-10 m, L=50-150 m Dam Construction
    costs : Rp.10-50 million
    benefits : 10-200 ha of irrigation
    watershed management : reforestation, tree cropping, erosion control, irrigation, groundwater exploitation, domestic water supply, mini-hydropower development.
  - Location : KB Pacitan, KB Trenggalek and KB Blitar.

- Drinking Water Supply Projects
  - Standard type: water source : spring or checkdam reservoirs, 2-5 litres/sec, piping of 2-4 km (diameter 2-5 in.)
    pump-up head : 10 m
    beneficiary : 3,000-10,000 inhabitants
    costs : Rp.20-40 million
  - Location : KB Blitar : Panggungrejo, Schruhwadang, and Bakung
    KB Trenggalek: Donko
    KB Pacitan : Punnung, Tulkun, Nagawan, Blingkak and Donorojo

CHAPTER XIII

LAND TRANSPORTATION

13.1 Land Transportation Development Strategy

The following strategies are recommended for development of land transportation systems in the Area.

(1) Road transportation is becoming more important, while railroad transportation becomes less important in the Study Area. This trend is expected to continue in the future. Therefore, it is recommended not to invest a large amount of money in railroad.

(2) At the present rate of increase in traffic volumes, the existing two-way provincial highways will be filled up to their capacity within five years. Expansion of the capacity will be required soon.

(3) Kabupaten road networks will be vital for development of the whole area. Development priority should be given first to the routes between kecamatan and kabupaten centers which provide the least travelling costs, second to the access roads to provincial highways and kecamatan centers, and third to the routes which lead to agriculture, mining, tourism and industrial potentials areas.

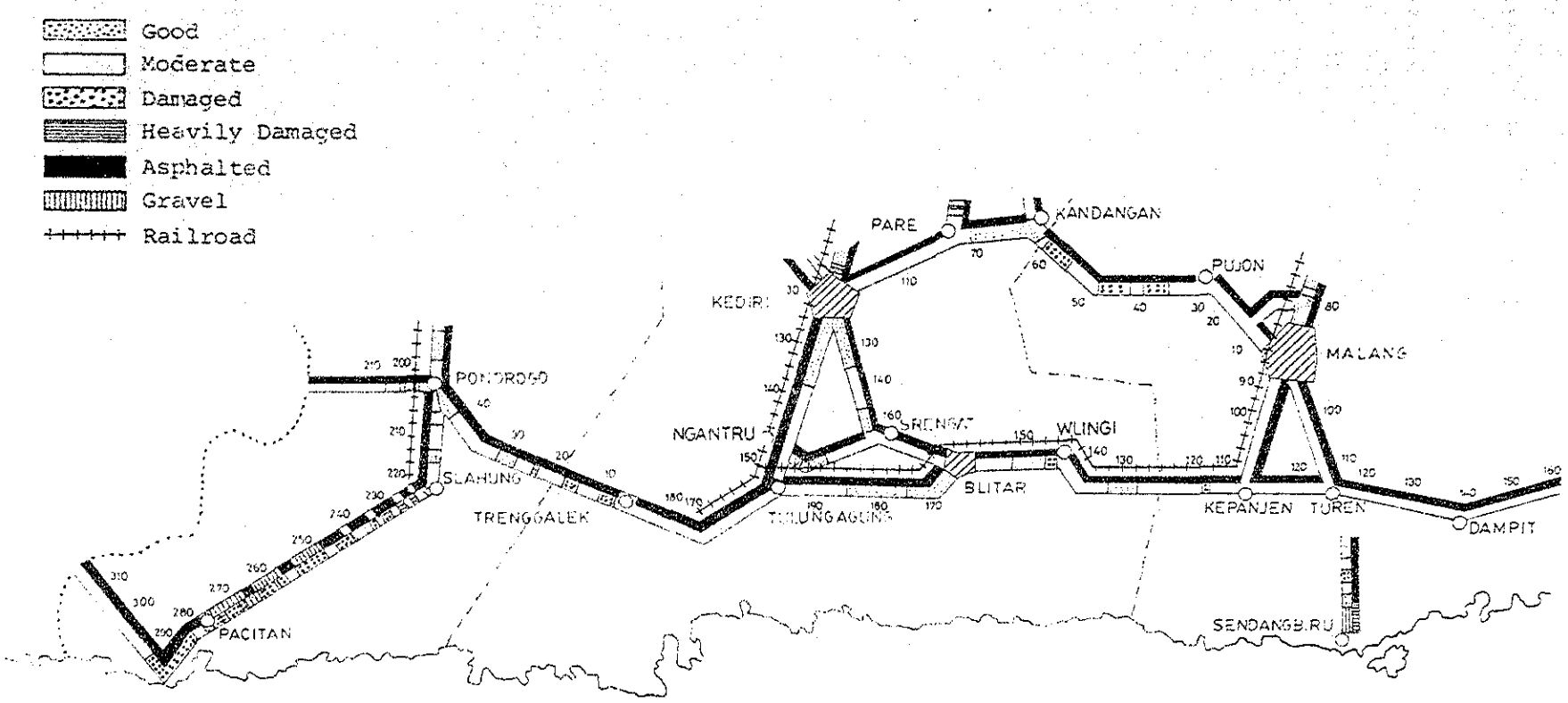
(4) For rural development, construction of access roads to desas is necessary, in addition to upgrading and building desa roads.

13.2 Evaluation of Present Land Transportation

13.2.1 Provincial Highway

The major function of the provincial highway network is to connect all the capital towns of kabupaten and to accommodate inter-city traffic smoothly. The entire provincial highways, major cities and their road conditions are shown in Figure 13.1. The width of carriage way in the rural flat heavy traffic areas is 6.0 m, whereas that in the less traffic areas is 4.0 to 5.5 m. All the roads have been asphalted except some sections between Pacitan and Ponorogo. Most of the highways are paved with penetration macadam. The surface conditions are good in flat area, but not in the hilly areas like Wlingi-Kepanjen and in mountain areas like Ponorogo-Trenggalek and Pacitan-Slahung. Most of the horizontal alignments of the existing highways in the flat terrain are straight, but some parts of the horizontal alignments in the crossing places with railroads and bridges are found to be S-curved with 60 to 100 m radii, which is not desirable. Both horizontal and vertical alignments in the hilly or mountainous terrain are not good because the lay of land prevents the highways from being constructed with better alignments. Bina Marga divided the provincial highway networks in the Study Area into 18 sections based on traffic flows and volumes. Those sections are shown in Table 13.1.

Figure 13.1 Statistics of Road Condition and Length (in km)
October 1978



Source: Bina Marga East Java Province

Table 13.1 Provincial Highways and Their Sections

	Section	Length (km)
1.	Provincial border--Pacitan	41
2.	Pacitan--Slahung	56
3.	Slahung--Dongek	14
4.	Dongek--Ponorogo	5
5.	Ponorogo--Study Area border	43
6.	Dongek--Trenggalek	47
7.	Trenggalek--Tulungagung	32
8.	Tulungagung--Kediri	29
9.	Tulungagung--Blitar	34
10.	Blitar--Srengat	15
11.	Srengat--Ngantru	20
12.	Srengat--Kediri	35
13.	Blitar--Wlingi	17
14.	Wlingi--Kepanjen	24
15.	Kepanjen--Malang	19
16.	Malang--Turen	26
17.	Kepanjen--Turen	17
18.	Turen--Study Area border	40

Source: East Java Provincial Development of Public Works.

13.2.2 Kabupaten Road

Dinas Public Works of each kabupaten made great efforts to improve kabupaten roads for the last five years, with annual investments ranging from Rp.150 to Rp.300 million. Nevertheless, kabupaten road networks are not good, especially in the southern coastal area. The present conditions of the kabupaten roads are shown in Table 13.2.

Table 13.2 Length of Kabupaten Roads and Their Conditions

Kabupaten	Total Length (km)	Normal (%)	Asphalted (%)
Pacitan	221	50	37
Ponorogo	269	41	16
Trenggalek	254	30	33
Tulungagung	272	29	40
Blitar	307	39	70
Kediri	n.a.	n.a.	n.a.
Malang	560	n.a.	n.a.

Source: Dinas Public Works of each kabupaten.

Note: "n.a." indicates that data is not available.

13.2.3 Railroad

As shown in Figure 13.1, the railroad in the Area runs parallel with the provincial highway. They are competitive and for the past ten years, demand for railroad transportation has been decreasing. In particular, volumes of short-distance passengers and freight on the railroad have been decreasing, and average distance of their movement has increased. The road has apparently an advantage over the railroad for the following reasons in the Area.

(1) Railroad transport cannot offer any good services, partly due to deterioration of rail, sleepers, bridges and rolling stock, and partly due to operational inefficiency.

(2) There is not much bulk cargo, and the distance for its transportation is short.

(3) Recent improvement in processing technique of sugar, coconut and others resulted in less demand for railroad transportation.

(4) Concerning passenger transportation, a railroad used to have an advantage over a road. However, minibuses called "colt" are taking over the railroad since they can provide convenient services.

Railroads in the Study Area were constructed around 50 or 60 years ago during the Dutch colonial period. The present railroad is 1,067 mm of gauge with 33 to 38 kg/m of rail and a single track for diesel locomotives. For the past forty years the maintenance has been neglected, and it will require a great amount of investment for improvement, including the modernization of rolling stocks. The branch lines of the railroad in the Study Area are operated by the Indonesian National Railway (PNKA) as a part of Java railway networks. The PNKA suffers from a deficit because of low tariffs and a large amount of personnel expenditure.

13.3 Provincial Highway

13.3.1 A Traffic Volume Forecast

Table 13.3 shows the sections where traffic volumes and their changes have been accurately measured. Rates of increase in traffic volume during the period 1972 to 1976 range from 20 to 40%, and are higher than the international standards. There are two factors for such high rates of increase in traffic volume. One is a rapid increase in number of cars, and the other is an expansion of economic activities in the Study Area.

Table 13.3 Traffic Volume and Its Rate of Increase

(Unit: Vehicles/day)

	Section	1972	1976	Annual Rate of Increase (%)
1.	Provincial border--Pacitan	72	212	30
3.	Slahung--Dongek	188	666	37
5.	Ponorogo--Border	186	797	44
6.	Dongek--Trenggalek	31	257	70
7.	Trenggalek--Tulungagung	246	915	40
9.	Tulungagung--Blitar	317	1,206	40
12.	Srengat--Kediri	526	1,160	22
13.	Blitar--Wlingi	664	1,634	25
16.	Malang--Turen	1,182	3,995	30
17.	Kepanjen--Turen	151	403	28

Source: Department of Transportation and Communication.

Based on the past trends of increase in traffic volume and number of motorized vehicles both in the Study Area and the whole East Java, the Team members estimated the future growth rates of traffic volume in the Study Area as follows:

	Average Daily Traffic in 1976	
	Less than 300	300 or more
	(%)	(%)
1976-1978	20	15
1978-1983	15	10
1983-1993	10	8

With these growth rates, the traffic volumes for 1983 and 1993 have been estimated as shown in Table 13.4.

Table 13.4 Estimated Traffic Volume by Section[1/]

(Unit: Vehicles/day)

Section	1976 (1)	1978 (2)	1983 (3)	1993 (4)	Ideal Capacity in 1993 (5)
1.	212	305	614	989	1,700
2.	39	56	113	182	1,500
3.	666	849	1,415	1,982	4,000
4.	1,136	1,500	2,414	3,380	8,000
5.	797	1,052	1,644	2,371	3,400
6.	257	370	744	1,198	1,500
7.	792	1,283	2,066	2,892	4,000
8.	975	1,287	2,072	2,901	8,000
9.	1,206	1,592	2,563	3,588	8,000
10.	2,783	3,674	5,914	8,280	8,000
11.	652	861	1,386	1,940	4,000
12.	1,160	1,531	2,465	3,451	8,000
13.	1,634	2,157	3,473	4,862	8,000
14.	3,069	4,057	7,322	9,131	6,700
15.	3,069	4,051	6,522	9,131	8,000
16.	3,995	5,273	8,490	11,886	8,000
17.	403	532	856	1,199	6,700
18.	619	817	1,315	1,184	6,700

Note: 1/ Motorcycles are not included.

Comparison of figures in columns (4) and (5) in Table 13.4 indicates that the following four sections will not be able to accommodate the traffic volumes by 1993.

Section 10: Blitar--Srengat
Section 14: Malang--Kepanjen
Section 15: Kepanjen-Wlingi
Section 16: Malang--Turen

On top of these sections where traffic volumes are clearly expected to exceed the present road capacities, more attention

needs to be paid to some other sections where bad road conditions discourage potential traffic demands from being realized. Such sections include the following ones:

Section 2: Pacitan--Slahung

Section 6: Trenggalek--Ponorogo.

To promote economic and social development in the less developed areas, this Study strongly recommends upgrading the two sections, even though their capacity is large enough for the projected 1993 traffic volumes.

13.3.2 Project Proposal

Based on the evaluation of present road conditions and the projection of future traffic volumes, the Team members recommend that road capacities should be expanded in the sections where the projected traffic volumes exceed the present road capacities, and that road conditions including alignment, pavement and drainage should be improved where such improvement would significantly contribute to realizing potential traffic demand and accelerating overall socio-economic development of the less developed areas.

Sections 10, 14, 15 and 16 where daily traffic volumes presumably exceed 8,000 in 1993 should be upgraded and, in addition, 1.5 to 2 m hard shoulder sidewalks should be constructed since the areas along the sections are densely populated. The sidewalks are for pedestrians, bicycles and animal-drawn carts, and will raise capacity of the carrigeway to 15,000 vehicles a day. Fortunately, there are enough spaces which protect pedestrians and bicycles on both sides of the carrigeway. The same sidewalks can be constructed along kabupaten roads, too. In line with these recommendations, the projects, as shown in Table 13.5, have been identified for the Repelita III period, including a feasibility study on the provincial highway network.

Table 13.5 Recommended Projects for Provincial Highway Betterment

Section	Contents of Project	Coverage Length of the Section (km)	Estimated Costs (Rp. Million)
Ponorogo-Pacitan	Feasibility Study and Construction	50	2,280
Ponorogo-Trenggalek	Upgrading of Mountainous Section	20	620 1980/81: 210 1981/82: 210 1982/83: 200
Blitar-Srengat,	Upgrading	15	225
Wlingi-Kepanjen-Malang,	Upgrading	43	645
Malang-Turen	Upgrading	26	390

Notes: The following policies are recommended:

1. Construction of new by-passes for through-traffic near local towns.
2. Upgrading and maintenance.
3. Planning of new routes and restriction of land use along the planned new routes.

13.4 Kabupaten Road

13.4.1 Identification of High Priority Projects

The Team members have identified three sets of high-priority projects based on three different functions to be performed by kabupaten roads. The major functions of kabupaten roads are first, to connect kecamatan centers to kabupaten centers which are usually the cores of economic activities of kabupatens, second, to interconnect kecamatans, and third, to link high potential areas (e.g., fishery, tourism and mining development areas) with provincial highway networks.

(a) Ideal Routes

The ideal routes have been sorted out to identify priority projects from the viewpoint of the first function of kabupaten roads, i.e., linkages between kabupaten and kecamatan centers at the least cost of travel.

One kecamatan has many alternative routes connecting it with an economic center of kabupaten. To find the ideal route, the following steps are taken:

(1) Identification of alternative routes and their length;
(2) Classification of topographic conditions along the routes into flat, hilly and mountainous;
(3) Estimation of vehicle operation costs per kilometer for different topographic conditions;
(4) Identification of the route which requires the least vehicle operating costs;
(5) Adjustment of the vehicle operating costs with the magnitude of attractiveness of the seven kabupaten centers in terms of levels of economic activities; and
(6) Selection of an ideal route based on the adjusted least vehicle operating costs.

As an example, Table 13.6 demonstrates the selection of an ideal route out of two alternative routes, Route A from Sudimoro to Pacitan and Route B from Sudimoro to Trenggalek. Vehicles Operating Costs (VOC) of Route A and B are Rp.2,383 and Rp.2,641, respectively. Even after discounting VOC of Route B by 2% with the magnitude of attractiveness, adjusted VOC of Route A is still less than that of Route B. Thus Route A is selected as an ideal route. With the method described above, thirteen ideal routes have been identified to be upgraded (see Table 13.7).

Table 13.6 Selection of the Ideal Route in Sudimoro, Pacitan

	(1) Roads	(2) Distance (km)	(3) VOC 1/ (Rp.)	(4) Magnitude of Attractiveness 2/ (%)	(5) Adjusted VOC (3)-(4)
Route A	Sudimoro-Ngadirejo	26	1,174		
	Ngadirejo-Tulakan	12	524	0	
	Tulakan-Pacitan	14	667		
		52	2,383	2,383x0=0	2,383
Route B	Sudimoro-Panggul	11	524		
	Panggul-Dongko	21	948	2	
	Dongko-Kepanjen	20	839		
	Kepanjen-Trenggalek	9	330		
		61	2,641	2,641x0.02=53	2,588

Notes: 1/ Data are obtained from "Comparison of Vehicle Operating Costs for Different Conditions of Pavement for Earth, Gravel and Seal," by Bina Marga, 1978.

2/ Magnitude of attractiveness of kabupaten centers is measured by the share of origin destination of traffic among seven kabupaten centers of the Study Area. Data are derived from "OD Survey Table in 1978," by Directorate General of Transportation.

Table 13.7 Ideal Route Projects for Upgrading

	Section	Length (km)	Cost (Rp. Million)
1.	Bandar (Pacitan)--Tegalombo (Pacitan)	10	60
2.	Sudimoro (Pacitan)--Ngadirejo (Pacitan)	14	84
3.	Dongko (Trenggalek)--Karangan (Trenggalek)	10	60
4.	Dongko (Trenggalek)--Panggul (Trenggalek)	5	30
5.	Munjungan (Trenggalek)--Kampak/Bendo (Trenggalek)	6	36
6.	Trenggalek--Bendungan (Trenggalek)	10	60
7.	Lodoyo (Blitar)--Binangun (Blitar)	18	108
8.	Margomulyo (Blitar)--Panggungrejo (Blitar)	11	66
9.	Suruhwadung (Blitar)--Kademangan (Blitar)	5	30
10.	Bakung (Blitar)--Lorejo (Blitar)	4	24
11.	Talun (Blitar)--Gandusari (Blitar)	4	24
12.	Kampak/Bendo (Trenggalek)--Gandusari (Trenggalek)	4	24
13.	Kalidawir (Tulungagung)--Pucanglaban (T. Agung)	15	90
14.	Sampung (Ponorogo)--Sumoroto (Ponorogo)	12	72
15.	Tenangan (Ponorogo)--Ngebel (Ponorogo)	13	78
16.	Pulung (Ponorogo)--Soko (Ponorogo)	10	60
17.	Sulaung (Ponorogo)--Ngrayun (Ponorogo)	7	42

(b) Access Roads to Provincial Roads and Kecamatan Centers

At present, access roads from kecamatan centers to kabupaten roads and also from desas to kecamatan centers are in fairly bad condition at many spots. To promote rural development and to provide basic social services to the people in the rural areas, the local governments have to upgrade the access roads as a part of the basic infrastructure for development. After investigating the road conditions on site, the Team members have identified the following access roads to be upgraded.

Table 13.8 Upgrading Projects of Access Roads

	Section	Length (km)	Cost (Rp. Mil.)
1.	Pringkuku (Pacitan)--Pacitan	10	60
2.	Mantren (Pacitan)--Provincial border	8	48
3.	Tegalombo (Pacitan)--Tulakan (Pacitan)	16	96
4.	Pogalan (Trenggalek)--Rejowinangun (Trenggalek)	17	42
5.	Gandusari (Trenggalek)--Durenan (Trenggalek)	8	48
6.	Lodoyo (Trenggalek)--Karangan (Trenggalek)	9	54
7.	Kesamben (Blitar)--Binangun (Blitar)	8	48
8.	Sawol (Ponorogo)--Kabupaten border (Ponorogo)	11	77

(c) Potential Roads

The potential for fishery, tourism and mining development is found in many places in the Study Area. However, due to lack of sufficient investments in infrastructures such as roads, electricity and water supply, some of those potentials have not been exploited yet. Based on the field observations and interviews, those roads which would promote development of specific sectors and areas are identified as shown in Table 13.9.

Table 13.9 Potential Road Projects for Upgrading

	Section	Length (km)	Cost (Rp. Million)
1.	Kebonagung (Pacitan)--Worawari (Pacitan)	12	82
2.	Punung (Pacitan)--Kalak (Pacitan)	14	98
3.	Ngadiluwih (Pacitan)--Koripan (Pacitan)	6	36
4.	Tulakan (Pacitan)--Sluang (Pacitan)	25	175
5.	Bandar (Pacitan)--Ngunut (Pacitan)	6	36
6.	Ngadirejo (Pacitan)--Tanggung (Pacitan)	5	35
7.	Sudimoro (Pacitan)--Panggul (Trenggalek)	11	66
8.	Panggul (Trenggalek)--Tangkil (Trenggalek)	12	72
9.	Panggul (Trenggalek)--Banjar (Trenggalek)	6	36
10.	Jombak (Trenggalek)--Sidomulyo (Trenggalek)	18	108
11.	Dongko (Trenggalek)--Kampan (Trenggalek)	17	102
12.	Kampak (Trenggalek)--Watulimo (Trenggalek)	10	90
13.	Watulimo (Trenggalek)--Prigi (Trenggalek)	10	60
14.	Pogalan (Trenggalek)--Cori (Trenggalek)	7	42
15.	Nglongsor (Trenggalek)--Pakel (Trenggalek)	5	30
16.	Lorejo (Trenggalek)--Coast (Trenggalek)	5	30
16'.	Craken (Trenggalek)--Bendoroto (Trenggalek)	9	54
17.	Sumberglagah (Blitar)--Watudor (Blitar)	6	36
18.	Panggung (Blitar)--Coast (Blitar)	6	42
19.	Bendorejo (Blitar)--Udanawu (Blitar)	8	48
20.	Jatilengger (Blitar)--Bendorejo (Blitar)	9	54
21.	Popoh (Tulungagung)--Besole (Tulungagung)	5	30
22.	Besole (Tulungagung)--Teluk Brumbun (A. Agung)	4	28
23.	Tanggunggunung (T. Agung)--Kalimenur (T. Agung)	12	72
24.	Kalimenur (T. Agung)--Teluk Sere (T. Agung)	7	49
25.	Pagerwojo (Trenggalek)--Bendung (Trenggalek)	10	70
26.	Ngadi (Tulungagung)--Doro (Kediri)	10	70
27.	Mojo (Kediri)--Besuki (Kediri)	16	64
28.	Sambirejo (Kediri)--Goliwan (Kediri)	16	74
29.	Tiron (Kediri)--Kalimanis (Kediri)	8	48
30.	Berbek (Kediri)--Blongko (Kediri)	7	42
31.	Berbek (Kediri)--Sawahan (Kediri)	14	98
32.	Pagerwojo (Trenggalek)--Bendungan (Trenggalek)	10	60
33.	Sumoroto (Ponorogo)--Pok (Ponorogo)	7	42
34.	Ponorogo--Kedungbanteng (Ponorogo)	11	44
35.	Jenangan (Ponorogo)--Kasugihan (Ponorogo)	9	45
36.	Ngling (Ponorogo)--Obaia (Ponorogo)	9	54
37.	Pulung (Ponorogo)--Banaran (Ponorogo)	10	50
38.	Sambit (Ponorogo)--Bglindeng (Ponorogo)	7	40
39.	Ngrayun (Ponorogo)--G. Tumrang (Ponorogo)	7	42
40.	Pagak (Malang)--Tumpakejo (Malang)	20	100
41.	Dampit (Malang)--Tembakasri (Malang)	30	150
42.	Langurdowo (Malang)--Teluk Sipelot (Malang)	19	105
43.	Tumansari (Malang)--Lebaksat (Malang)	12	60
44.	Pucanglaban (T. Agung)--Coast	7	49
45.	Katjangan (T. Agung)--Puse (T. Agung)	7	42
46.	Karangatatug (T. Agung)--Ngledok (T. Agung)	10	60
47.	Sendang (T. Agung)--Penampean (T. Agung)	9	54

13.5 Desa Road Development Projects

There are 1,700 desas with population of 3,000 to 5,000. Most of them are located far from any of both the provincial highways and their kecamatan centers, without convenient access roads. The lack of sufficient access roads has been a great obstacle to marketing of agricultural, fishery and forestry products and to provision of productive inputs and social services to desas. For rural development, improvement of access roads to desas is an essential requirement. Deficiency in desa roads has been calculated as follows:

A case of KB Trenggalek

Total area:	1,272 km^2
Number of desas:	157
Number of desa per km^2:	0.1234
Road needed per km^2:	$\sqrt{2/0.1234}$ = 4.0250 km/km^2
Total road needed:	4.0250 km/km^2 x 1,272 km^2
	= 5,120 km
Existing road length:	1,370 km
New road needed:	5,120 km - 1,370 km
	= 3,750 km

The deficiency in feeder roads in each kabupaten is shown in the following table:

Kabupaten	Length (km)
Pacitan	3,870
Ponorogo	1,314
Trenggalek	3,750
Tulungagung	615
Kediri	84
Blitar	3,157
Malang (1/2)	3,537
Total	16,327

Though desa roads are essential for rural development, it is still premature to correct all these deficiencies

during the Repelita III period. This Study, therefore, recommends that 50% of the present deficiency should be upgraded during Repelita III, and the rest during Repelita IV. The total costs required for the construction and upgrading are estimated at Rp.32.7 billion.

13.6 Recommendation for Railroad Development

There are three branch lines of railroad networks in the Study Area; Madiun to Ponorogo, Jumbang to Blitar, and Rangil to Blitar through Malang. At present, the volume of freight by railroad is less than that by trucks. Since the railroad takes a longer time to transport cargo, it transports only limited kinds of items such as fertilizer and cement. This trend of railroad transportation is found not only in Indonesia but also all over the world. As road facilities improve and the number of vehicles increases, the railroad is losing its role as a means of local transport and serves only for long distance transport. In relation to this declining demand for railroad transportation, a feasibility study is required to investigate what amount of money should be invested in improvement of the railroad system in the Area. The costs of this feasibility study are estimated to be Rp.200 million.

CHAPTER XIV

PORTS

14.1 General

Despite the enormous significance of coastal and inter-insular transportation for Indonesia, there is no regular liner service along the southern coast of East Java. This is a natural consequence of sea transportation technology (which tends to favor concentration and bulk handling not suitable for much, if not most, of the potential demand along the East Java coast), and unfavorable natural conditions such as the rough sea and shallow water along the most parts of the coast. However, it is also due to insufficient attention given to the development of local ports.

With increased economic activities which will be expected to be generated in near future in accordance with the implementation of development plans, the demand for commercial ports will substantially increase. In addition, intensified fishery activities along the coast have already increased the demand for fishing ports and their services.

14.2 Existing Conditions

Within the Study Area, one fishing port exists at Pacitan, and another is under construction at Prigi. Pacitan fishing port consists of a newly constructed piling pier, a 40 m causeway, a fish market (20 m x 10 m) and a warehouse.

Beside this newly constructed pier, there are some old piles around a wrecked jetty, but they are no obstacle to use of the fishing port (see Figure 14.1). However, for the fishing boats currently being used in Pacitan bay, the elevation of the pier, 3 m above mean sea level, is too high.

In addition, there are level differences between this pier and the causeway, and also between the causeway and the market ground. These differences make transportation of goods from the pier to the market difficult. As a result, the Pacitan fishing port is not used much by fishermen, who instead prefer to land their catch and moor their boats at the natural beach north of this fishing port.

The warehouse behind the fish market was used infrequently to store salt or fertilizer. But it is not known whether salt and fertilizer was transported by vessels or trucks.

To sum up, the port of Pacitan is not now adequate either as a fishing port nor as a commercial port, but its improvement would help develop fishery activities and, to some extent, commercial port activities.

On the Bay of Prigi, the construction of a fishing port started in 1976, and Rp.12.5 million and Rp.110 million were spent for its construction in 1976/77 and 1977/78, respectively, by the Central Government. The fish market with office was completed at the end of 1978, and an access road which connects the existing road to the fishing port is under construction.

This fishing port had been planned with the intention of establishing one fishing port which includes basic port facilities such as mooring and preparation quay and functional facilities. The functional facilities are an ice plant, cold storage, electricity, a fish market, a water supply system, a workshop with slipway, and an administration office with official residences (see Figure 14.2).

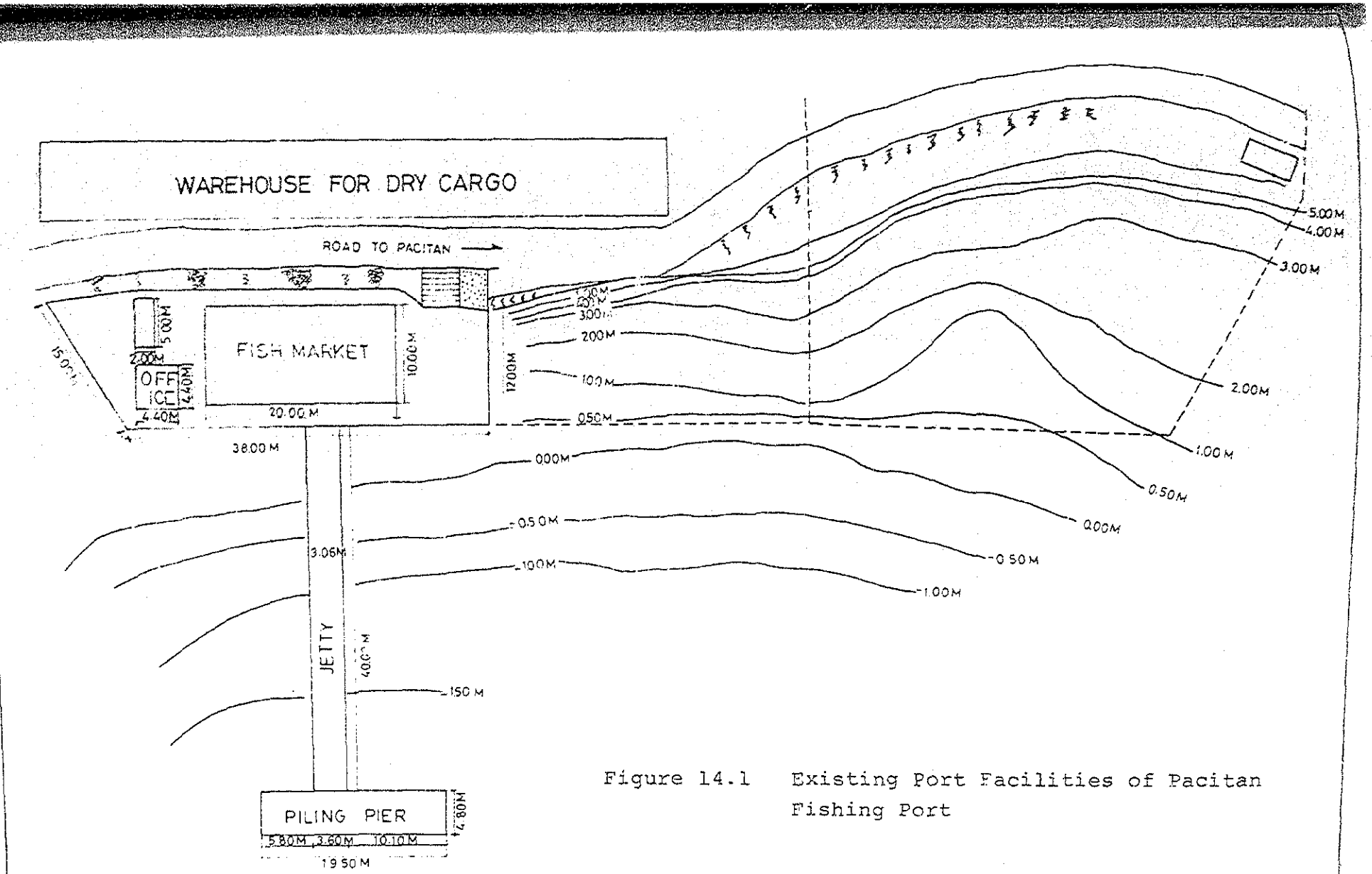
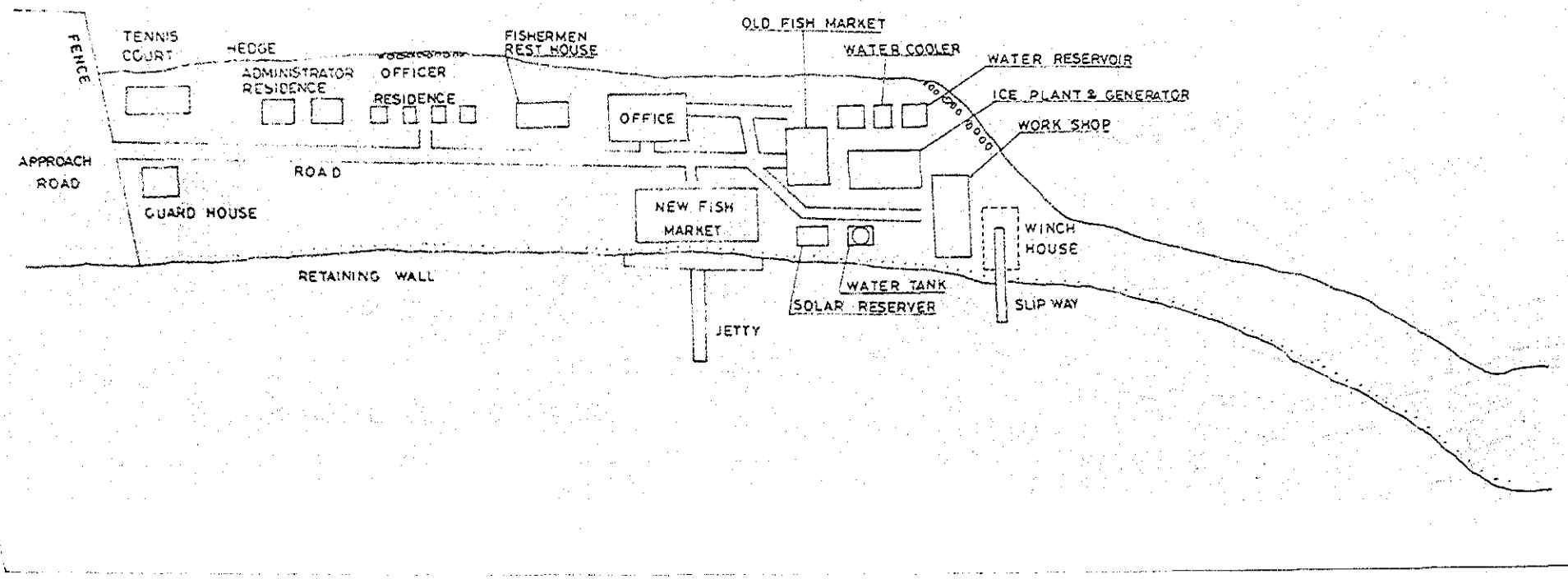


Figure 14.1 Existing Port Facilities of Pacitan Fishing Port

Figure 14.2 Arrangement of Facilities of Prigi Fishing Port 1976-1978, Prepared by Bupati



The port is well located, and its planning has proved to be timely in view of the increase in the catch by Prigi fishermen. However, the plan appears to be based on a short-run projection of fishery activities in the area, and fishery activities in this area will soon outgrow the facilities currently planned.

Since large investment is required to establish port facilities, and it is rather difficult within several years to expand their capacity later by improvement of facilities or revision of the original plan, a master plan of a fishing port must be based on a long range perspective, and all improvement and development works should be implemented within the framework of this master plan.

14.3 An Approach for Port Development

There are coastal boats, inter-insular vessels and sailing vessels serving Surabaya Port and other ports on the coast of Java Sea. On the Southern coast of East Java, however, there is no coastal boat or inter-insular vessel in local service. This lack of service is partly because port facilities are not in working order, and partly because there is not sufficient volume of cargo demand for ships to be profitably operated. Since roads are relatively well developed in East Java and have greater capacity than the present demand for transportation, land transport by trucks is easy and there is little demand for shipping cargo by sea.

The present economic activities in the Study Area are still at a low level, but in order to pave the way for future economic development, port facilities for domestic trade definitely will be necessary for the southern coast of East Java. As economic activities in the hinterland increase, sea transportation will prove to be the most efficient and economical for bulk cargo such as fertilizer and cement. It is also possible to transport general cargo

(including sundry goods) in domestic trade more efficiently if and when the regular shipping services are opened between Surabaya Port, Cilacap Port and prospective ports in the Study Area. Therefore, it is necessary to build, in several phases, port facilities for domestic trade as a way to promote regional development on the southern coast of East Java.

The sites suitable for port construction are mostly limited to three bay areas, Pacitan, Prigi and Popoh. But these bays do not possess any lagoon or swampy area that could be readily used as inlet for construction of ports. In view of topographical and hinterland conditions, large scale port development is not likely in the Area.

Based on the above considerations, development strategy for ports and harbors with the underlying objective of promoting regional development has been defined as follows:

(1) First phase: To improve port facilities in phases in view of the level of utilization of facilities and amounts of catch and demand, all within the framework of the master plan for improvement of fishing ports.

(2) Second phase: To make fishing port facilities available for trade shipping as required.

(3) Third phase: To build commercial port facilities to function independently from those for fishing as shipping demand increases. The facilities of the commercial port should be separated from those of existing fishing ports, and the function of commercial ports will be promoted in accordance with growth and development of demand for sea transportation.

14.4 Recommended Projects and Priorities

Among the three potential locations for fishing ports (Prigi, Pacitan and Popoh), Prigi deserves the highest priority for development. This is based on the following reasons:

(1) Geographic and topographic conditions are most favorable for construction of a port;
(2) Hydraulic conditions (wave, swell, current and others) are also favorable;
(3) Fishery technology is more advanced here than elsewhere, and fishermen are most progressive-minded;
(4) Access to the market is equally good as at Popoh; and
(5) Construction of a port has already started.

As to the last point, the Directorate General of Sea Communication sent to the Directorate General of Fishery an official letter indicating its acceptance of the request from the latter for establishment of a fishing port, dated October 4, 1978.

The recommended features for the fishing port at Prigi are based on the current plant and its modification in view of substantial expansion of fishery activities in the long-run. The planned capacity of the port is handling fish catch of 190 tons a day, which is the level expected in 2000 A.D. This figure has been derived from the target consumption of fish in Java and the expected market area of Prigi. From the past growth of fish catch at Prigi, the fish catch is projected to increase to the following levels:

1979	10	tons a day	
1980	15	"	
1981	18	"	
1982	20	"	
1983	40	"	(New Port Phase I in full use)
1985	50	"	

1990 100 tons a day

2000 190 "

The target year of completion and start of use of the basic facilities, functional facilities and land shown in Figure 14.3 is set as 2000 A.D. On the basis of the above, the recommended port will have the following characteristics when fully completed in that year (see Figure 14.3):

(1)	Area of fishing port complex	5.7 ha
(2)	Number of fishing boats in target year	
	- Purse seiners (medium size)	55 boats
	- Purse seiners (small size)	132 boats
	- Small fishing boats	90 boats
(3)	Catch per day and number of fishing boats	
	- Purse seiners (medium size)	56 tons (7 boats)
	- Purse seiners (small size)	132 tons (22 boats)
	- Small fishing boats	1.08 tons (72 boats)
(4)	Quantity of fish landed	190 tons/day
		approx. 70,000 tons/year
(5)	Basic port facilities	
	- Purse seiner landing and preparation quay	90 m
	- Stair landing facility	90 m
	- Small boat landing facility	90 m
	- Breakwater (rubble mound sloping type)	50 m
	- Rock Bulkhead	575 m
	- Dredging works (-4 m)	196,700 m^3
(6)	Principal functional facilities	
	- Fish market	3,800 m^2
	- Shed	1,000 m^2

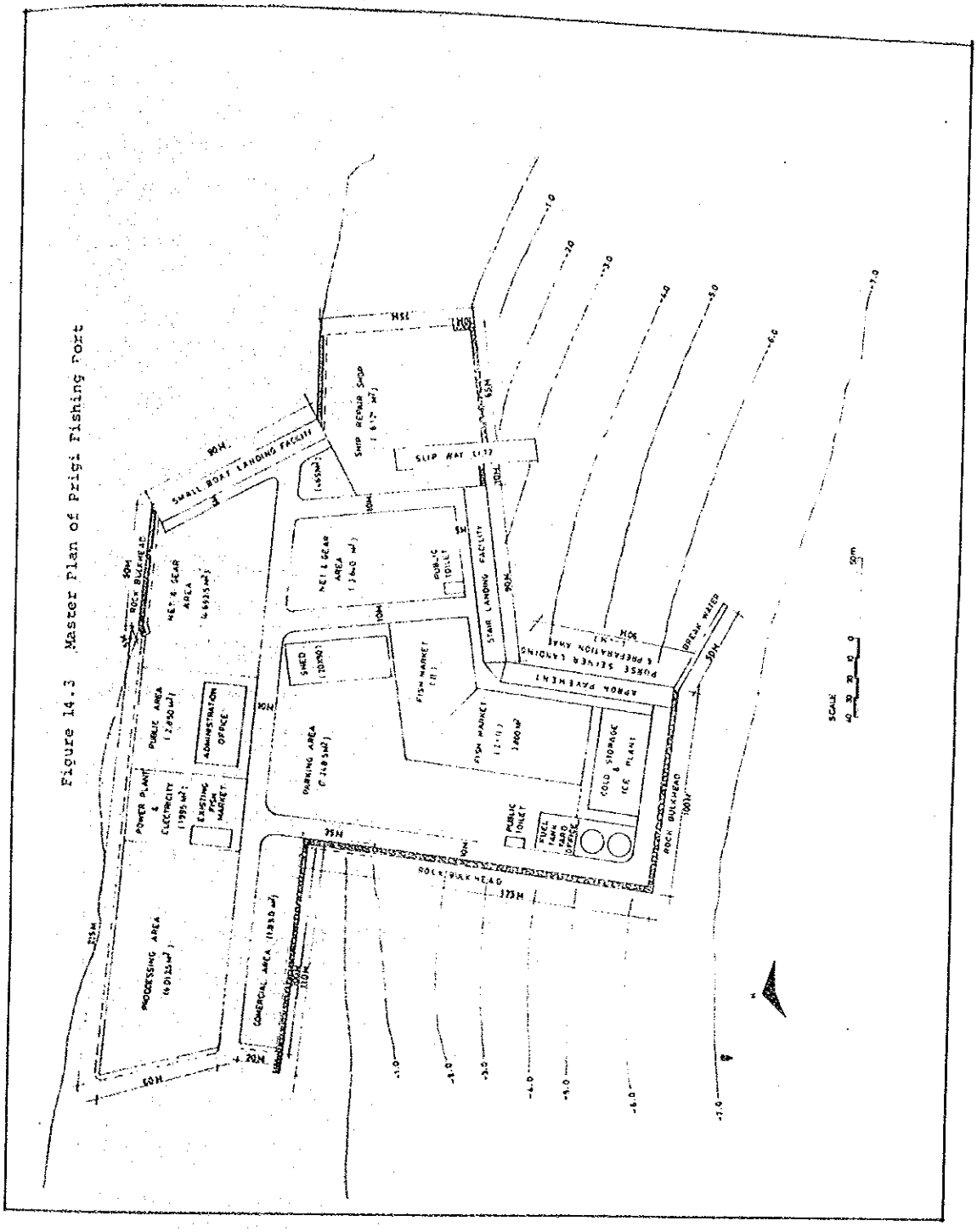


Figure 14.3 Master Plan of Prigi Fishing Port

- Fuel supply system	1 set
- Parking area	7,348.5 m^2
- Processing area	6,013.5 m^2
- Net and gear area	8,333.5 m^2
- Shipyard area	6,121.0 m^2
- Slipway of workshop	72.0 m
- Dock road	8,645.0 m^2
- Commercial area	1,850.0 m^2
- Administration office area	2,850.0 m^2

(7) Total costs of investment (includes consultant fees, contingency of 25% and sales tax of 7%)

- Local currency portion	US$3.7 million
- Foreign currency portion	US$5.9 million
- Total costs	US$9.6 million

This project will have the following development impacts:

(1) It will reduce the time needed by fishing boats for departing and unloading catch, thereby increasing the utilization of fishing boats and increasing the productivity of fishermen and their equipment;

(2) It will enable the introduction of larger and motorized fishing boats, thereby expanding the fishing areas and increasing productivity;

(3) It will enable preservation of the quality of fish through refrigeration and freezing, thereby expanding the market area and stabilizing the supply and price of fish;

(4) It will reduce the price of fish, thereby contributing to the improvement of nutrition in the market area; and

(5) It will increase the income of fishermen at Prigi, and indirectly stimulate the development of the area around it.

In sum, this port will have a significant impact on the regional development of the market area (comprising KB Trenggalek, KB Tulungagung, KB Blitar and KB and KDY Kediri) not only through supply of fresh fish in large quantity, but also through improvement of health and inducement of supplementary activities such as ship repair, mechanical industry and food processing industry. In addition, the development of this port will justify the generation of a large quantity of power and provision of a public water supply system at Prigi, to the general benefit of the people there.

As to the feasibility of the proposed fishing port project at Prigi, the total construction cost amounts to US$9.6 million (Rp.5,590 million), while the expected annual benefit will amount to about Rp.650 million, of which Rp.540 million are direct benefits from the fish catch and the rest, Rp.110 million, are indirect benefits from port and functional facilities. This means that the rough estimated internal rate of return is 10%, assuming twenty-five years of economic life of the project.

After the fishing port of Prigi, the next priority is the development of Pacitan fishing port. The present fishing port facilities are quite inadequate for existing fishing boats due to lack of small boat landing facilities and shortage of functional facilities such as a cold storage and ice plant. The size of investment should be half of that at Prigi Port. Port facilities to be added at Pacitan within a few years after the development of the Prigi fishing port are as follows:

(1) Small fishing boat landing facility,
(2) Stair landing facility,
(3) Ice plant and cold storage,
(4) Water supply system,
(5) Electricity,
(6) Net and gear area,
(7) Parking area.

Another fishing port construction possibility which should be considered is to build one at Popoh Bay. Because of the overlapping market area with Prigi Port and topographical conditions, a large-scale fishing port is left out of consideration. But, to improve the productivity of the fishermen at Popoh and to stabilize fish supply, a small-scale fishing port including a small boat landing facility or a stair landing facility, should be constructed toward the end of Repelita III. The investment costs would be less than $1 million. The last two fishing ports should, however, be planned after the completion of the Phase I part of the Prigi fishing port, so that the lessons learned from the first case may be incorporated into their plans.

In addition to fishing ports, the development planning of a commercial port should be considered at Prigi during Repelita III, which expects the construction during Repelita IV. The development of the proposed fishery port at Prigi will stimulate the growth of this village and its hinterland, and this port itself can be used by smaller coastal vessels. Thus, the future prospect of developing a commercial port at Prigi would be substantially different from the presently proposed one.

The location for a commercial port at Prigi Bay in the future is indicated in Figure 14.4. The proposed location is excellent from several points of view, listed as follows:

(1) The site is well sheltered against swells and waves from the Indonesian Ocean by a peninsula and an island;
(2) The site will be connected easily to the existing road by an access road;
(3) The site is expected to be reclaimed easily for construction of a port terminal by using sand and gravel from the hill located behind the site; and

(4) The site is close to deep water.

The capacity of the planned commercial port of Prigi and arrangement of facilities are listed as follows:

(1) Commercial port facilities planned at Prigi Bay
- Piling pier with -6 m depth
  Pier length = 210 m (3,000 D/W x 2 berths)
- Port terminal 5.0 ha
- One transit shed and one warehouse
- Access road about 1,000 m
- One administration office

(2) Capacity of Pier
- 900 tons/m/year in 2000 A.D.
- Average annual capacity estimated 189,000 tons/year

(3) Total costs of investment (includes consultant fees and contingency of 25%)

- Local currency portion	US$2.1 million
- Foreign currency portion	US$3.9 million
- Total costs	US$6.0 million

At the same time, the possibility of improving the existing port at Pacitan for use as commercial port should be also examined. With intensified rural development activities and improved access to neighboring kabupatens, the need for a commercial port at Pacitan will be intensified within the Repelita III period.

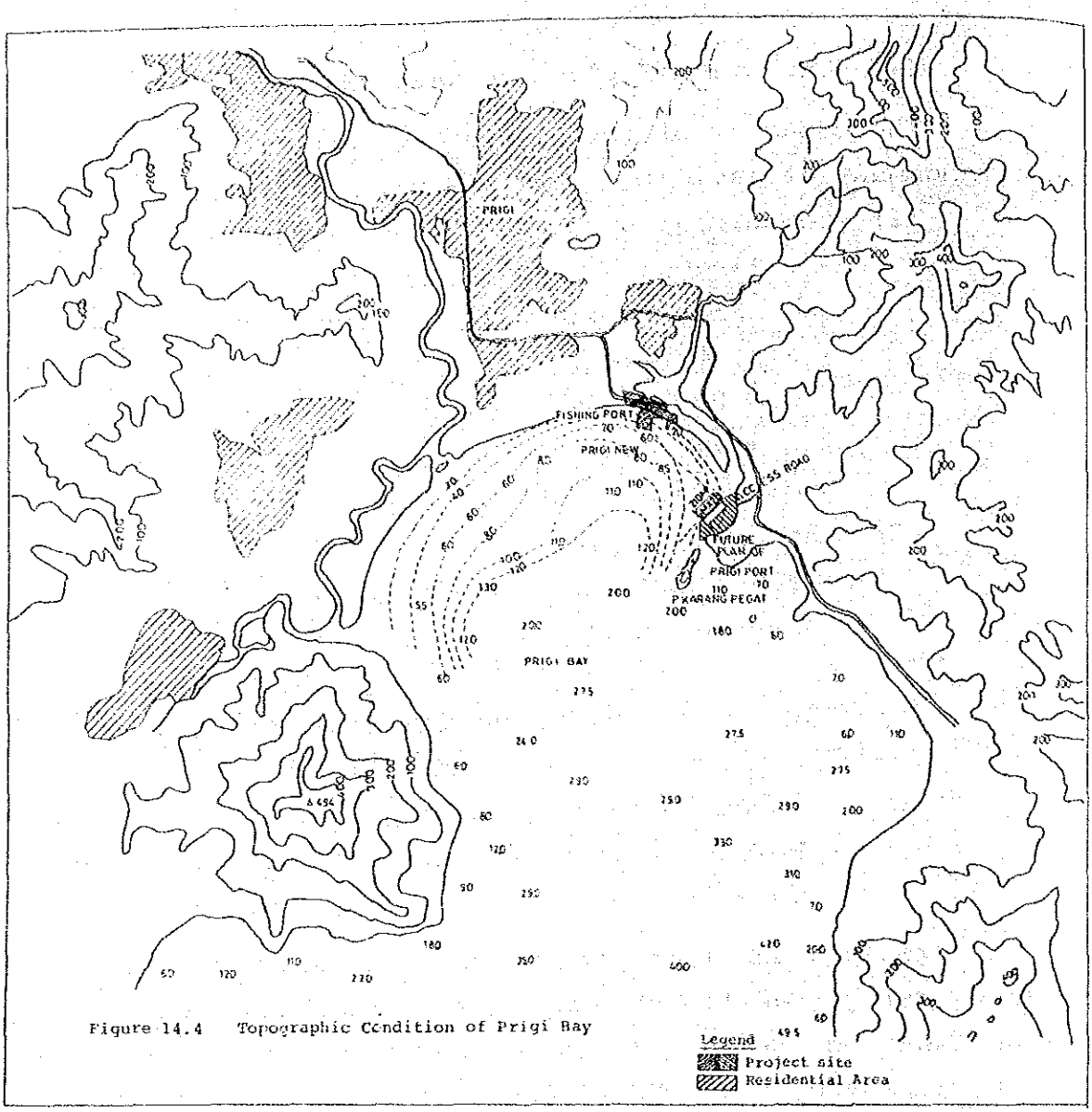


Figure 14.4 Topographic Condition of Prigi Bay

14.5 Recommended Investment and Study Schedule

	Repelita III 1979	1980	1981	1982	1983	Repelita IV	Cost in US$1,000
1. Fishing Port, Prigi							
a. Phase I		⊢	—	—	—		6,500
b. Phase II						⊢	3,100
c. Feasibility Study	⊢	—	—				300
2. Fishing Port, Pacitan							
a. Feasibility Study				⊢	—		100
b. Construction						⊢	3,500
3. Fishing Port, Popoh							
a. Feasibility Study				⊢	—		80
b. Construction						⊢	600
4. Commercial Port, Prigi							
a. Feasibility Study	⊢	—					200
b. Construction						⊢	6,000
5. Commercial Port, Pacitan							
a. Feasibility Study				⊢	—		200
b. Construction						⊢	6,000
Total		7,380				19,200	26,580

PART III

FORMULATION OF STRATEGIC PROJECTS

CHAPTER XV

PROJECT FORMULATION

15.1 Introduction

In the previous studies, i.e., the first phase, the Regional Study, East Java made in 1975, and the second phase, made in 1978/79, the bottom-up (pushing from the bottom) and packaging approaches were recommended as major tactics for regional development. In the light of the above orientation, the Western Pacitan Rural Development Project Package (PP. I) was found to be most viable among 14 proposed projects, which are listed in Part I of this report.

Although the PP. I consists of 14 individual projects, the Part III deals with major projects in water resources, road and critical area development, for which project formulation, integration and justification are discussed.

Consequently, Part III describes the following items in order: (1) Description of the area of KB Pacitan including physical and socio-economic conditions, (2) Based on analysis of KB Pacitan, the development necessity of the area is discussed, and (3) Development potential and projects in the area are presented, leading to (4) Integration, justification and implementation program of the proposed projects, and, finally (5) Technical aspects of the projects, as attached in the following Chapter XVI.

15.2 Physical Settings in Pacitan Area

15.2.1 Meteorological Conditions

The annual rainfall in the area is about 2,500 mm which is artificially derived by use of the available records in the area, and adjusted according to the records of neighbouring meteorological stations (refer to Chapter XVI, 16.1.1). The rainy season ranges from September to March whose amount of rainfall dominates about 83% of the total annual rainfall. The temperature in the area does not fluctuate much ranging from about 23°C at minimum to about 33°C at maximum all year round. However, it is much cooler in inhabitated hilly parts (500-1,000 m above sea level) than coastal areas.

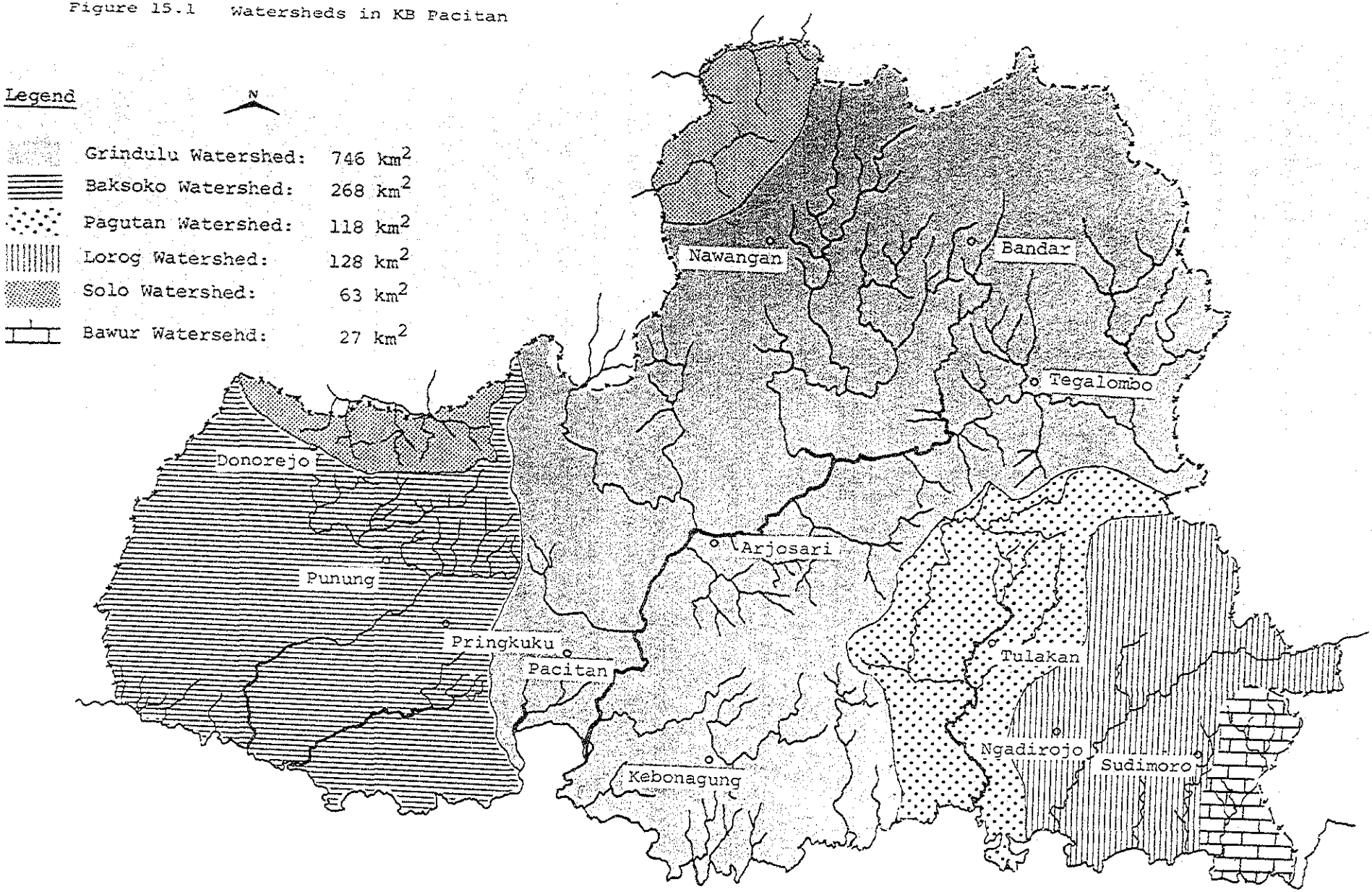
15.2.2 Major Watersheds in KB Pacitan

There are four major watersheds in KB Pacitan, as shown in Figure 15.1. The largest is the Grindulu River watershed which occupies the central part of KB Pacitan. It is 750 km^2 in area, equal to 55% of the total kabupaten area. The next largest watershed is that of the Baksoko River in the western part of KB Pacitan (270 km^2). In the south-eastern part, there are three minor watersheds, those of the Pagutan River, the Lorog River and the Bawur River (each of which is 100-120 km^2). Small portions of the northern part of the kabupaten belong to the Bengawan Solo watershed.

15.2.3. Topographic and Geological Condition of KB Pacitan

The southern coastal area of East Java is generally hilly and mountainous. As shown in the watershed map (Figure 15.1), the most of rivers flow south to the Indonesian Sea. The elevation of the kabupaten ranges from 0 m to 1,000 m above sea level despite its small area.

Figure 15.1 Watersheds in KB Pacitan



Distribution of the area classified by slope gradients indicates that flat area with the slope under 5% amounts to 3,000 ha which is only 3% of the total kabupaten area, as shown in Figure 15.2. On the other hand, more than 65% of the kabupaten land has the slope gradients of 30-50%. In particular, a considerable part of the Grindulu River watershed falls into this category.

Geologically the area is dominated by basalt or andesite in the central part, i.e., the Grindulu River basin, limestone in the western part, and Miocene sedimentary facies in the eastern part as shown in Figure 15.3.

15.2.4 Distribution of Surface Soil

Distribution of surface soil by types largely corresponds to the distribution of major watersheds. As shown in Figure 15.4, concentrations of the most fertile alluvial soil are found in the downstream area of the Grindulu River around Kota Pacitan as well as the Pagutan River and the Lorog River, although the latter two are very small in areas. Soil in the middle reaches of the Grindulu River watershed is characterized by lithosol which is a shallow soil consisting of imperfectly weathered rock fragments and generally observed in mountainous areas with steep slope gradient.

Chocolate reddish latosol is widely dispersed along the upper reaches of the Grindulu River catchment. Latosol is a typical soil in the area where there are distinctive dry and rainy seasons. From the agricultural point of view, latosol is generally infertile and requires application of large quantities of phosphatic fertilizer in order to raise land productivity.

The southwestern part of the kabupaten is characterized by lithosol with limestone as mother material. The area covered by lithosol should be generally used as forest from the point of view of soil conservation, since the depth of soil is so shallow that soil is easily washed away.

Figure 15.2 Area Classification by Slope Gradient

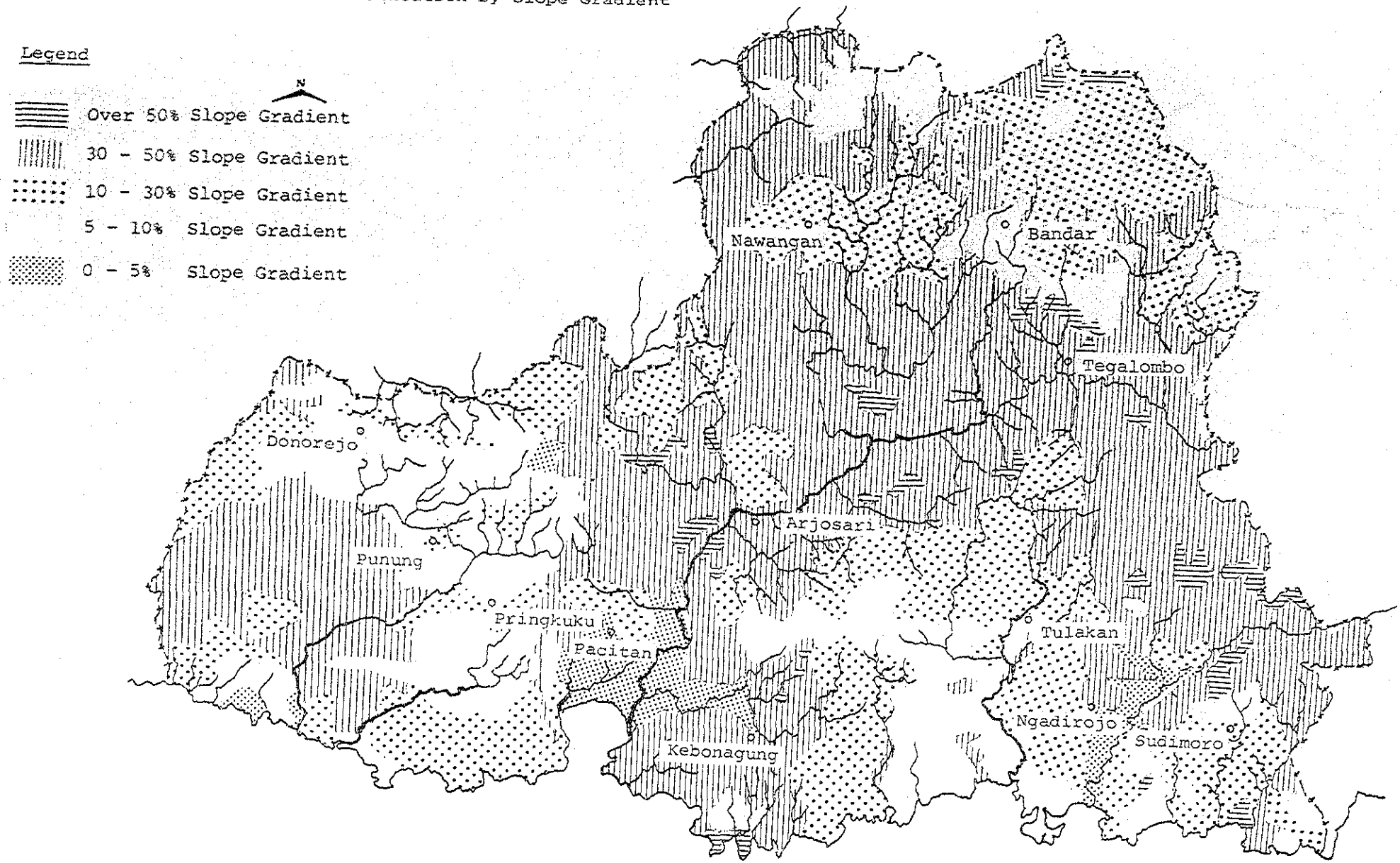


Figure 15.3 Geological Map in KB Pacitan

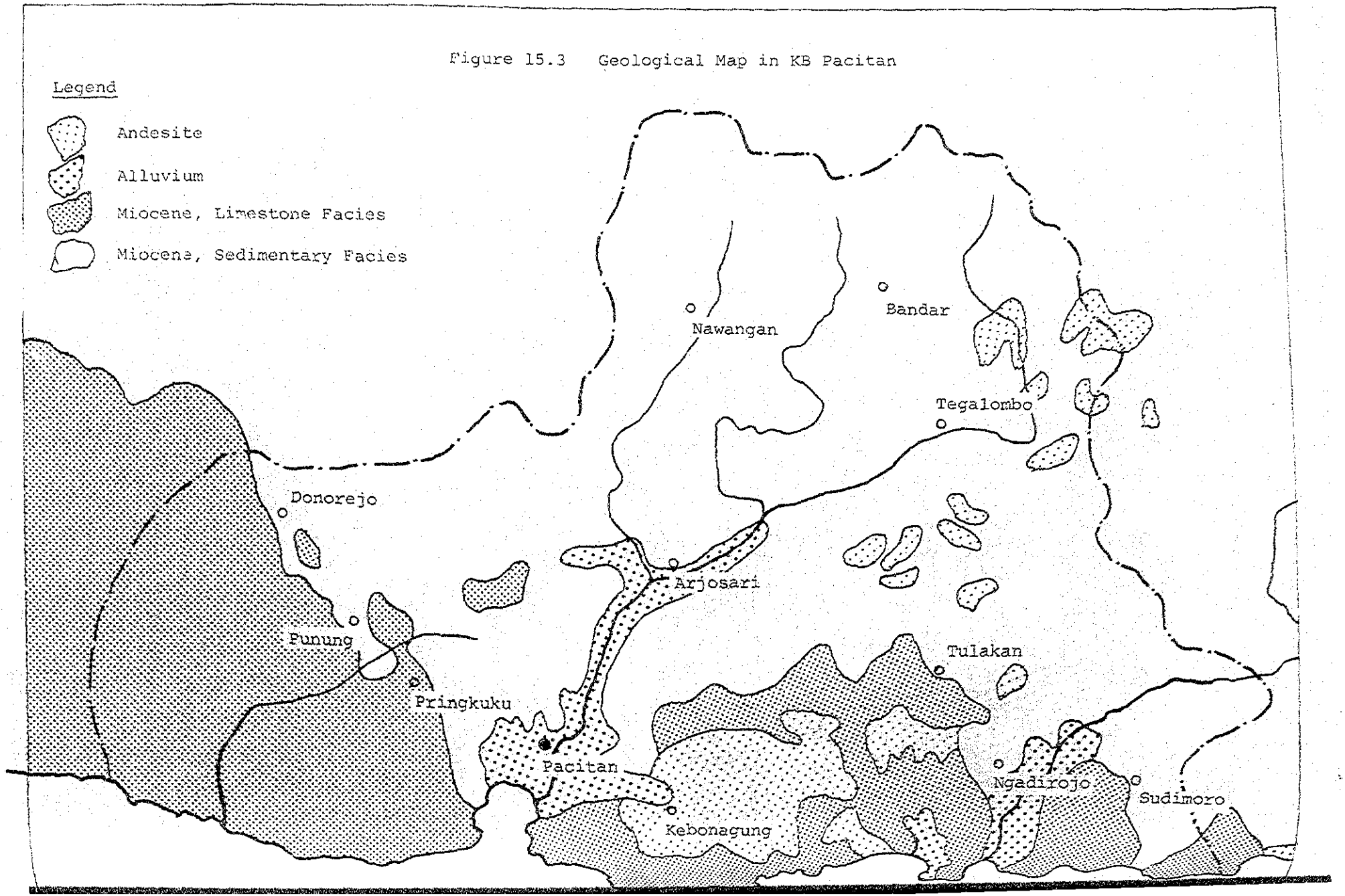
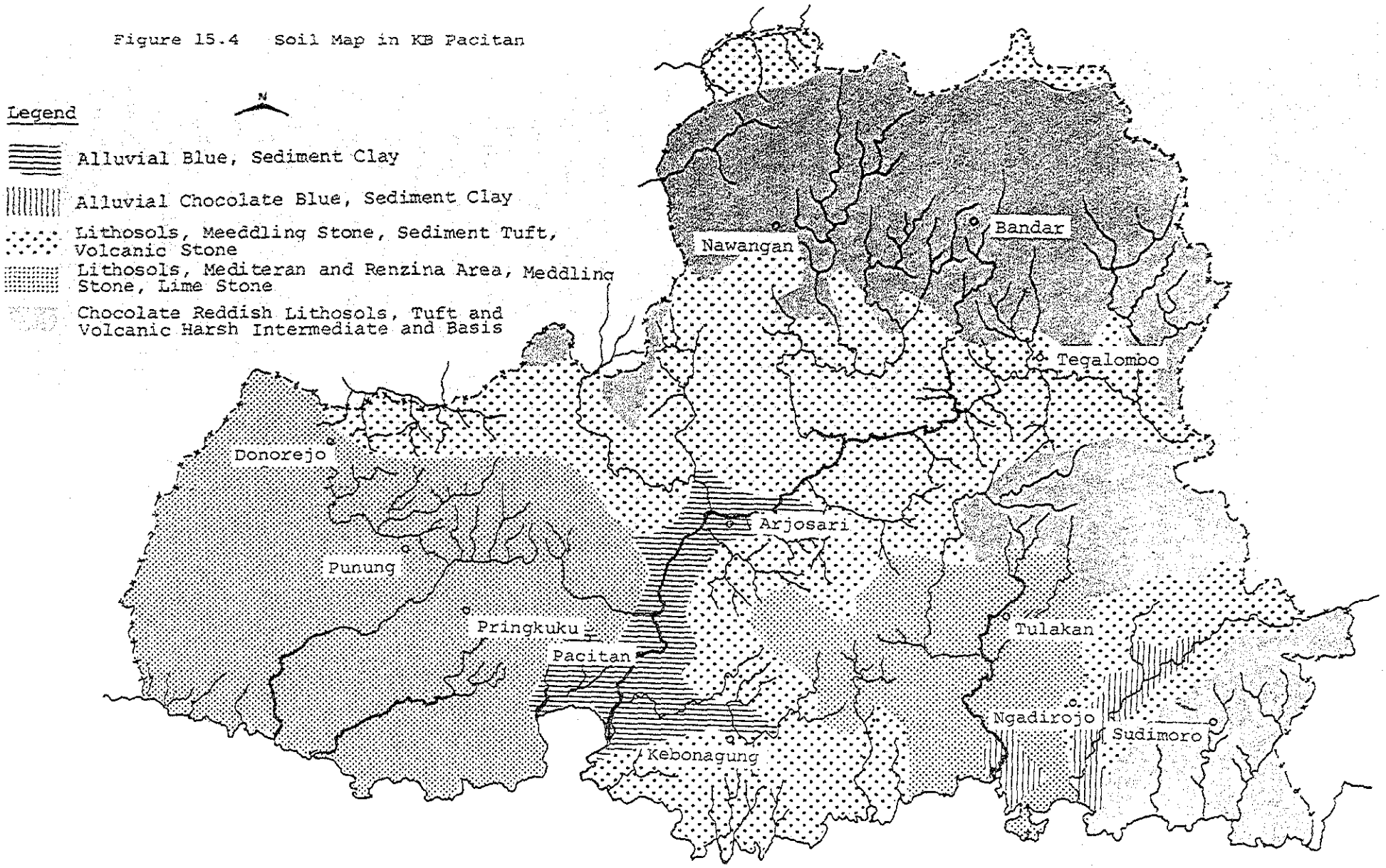


Figure 15.4 Soil Map in KB Pacitan



In relation to the relative size of the Grindulu River watershed as well as distribution of soil types and other physical conditions, the analysis of physical settings indicates that a considerable portion of the development effort can be concentrated in the area covered by the Grindulu River watershed.

15.3 Socio-Economic Conditions of the Area

KB Pacitan is administratively governed by East Java Province; it consists of 12 kecamatans (districts) and 164 desas (villages). The total area of KB Pacitan is 1,350 km^2 and the population is 477,000 in 1978, thus the population density is 350 persons per square kilometer.

The population growth rate during the Repelita II period was estimated at about 0.4% per annum, as a result of success of family planning and transmigration programs. This figure is derived from the natural population growth rate (0.5%) minus the rate (0.1%) of transmigration to the total number of the population. The number of the transmigrants from Pacitan during the Repelita II period was 2,820 persons (663 families) whose destination was mainly to Sumatra.

The economy of KB Pacitan is characterized by a large portion being occupied by the agricultural sector. About 75% of the total labor force is employed in the agricultural sector, which is 15% higher than the average sectoral share in East Java. The employment share by sector in KB Pacitan is shown in Table 15.1.

In spite of agriculture's domination of the economy, a major problem of the area is a shortage of food, especially rice and other major crops which are imported from the Solo and Ponorogo areas. Food production and the productivity of KB Pacitan in 1976 and 1978 are shown in Table 15.2. As seen in Table 15.2, rice productivity has increased remarkably in recent years owing to BIMAS and INMAS programs, however, the

productivity of rice (3 ton/ha) in irrigated paddy fields is still less than the average figure (4.6 ton/ha) of East Java.

Table 15.1 Labor Share by Sector in KB Pacitan

Sector	Share (%) in Labor Force
Public Service	2.0
Agriculture	72.8
Commerce and Trade	0.5
Fishery	0.2
Construction	0.4
Others	24.1

Source: Pemerintah Kabupaten Daerah Tingkat II Pacitan.

Table 15.2 Production of Major Crops in KB Pacitan

	1976			1978		
	Ton	Ha	Ton/Ha	Ton	Ha	Ton/Ha
Rice	69,540	27,564	2.52	88,796	29,599	3.00
Cassava	241,614	46,001	5.25	250,604	43,365	5.78
Others[1/]	11,523	19,806	-	12,173	23,966	-
Total		93,371			96,930	

Source: Kantor KB Pacitan.

Note: 1/ Include maize, potato, peanuts and soybean.

Owing to its topographic features and flood inundation in lower reaches of rivers every rainy season, the potential of increasing and upgrading the area of paddy fields is extremely limited unless proper countermeasures are carried out.

Other productive sectors such as fishery and mining occupy minor roles in the economy.

Consequently, the per capita income of the KB Pacitan is less than that of other areas. Comparison of per capita income in 1973 and 1978 with neighboring kabupatens is tabulated in Table 15.3.

Table 15.3 Comparison of Per Capita Income by Kabupaten

(Unit: Rp.)

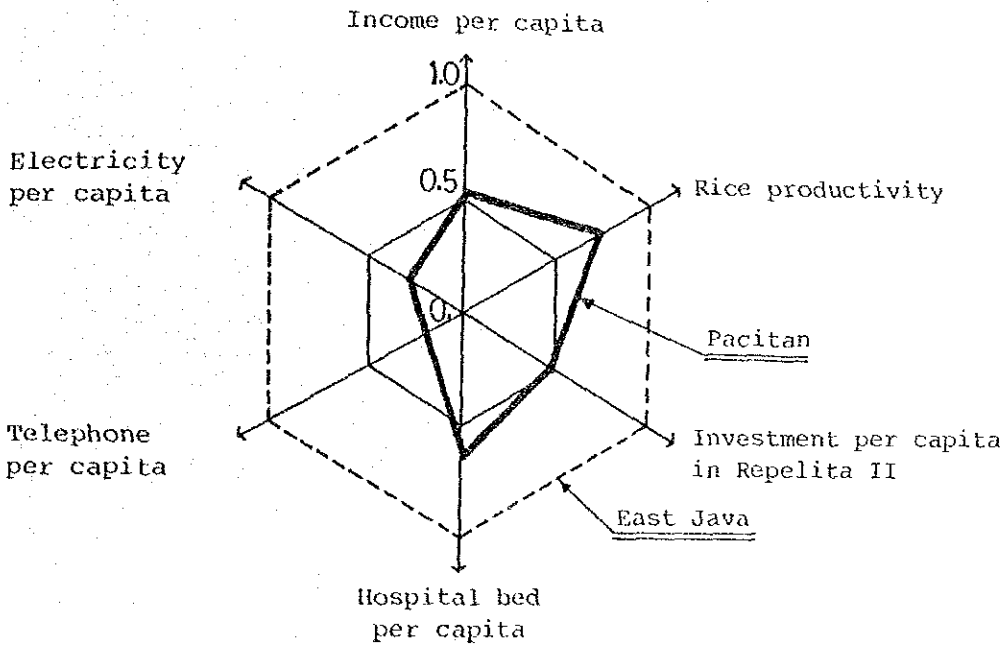
Kabupaten	Year 1973	% of Average	Year 1978	% of Average
Pacitan	14,833	78	57,949	77
Trenggalek	16,695	88	73,753	98
Blitar	17,664	94	88,804	118
Tulungagung	20,227	107	82,784	110
Malang	20,890	111	-	-
Kediri	20,454	108	85,042	113
Ponorogo	21,222	113	62,464	83
Average	18,855	100	75,258	100
Average in East Java	34,870		n.a.	

Source: Kecamatan Rawan, Menurut Propinsi Kabupaten and Pendatan Perkapita, Departemen Tenga Kerja dan Transmigrasi, 1978, and Team members.

The Table 15.3 shows that the economic situation in terms of per capita income of KB Pacitan was in the lowest position and has not been improved in recent years.

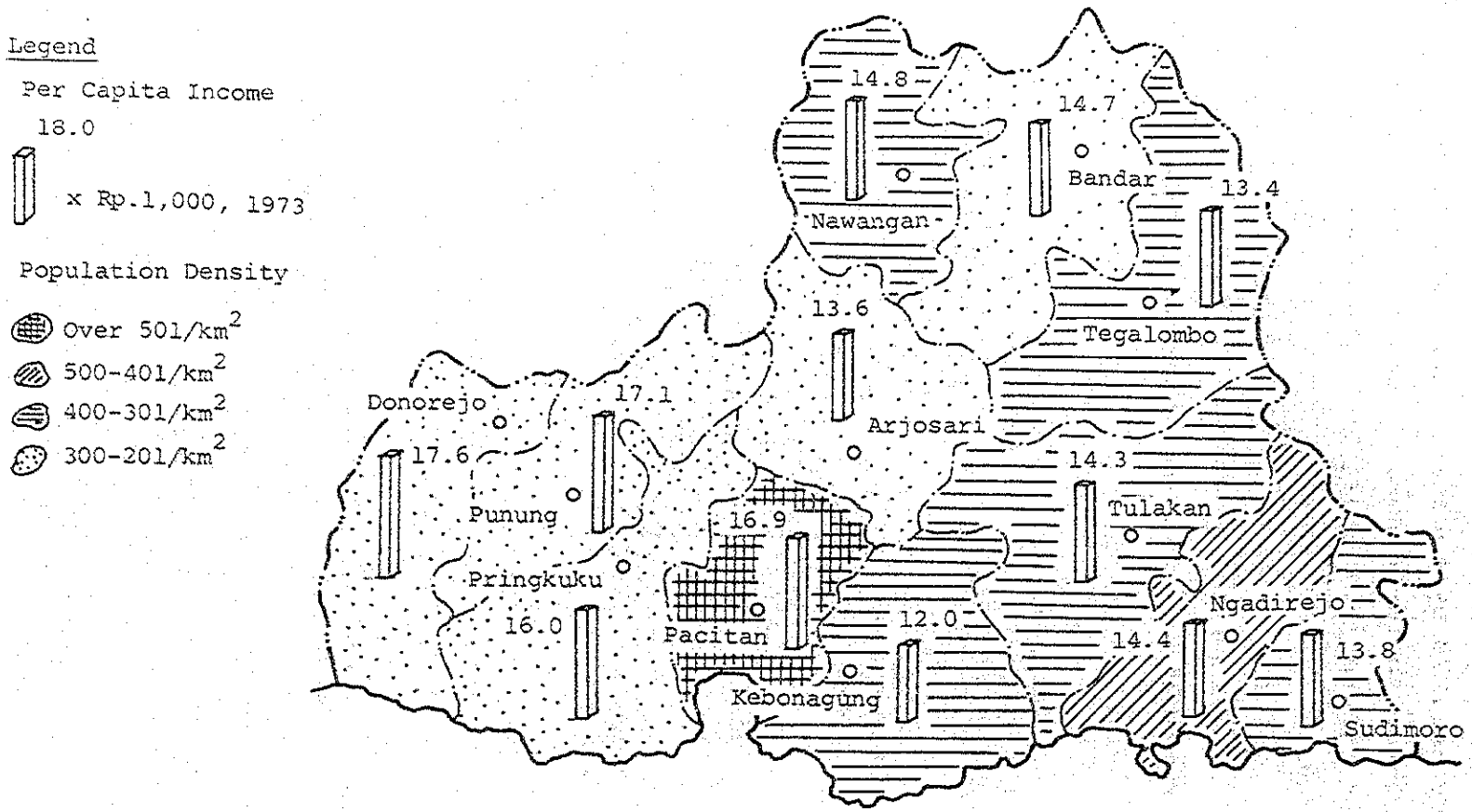
The per capita income in 1973 and population density in 1978 by kecamatan are shown in Figure 15.6, and some of the socio-economic indicators of KB Pacitan can be seen in Figure 15.5 where they are compared with those of East Java.

Figure 15.5 Socio-Economic Position of KB Pacitan in 1977-78



Source: Kantor KB Pacitan and Statistical Year Book 1977-78.

Figure 15.6 Per Capita Income and Population Density by Kecamatan in KB Pacitan



15.4 Necessity of Public Investment in KB Pacitan

As described in the previous section, the existing socio-economic condition in KB Pacitan is one of dire poverty and misery. One cause of this lies in the shortage of infrastructure in the area, one measure of which can be seen in the following table;

Table 15.4 Per Capita Public Investment in Repelita II by Kabupaten

Area	Rp./Person
KB Pacitan	3,106
KB Ponorogo	3,947
KB Kediri	4,517
KB Blitar	4,063
KB Tulungagung	4,228
KB Trenggalek	3,366
KB Malang	4,138
Average in Southern Coast	4,043
Average in East Java	4,752
Average in Indonesia	n.a.

Source: BAPPEDA Office of JATIM.

Table 15.4 shows that Pacitan's per capita investment was only 65% of that in East Java and 77% of the average in the southern coast kabupatens.

In addition to this fact, most of the surrounding areas of KB Pacitan are included in large-scale on-going projects such as the Lodoyo irrigation project in Blitar and Tulungagung, the drainage project in Tulungagung and Trenggalek, and the PROSIDA Madiun project in Ponorogo. It is natural that the benefits from these large scale projects will be absorbed only in the areas surrounding KB Pacitan. This means that the

gap which now exists between KB Pacitan and others will be steadily widened. As a result, KB Pacitan has been and will be a blind spot left behind the growth belts of Brantas and Solo River basins. This condition suggests that there will be justification for substantial infrastructure development in KB Pacitan in the future, in the light of major objectives of the Repelita III, i.e., those regarding regional income distribution and stability of the nation.

In order to narrow the existing per capita income gap between KB Pacitan and East Java, the Study estimates the amount of investment required in KB Pacitan. Firstly, it is assumed that the per capita income of East Java and KB Pacitan increase at 5% per year during the next 10 years. Then they will be Rp.179,000 and Rp.98,000 in 1990 respectively. If the per capita income level of KB Pacitan is kept at 75% of that of East Java in 1990, it must be Rp.134,000. Then the difference between these two estimates becomes Rp.36,000 (Rp.134,000-Rp.98,000). Secondly, in order to estimate the required investment which can generate additional income of Rp.36,000 per capita, the average incremental capital output ratio is employed. The figure for Indonesia from 1973 to 1976 was 3.8,[1/] yet it cannot be directly applied to such economically lagged area as KB Pacitan. Therefore, the Study assumes it to be 3.0.

Then, additional capital formation required to attain additional income of Rp.36,000 becomes Rp.108,000, of which Rp.43,000 is supplied by private capital formation[2/] induced by public investment. Then the required public capital formation will be Rp.65,000 in terms of a per capita base.

1/ Refer to Statistical Yearbook 1977/78.

2/ Refer to Chapter V, the private investment induced by public investment is assumed to be about 65% of the public investment.

As a result, if Rp.33 billion (Rp.65,000 per capita x 500,000 population) of public investment is made in KB Pacitan in the coming 10 years, the per capita income of KB Pacitan could attain the target of 75% of per capita income level of East Java by 1990. This figure of Rp.33 billion gives some idea as to the necessary scale and timing of required investment in the area.

15.5 Development Potential and Projects

Public investment or infrastructure development can be amply justified if those projects produce economically and socially desirable results. As presented in the previous sections, the distinct causes of the prevailing poor socio-economic condition in the area are: (1) overpopulation in the hilly parts, (2) low productivity of the land, (3) flood calamity along the Grindulu River, and (4) shortage of stock in infrastructure. The first obstacle, overpopulation in the hilly area, can be mitigated by emphasizing transmigration, especially from the eastern part of Pacitan, i.e., Kecamatans of Tegalombo, Tulakan, Ngadirejo and Sudimoro where the population density is high, the per capita income is low, and the soil fertility (land productivity) is low in comparison with other areas of Pacitan as shown in Figures 15.4 and 15.6. The second and third items can be mitigated by overcoming the last item, shortage of infrastructure.

Concerning development potential of the area, the area is fairly well endowed with water resources although these are recognized as the origin of disastrous floods in the area. The soil and geological conditions are more favorable than in other southern coastal area in Blitar and Malang. The manpower is abundant, and the patience and perseverance of the workers are well known in Java.

The results of the field survey by the Team suggests that the development of the Grindulu River, if it is well coordinated with road development, rehabilitation in critical hilly

areas and transmigration guidelines, would play a key role in solving the above-mentioned major issues in the area.

The following sections, from 15.5.1 to 15.5.3, describe major project proposals identified in the field survey. In the process of formulation of projects by each sector, intersectoral linkage is taken into account. Integration and investment scheduling shall be presented in the following section 15.6.

15.5.1 Water Resource Development Potential and Projects

The Grindulu River can be a major resource for development in the area, taking into account the existing area of paddy fields, and topographic and soil conditions along the river, as well as the amounts of rainfall it receives.

The field inspection and subsequent studies propose two medium scale dam projects and other associated river improvement projects on the Grindulu River. The construction cost of each project is shown below:

(Unit: Rp. Million)

Project	Construction Cost
Grindulu Dam Project	8,500
Tinatar Dam Project	3,800
Levee Construction Project	2,800
Short-cut Construction Project	1,800
Associated Irrigation Structure	1,200
Total	18,100

The command area of the above series of projects is approximately 4,000 ha, of which about 3,000 ha are used as paddy fields. The major function of the proposed projects lies in flood control and irrigation. The total annual benefit of the projects is calculated at about Rp.1,080 million, which implies that the internal rate of return is around 5%.

Detailed information on the projects is presented in the following Chapter XVI, "Technical Notes of Proposed Projects."

15.5.2 Critical Area Rehabilitation Projects

In conjunction with Grindulu River development, intensive rehabilitation of the northern part of the Grindulu watershed is strongly recommended. The salient purposes of this project rest on three needs: (1) to prevent production of suspended material in this area, by which reduction of the storage volume of the proposed Grindulu reservoir can be mitigated, (2) to increase water retaining capacity of the area, by which the fluctuation of the river discharge will be narrowed, and (3) to increase land productivity of the area, by which the income level of the people in the area will be increased. The project consists of three major works: (1) intensified regreening project, (2) construction of five check dams, and (3) desa road improvement. The total initial cost of the three projects amounts to Rp.1,050 million as shown in the following table, together with the direct annual benefits.

(Unit: Rp. Million)

Project	Initial Cost	Annual Direct Benefit
Intensified Regreening Project	800	180
Check Dams	150	20
Desa Roads	100	-
Total	1,050	200

The project produces other inquantifiable benefits such as land conservation effect, and improvement of mobility in the area. The detailed designs are presented in Chapter XVI.

15.5.3 Road Development Potential and Projects

Road development in this area has several specific roles such as improvement of social services, economic development in the area, socio-economic integration within the area as well as strengthening of linkage with outer areas, and producing a multiplier effect with the proposed projects.

The road density of KB Pacitan is in a low level in comparison with other kabupatens; in particular that of asphalted roads is considerably less than that in neighboring areas, due to Pacitan's topographic features and low level of economic activities.

Major access routes between Kota Pacitan (a center of KB Pacitan) and outer areas are the Pacitan-Ponorogo and Pacitan-Solo provincial highways. Presently Kota Pacitan's economy is mainly linked to Solo's economy through the relatively good provincial highway between Pacitan and Solo. However, KB Pacitan is administratively part of influencial area of Surabaya and the tie between Pacitan and Surabaya will be required to be strengthened through KDY Madiun during the Repelita III period, since the Repelita III puts more emphasis on the linkage between each kabupaten and provincial capital to distribute social services from the center.

With regard to kabupaten and desa roads, several roads may be graded-up in order to generate socio-economic activities in the isolated areas, which shall provide social functions from major towns and linkage effects to rehabilitation projects in critical land that dominates most of the hilly parts of KB Pacitan.

In the light of the above-mentioned guidelines, the Study proposes the following projects as shown below together with their costs:

(Unit: Rp. Million)

Project	Initial Cost
Provincial Highway Betterment Project	
Pacitan - Slahung (56 km)	2,250
KB Road Improvement Project	
a) Arjosari - Nawangan - Kismantoro (48 km)	720
b) Gemaharjo - Bandar - Jeruk (23 km)	230
c) Tulakan - Tegalombo - Bandar (26 km)	260
d) Hadiwana - Sudimoro - Panggul (24 km)	240
New Road Project	
Kebonagung - Hadiwana (27 km)	750
Dadapan - Widoro (23 km)	
Total	4,450

15.6 An Integrated Approach of the Projects

The "integrated" approach is often favored today, especially when development in rural areas is considered. This tendency is a natural consequence since "development" involves not only physical construction but also interdisciplinary aspects such as planning, management and organizational activities.

The proposed projects also require not only physical or hardware integration but also institutional or software arrangement. The physical integration means properly arranged locations, scales and timing of a series of the proposed construction works and other associated works, while institutional arrangement implies an involvement of planning, managing and executing the functions of the projects with a keen attention to intersectoral linkage. For example, the proposed dam projects would not bring about the benefits unless are properly provided the associated software activities such as relief programs for the people affected by the reservoir construction, water management in fields,

extension service in the irrigable areas, procurement of inputs, agro-industrial promotion in the area, marketing of products, watershed management upstream, financial facilities and so on.

The detailed discussion on the integrated approach for the proposed projects should be carried forward to the more advanced stage of the succeeding studies. However, in the process of project formulation of the Study, some major factors of the integrated approach, i.e., integrations in physical designs and planning should be referred.

15.6.1 Integration of Location, Scale and Timing of the Proposed Projects

In the previous section (15.5), a number of projects are identified; among those, the key projects are the Grindulu and Tinatar Dams whose locations are mainly determined by their topographic, geological and hydrological advantages together with their beneficiary areas. Therefore, the locations, scale and timing of other proposed projects should be determined in such a way as to maximize complementary effects with the dam projects.

In the above context, the critical area rehabilitation project should be implemented first. This project can be a model of watershed management in the area so that similar types of projects will be carried out in other areas upstream of the proposed reservoirs.

As to road development projects, the improvement project between Gemaharjo and Jeruk (23 km) should be carried out at the earliest opportunity because this road is closely connected with the proposed critical area rehabilitation project. The betterment project of the provincial highway between Pacitan and Slahung will have a substantial effect on the construction of the Grindulu Dam. The specification of the road has to meet the capacity required by transporting construction equipment for the dam construction. Further the

betterment schedule should take into account the plan for relocation of the road which will be submerged by the reservoir.

The locations of the proposed projects are shown in Figure 15.7. The investment timing is shown in Table 15.5, taking into consideration the above mentioned resource endowment as well as socio-economic conditions in the area.

15.6.2 Coordination with Transmigration Guidelines

The Repelita III emphasizes transmigration from Java (including Madura and Bali) islands to other less populated islands. The government aims at transmigration of 500,000 families in this period. The total amount of Rp.1,090 billion will be allocated for the transmigration programs which involve planning and implementing of infrastructural arrangements in destinations as well as subsidies for the peoples. This means that a budget of about Rp.2 million per family is required.

Construction of the proposed reservoirs will require evacuation of about 650 families or 3,000 people which is less than the planned figure (6,000 people) for transmigration from KB Pacitan in the Repelita III period.

The initial cost of the proposed Grindulu Dam includes the cost of compensation of Rp.450 million or Rp.700,000 per family for the affected people. This might be enough for preparation of travelling and settlement only if the infrastructure and land in new settlement areas are provided.

As a matter of course, the affected families should be involved in the transmigration program of KB Pacitan. Therefore, the proposed dam projects require a substantial coordination with political leadership or planners in local levels. The lessons obtained from the case of the Wonogiri Dam Project should be taken into consideration through

No.	Proposed Project
1	Grindulu Dam
2	Tinatar Dam
3	Levee Construction
4	Short-cut Construction
5	Critical Area Rehabilitation
6	Provincial Highway Betterment Pacitan-Slahung 56 km
7	Kabupaten Road Improvement Gemaharjo-Bandar-Jeruk 23 km
8	Kabupaten Road Improvement Tulakan-Tegalombo-Bandar 26 km
9	Kabupaten Road Improvement Arjosari-Nawangan-Pakis-Kismantoro 48 km
10	Kabupaten Road Improvement Hadiwiono-Sudimoro-Panggul 24 km
11	New Kabupaten Road (South Coastal Road) 50 km

Figure 15.7 Location of Proposed Projects

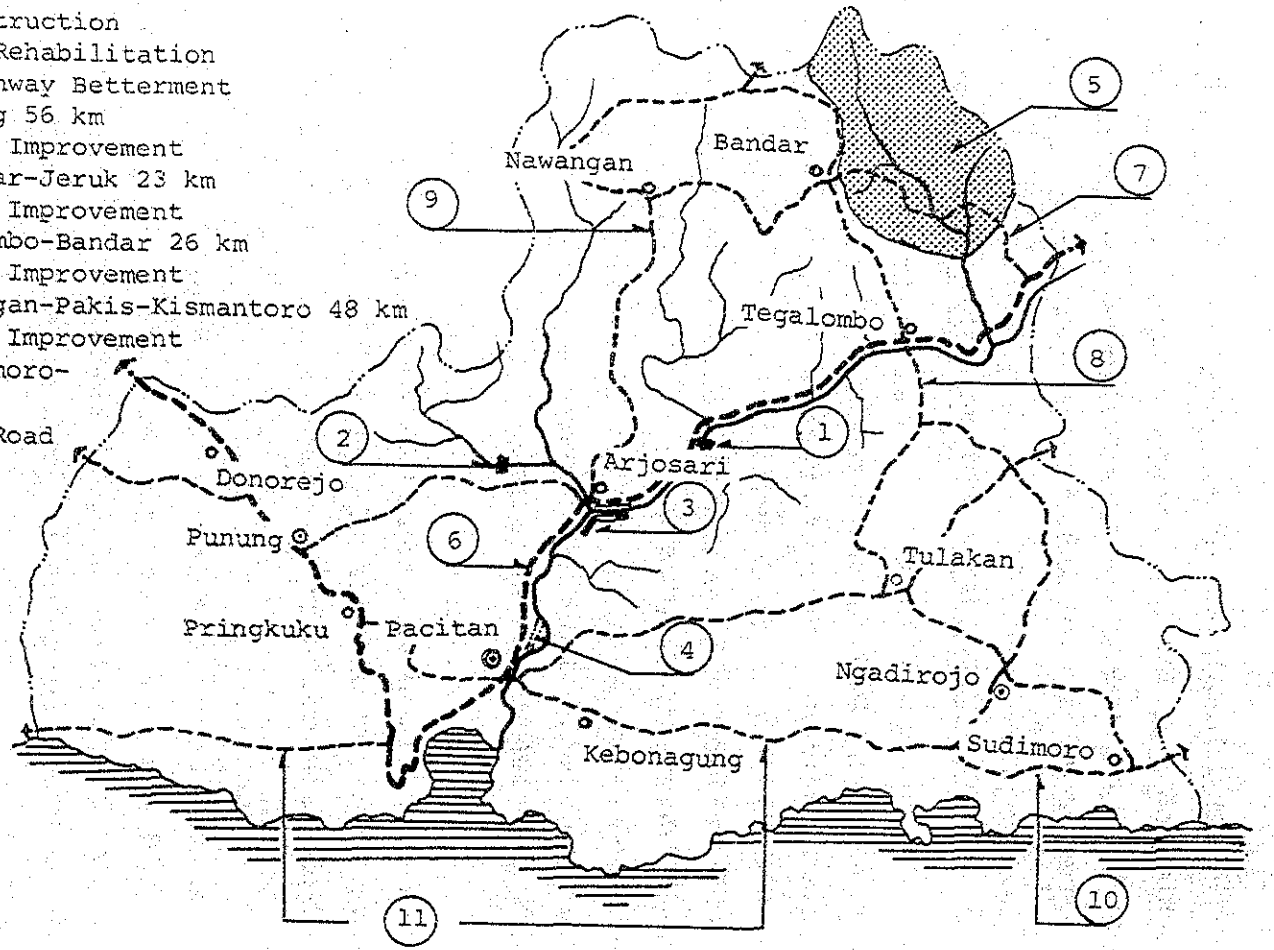


Table 15.5 Investment Schedule of the Proposed Projects

Proposed Projects	Construction Costs Rp. Million	Year: 79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90
Water Resource Development Projects												
Grindulu Dam Project	8,500 1/		J.PF/S	J.F/S		J.D/D	D/D	Const.	Const.			
Tinatar Dam Project	3,800						D/D	Const.				
Levee Construction Project	2,800								Const.			
Short-cut Construction Project	1,800								Const.			
Associated Irrigation Structure	1,200						D/D	Const.	Const.			
Sub-total	(18,100)											
Critical Area Rehabilitation Projects												
Intensified Regreening Project	800											
Five Check Dams	150			2 dams			3 dams					
Desa Road Construction Project	100											
Sub-total	(1,050)											
Road Development Projects												
Provincial Highway Betterment Project (Pacitan-Slahung: 56 km)	2,250	F/S	D/D		Const.							
Relocation of Section in Grindulu Reservoir (10 km)	(1,500) 2/						D/D	Const.				
KB Road Improvement Projects												
Arjosari-Kismantoro: 48 km	720	Const.										
Gemanarjo-Jeruk : 23 km	230	Const.										
Tulakan-Bander : 26 km	260			Const.								
Hadiwana-Panggul : 24 km	240					Const.	Const.					
New Southern Coast Road: 50 km	750	D/D		Const.								
Sub-total	(4,450)											
Grand Total	23,600											

Notes: 1/ Including cost of improvement in irrigation facilities.

2/ This is included in Grindulu Dam Project.

J: joint, PF/S: Prefeasibility Study, F/S: Feasibility Study
D/D: Detailed Design, Const.: Construction

introduction of necessary modifications or improvements for the sake of increasing the socio-economic welfare of the affected people. In this connection, it is recommendable that a thorough review of the Wonogiri case is carried out before planning this project.

15.6.3 Integrated Planning

The proposed projects contain technically and financially sizable ones. The existing capability of planning in local levels seems to be too limited to handle these projects.

The Study recommends establishment of a sub-project office as a core body for planning and implementation of the proposed projects; this might be a branch office of the Bengawan Solo Project Office in Surakarta.

The sub-project office should handle technical aspects and also coordination work for the associated projects and activities on socio-economic affairs related to the proposed projects. It has to be emphasized here that consultation with the relevant offices in Kantor Pacitan and involvement of local political leaders and planners are quite essential to lead the projects to success. It has been experienced many times in developing countries that "big" projects did not provide the expected results because of failures in the associated and auxiliary activities. A well formulated group of many minor projects associated with a big project can produce remarkable results. In this sense, the Study puts much emphasis on the following items:

(1) construction of irrigation facilities, particularly of secondary and tertiary canals,
(2) water management in the irrigable field,
(3) extension services in agricultural production,
(4) watershed management in critical areas as mentioned in critical area rehabilitation projects,

(5) promotion of agro-industries and marketing, and

(6) financial facilities to farmers.

In this context, one possible planning organization is shown in Figure 15.8.

15.7 Justification of the Proposed Projects

A public investment project proposal is screened by the magnitude of contribution to attainment of the objectives. This is easy to define but difficult to do in practice. Major difficulties arise from (1) inputs into and outputs from a proposed project cannot always be defined in quantitative terms, and (2) objectives are usually explained in such ordinal terms that quantitative weighting among different objectives is almost impossible.

However, a project analysis can disclose its impacts in both quantitative and qualitative forms, i.e., direct costs and benefits in money terms and indirect costs and benefits in descriptive terms. The limitation of cost-benefit analysis lies in that it deals with only production effects of investment. Another effect, that of creation of effective demand in the region, should not be overlooked; particularly, regional income distribution impacts through creation of employment in construction works and associated service sectors.

The total initial cost of the proposed projects amounts to Rp.23.6 billion that is less than the tentatively estimated investment necessary to the area given in the previous section 15.3. The direct costs and benefits are tabulated in Table 15.6 together with the qualitative description of indirect benefits of the projects.

The annual direct benefits in total become Rp.1.4 billion per annum. Then, the present worth of the benefits becomes about Rp.25.6 billion by using 5% discount

Figure 15.8 A Tentative Chart of Planning Organization

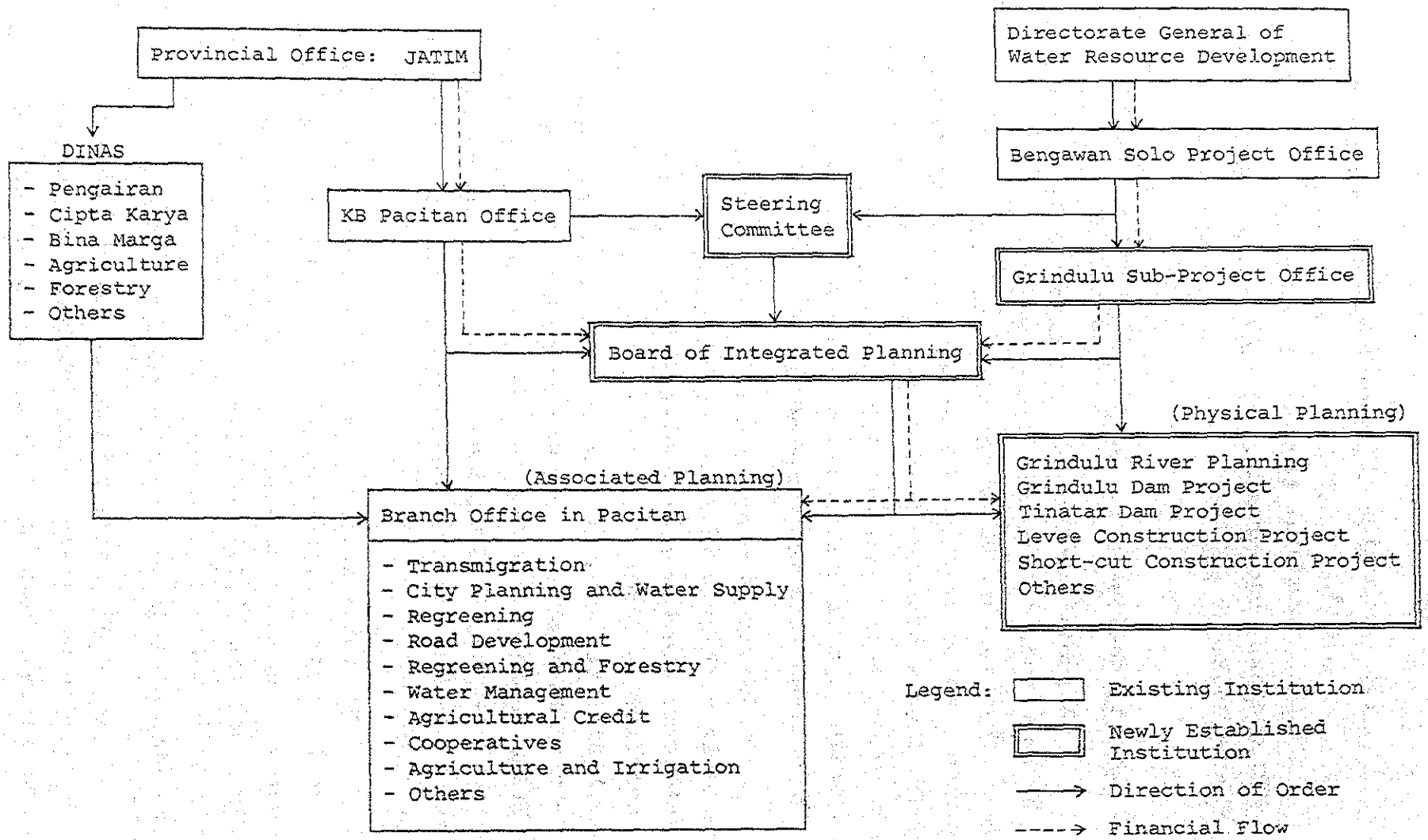


Table 15.6 The Total Costs and Benefits of Proposed Projects

(Unit: Rp. Million)

Proposed Projects	Construction Cost	Direct[1] Annual Benefit	Indirect Benefits		
			Economic	Social	Environmental
Water Resources Development Projects	(18,100)				
Grindulu Dam Project	8,500		- Provision of fishery production in the reservoirs.	- Provision of recreation in the reservoirs.	- Decrease in flood damages on river banks.
Tinatar Dam Project	3,800				
Levee Construction Project	2,800	1,080	- Reduction of maintenance cost of P. Highway.	- Relief of flood fear.	- Stabilization of river beds and course.
Short-cut Construction Project	1,800		- Increase in job opportunity.	- Decrease in water-born deseases.	- Decrease of siltation down-stream.
Associated Irrigation Structure	1,200			- Drinking water supply.	
Critical Area Rehabilitation Projects	(1,050)				
Intensified Regreening Project	800	180	- Prolonging economic life of the reservoir.		- Land conservation.
Five Check Dams	150	20	- Increase in job opportunity.		- Decrease of soil erosion.
Desa Road Construction	100	+[2]	- Increase in land fertility.		- Increase in water retaining capacity.
					- Stabilization of valleys.
					- Stabilization of ecological conditions.
Road Development Projects	(4,450)				
Provincial Highway Betterment Project (Pacitan - Slahung)	2,250	90	- Increase in farm production.	- Socio-political integration.	- Stabilization of landshape.
KB Road Improvement Projects	1,450	35	- Transfer of transport saving cost to producer and product users.	- Improvement of communication.	- Decrease of soil erosion.
New Southern Coast Road Project	750		- Introduction of innovation/knowledge.	- Strengthening economic, social and administrative linkages.	
			- Reduction of marketing and distribution cost.	- Easy access to social service, education and hospitals.	
Total	23,600	1,405			

Notes: 1/ 5% discount rate is applied. 2/ Positive but not quantified.

rate. This means that the internal economic rate of return of the proposed projects is roughly 5% which is obviously less than those in growing sectors or regions in Indonesia.

However, the indirect benefits induced by the proposed projects are considerable, they are categorized into economic, social and environmental benefits described as follows: (1) Major economic indirect benefits come from inland fishery and recreation in the Grindulu and Tinatar reservoirs, reduction of road maintenance cost on the river banks through controlled flow of the rivers, transfer of transport savings to producers and product users by road development and creation of job opportunity (2,000-3,000 unskilled workers) by the construction; (2) Major social indirect benefits are brought by decrease of indegenous desease through steady water supply made by the river development projects, spread of new knowledge/innovation and strengthening of administrative and social linkages by road development; (3) Environmental conditions are improved by decrease of soil erosion and increase in water retaining capability in the hilly areas by the rehabilitation projects which prolong the economic life of reservoirs, stabilization of river beds and banks by the controlled discharge. As described above, the package of the proposed projects are inter-dependent each other, and the linkages produce themselves indirect benefits. It is obvious that most of the indirect benefits have income distribution effect in the project area.

If it is the case that the government puts more emphasis on regional income distribution in this specific depressed area rather than the growth objective, or in other words, if the government admits the marginal value of additional income of the low income people in the region is much higher than that of high-income people in other regions, the social rate of return of the proposed projects must be much higher than the estimated economic rate of return. This would mean that the project is socially worth implementing.

Usually, the economic rate of return in depressed areas is lower than in growth areas because of the shortage of accumulated infrastructure and less linkage in economic activities. Therefore, 5% of economic rate of return in such the depressed area seems acceptable. And it can be said that the area has relatively high potential to develop.

The Study has already disclosed that the Pacitan area is one of the most depressed areas in Java island. The per capita income is only less than half of the average in Java island in spite of the fact that the prevailing commodity price level in the area is higher than other areas. Flood disaster, critical areas in the highlands, poor stock in roads and shortage in other social facilities are all depriving production opportunities from the indigenous people; consequently, mulnutrition of children is still a major concern in the area.

The decision making on implementation for the proposed projects asks for political judgement or political will to accomplish the advocated major objectives of the nation, i.e., stability of the nation and inter-regional and inter-personal redistribution of welfare.

CHAPTER XVI

TECHNICAL NOTES ON PROPOSED PROJECTS

16.1 Water Resources Development Projects

16.1.1 Rainfall and Runoff

(a) Meteorological Conditions

There are eight daily-rainfall gauging stations in KB Pacitan as shown in Figure 16.1, namely, Tegalombo, Mangunharjo, Bandar, Wijil, Pacitan, Kebonagung, Nawangan and Punung. However, the records from these stations have limited usability because of the short period during which observations have been taken, and incompleteness of recording. The annual rainfall records at eight stations from 1971 to 1979 are shown in Table 16.1, and the monthly records in the Grindulu River watershed in 1973 and 1974 are tabulated in Table 16.2.

Table 16.1 Annual Rainfall in KB Pacitan, 1971-1979

(Unit: mm)

	1971	1972	1973	1974	1975	1976	1977	1978	1979 (till Oct.)
Tegalombo				2,542	3,276			2,108	1,531
Mangunharjo								1,620	1,893
Bandar				3,105				1,628	1,134
Wijil									1,112
Pacitan	3,719	1,261	4,607	3,294	3,204		1,366	2,911	1,842
Kebonagung	2,883	1,539	3,068	4,011	5,141			2,672	1,869
Nawangan				3,489	2,902				
Punung	1,771	1,374	2,600	2,769	3,014			3,213	

Note: Underlined figures indicate faulty records.

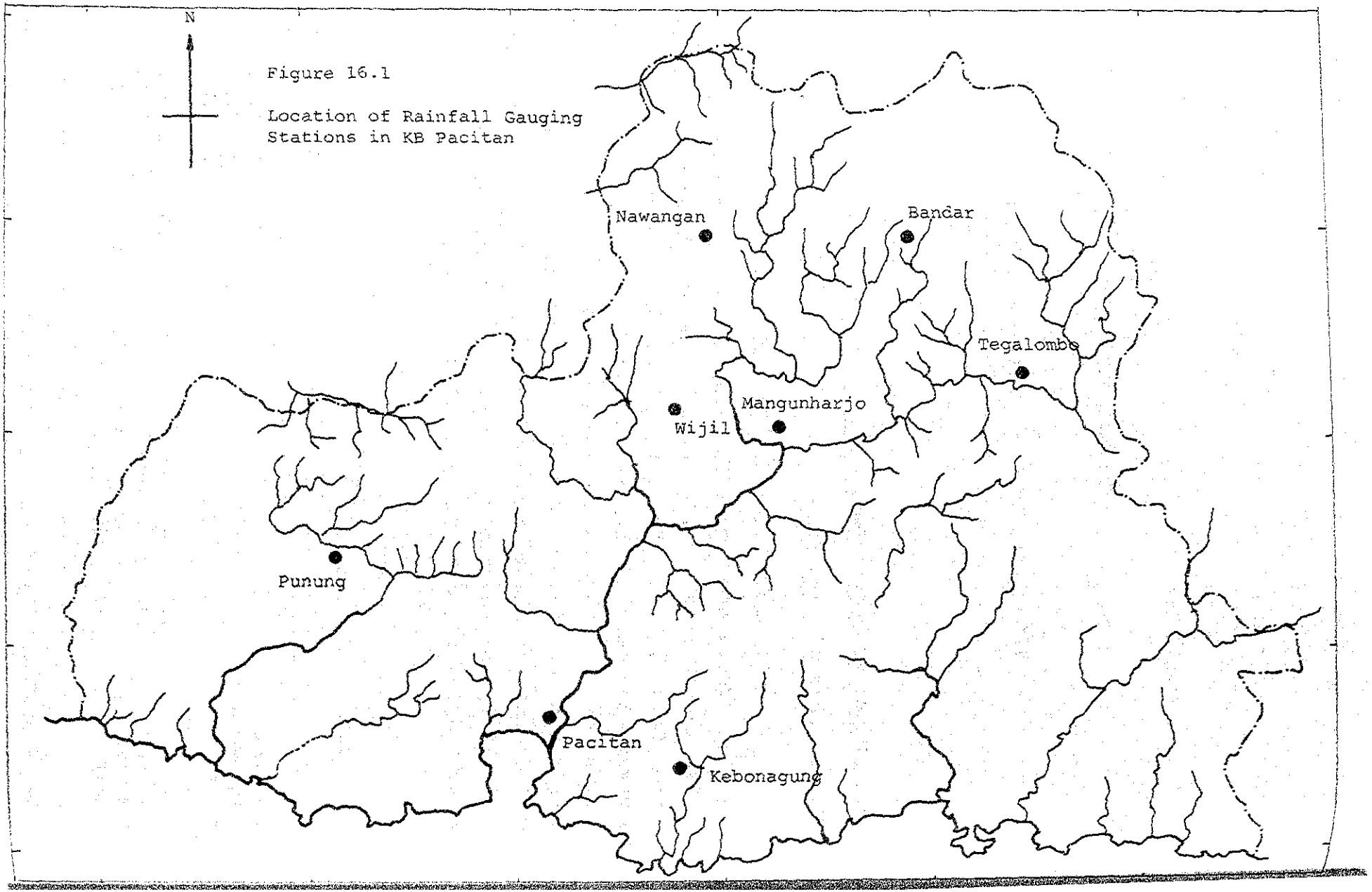


Figure 16.1

Location of Rainfall Gauging Stations in KB Pacitan

Table 16.2 Monthly Rainfall Record in Grindulu River Watershed, 1973 and 1974

(Unit: mm)

	Year 1974												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Tegalombo	364	339	275	45	245	25	111	49	127	220	382	310	2,542
Bandar	385	392	257	316	182	27	116	107	197	255	339	531	3,105
Pacitan	275	425	305	205	100	37	122	40	267	639	460	417	3,294
Kebonagung	346	1,068	249	-	-	5	10	255	219	790	588	471	4,001
Nawangan	277	422	293	330	345	38	81	67	399	333	431	493	3,489
Mean	329	529	276	179	174	26	88	103	242	447	440	444	3,276

	Year 1973												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Pacitan	399	271	799	278	306	56	216	175	375	301	1,198	224	4,597
Kebonagung	247	130	477	257	278	115	207	84	261	96	547	369	3,068
Punung	307	330	442	169	237	102	198	40	120	72	347	236	2,600
Mean	317	244	572	235	274	91	207	100	252	156	697	276	3,421
Mean 1/	323	200	638	267	292	85	211	129	318	198	872	296	3,829

Note: 1/ Mean excluding records at Punung because it is outside of the Grindulu Watershed.

Besides the records obtained in the Grindulu basin, reference shall be made to the rainfall records of neighboring watersheds in upper Wonogiri and Ponorogo, where observation periods are reasonably long, as shown in Table 16.3.

Table 16.3 Monthly Rainfall in Upper Wonogiri Basin of Bengawan Solo: Mean During 1952-1973 and 1973

(Unit: mm)

	Jan.	Feb.	Mar.	Arp.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Mean	363	344	326	198	143	64	46	25	25	86	207	295	2,122
1973	504	447	475	302	389	207	33	29	131	104	261	196	3,078

Source: JICA Feasibility Report on the Wonogiri Dam Project.

The annual mean rainfall in the Grindulu basin is derived by making use of the records observed at Wonogiri. The rainfall in 1973 at Wonogiri in Bengawan Solo basin was 3,078 mm while the mean value for 22 years of records is 2,122 mm, then the ratio of the deviation of the 1973 rainfall becomes 3,078 mm/2,122 mm = 1.45. Employing this ratio, the mean rainfall in the Grindulu basin is calculated as the annual rainfall of 3,829 mm in 1973 divided by 1.45, i.e., 3,829/1.45 = 2,640 mm. On the other hand, the 1974 rainfall record in the Grindulu basin is 3,276 mm by which the mean annual rainfall is derived as 2,600 mm x $\left(\frac{3,276}{(3,276 + 3,829) \times 0.5}\right)$ = 2,434 mm. From the above estimation and monthly observed data in the basin, the following model pattern of rainfall in the Grindulu basin is obtained.

(Unit: mm)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Rain-fall	250	400	200	120	120	25	75	75	175	350	350	360	2,500

Other meteorological data have not been collected in the area; however, a summary of the records of Wonogiri in the upper Bengawan Solo basin which is next to the Grindulu watershed, is presented in Table 16.4.

Table 16.4 Temperature, Humidity and Evaporation in the Upper Wonogiri Basin of Bengawan Solo

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
(1) Monthly Temperature (at Pabelan) Unit: °C													
Average	27.3	27.9	28.2	29.4	28.6	28.5	28.1	27.8	27.4	28.5	28.6	28.1	28.2
Ave.Max	30.4	31.2	31.4	32.8	32.2	32.4	31.6	32.6	31.9	32.3	30.9	30.5	31.7
Ave.Min	23.5	23.7	23.7	24.8	24.7	23.5	23.6	23.2	22.8	23.5	23.9	23.0	23.6
(2) Average Monthly Relative Humidity (at Panasan) Unit: %													
	30.0	31.1	35.5	45.6	51.1	63.3	70.0	72.5	75.0	32.5	48.8	33.8	49.2
(3) Average Monthly Evaporation (at Pabelan) Unit: mm/day													
	1.5	1.4	1.5	1.7	1.5	2.3	3.2	3.4	4.3	2.9	2.4	2.0	2.4

(b) Runoff

There are two automatic runoff gauging stations in Gunungsari and Arjowinangun (Kota Pacitan) in the Grindulu basin. The rating curves are not prepared and both records are available only for a short period from 1977 to 1979. Such data are so insufficient for estimating the water discharge that the runoff is derived from the monthly rainfall given in the above section.

From a careful inspection of the watershed, the runoff ratio of 0.35 is assumed for the Grindulu basin taking into account the geological, topographical and vegetational conditions of the area. This value of 0.35 can be justified