B. Water Resources

1. Present Situation

135. Geography. The Region is climatically in the tropical rainforest zone and influenced by the India-Australia monsoon. The temperature of the Region shows 26 to 27°C on monthly average without noticeable variation throughout the year. Annual rainfall is approximately 1,500 mm to 6,000 mm, depending on location. Rainfall generally increases during the months from November to March and decreases in June to October, though this seasonal difference is not so conspicuous as that in Java. One of the features of the regional rainfall is a marked difference between the western and eastern sides which are divided by the Barisan Range extending northwest to southeast of the Sumatra Island; annual rainfall in the western part is considerably higher than that in the eastern side. Some hilly zones in the western side receive 5,000 mm of rainfall annually. The evaporation rate of the Region is in the range of 4 to 6 mm per day. There are a number of large rivers in the Region; rivers whose catchment area exceeds 2,000 km^2 number more than 20.

136. Water uses. Water in the Region is closely related with various fields and sectors such as domestic use, agricultural and industrial use, hydropower generation, aquaculture (in brackish or fresh water), navigation, etc. The Region is endowed with ample water resources owing to abundant rainfall on luxuriant vegetation cover. However, these resources have not been utilized effectively.

137. Flood. In the Region, there still exist a number of areas which suffer from habitual flooding. Inundation occurs not only in low coastal land but also in depressions in hilly areas. Inundation has caused serious damage to people, properties, agricultural crops, economic activities, transport and communication systems. Therefore, mitigation of flood damage should be considered a first front for sustaining people's stable life and for supporting socio-economic activities.

138. Water supply. The extension and improvement of piped water supply systems in the Region is at a developing stage and the Government has promoted water supply programs at two different levels: the Basic Needs Approach (BNA) level for municipalities with a population of over 20,000 and the Ibu Kota Kecamatan (IKK) level for cities or towns with between 3,000 and 20,000 inhabitants. Actually only a small percentage of total households are provided with a piped water connection, while some people have access to public taps. In urban and semi-urban areas, 20 to 40% of households are supplied with piped water taken or processed from springs, wells and rivers. Some people in the coastal zone take drinking water from rainfall since surface and ground waters are affected by peat soils. Piped water distributed in the Region in 1985 totaled 71,840,000 m^3, of which about 65% was used in households. Most of the water production capacities of the IKK level are between 2.5 l/s to 10 l/s, while the supply company is Medan (PDAM) has the largest supply capacity of 1,850 l/s.

139. Irrigation. Of the various users of water resources, the irrigation sector is the largest bulk consumer of water, which has sustained agricultural production particularly of rice. Massive investments in irrigation schemes over the last four Repelitas, together with the introduction of other modern agricultural technologies such as high yielding varieties and more fertilizer application, have brought the country to reach the threshold of self-sufficiency in rice. Rice production in the Region accounts for about

12% of the country's total production, thus contributing much to the nation as a rice production base next to Java. The Region as a whole has succeeded in self-sufficiency of rice since it supports 11% of the total population, that is, around 9% of surplus is realized. Of the four provinces, Aceh and West Sumatra provide the surplus and North Sumatra and Riau have not achieved the self-sufficiency of rice.

140. Current level. Irrigation water is taken through simple and small intake facilities on streams or diversion weirs on rivers. There is no storage scheme of significant size for irrigation in the Region. The unit diversion requirement of water is assumed to be in a range of 1.0 to 1.6 m^3/s per 1,000 ha at peak for the pattern of double cropping of rice and one cropping of Palawija. Rice production in the Region reached 4.89 million tons in dry unhusked paddy in 1986, of which 4.63 million tons were from wet paddy land and 0.26 million tons from dry paddy land. Total wet land in the Region is 1.25 million ha, which accounts for 16% of the country's total of 7.77 million ha. The ratio of irrigation area to wet land is 45.6% on average, which is higher than entire Sumatra's average (40.5%) but still much lower than Java's average (72%). The highest irrigation rate is realized in West Sumatra (70.7%), while the lowest in Riau (7.5%).

141. Hydropower. Hydropower potentials in the Region, being blessed with abundant river runoff and favorable topography, are quite high. However, these potentials have not been tapped yet, except for the Asahan No. 2 (603 MW), the Maninjau (68 MW) and the Batang Agam plant (10.5 MW). Of these, the Asahan plant was developed mainly for producing aluminium, though 50 MW is allocated for public use. The share of the existing hydropower capacity to the PLN's total installed capacity is about 19%.

2. Development Potentials and Strategies

142. Long-range, basin-wide approach. Water is used for sustaining basic human needs and meeting various demands of productive sectors. Therefore, use of limited water resources should be shared properly among users. Most of the water resources development plans would have a broad perspective covering the provision of basic infrastructures and various water management schemes whose objectives include, among others, conservation of the basin wide environment and water resources there with a long perspective. Water supply projects are formulated aiming at a target which moves with time due to the increase of population and economic activities. Therefore, long-range water balance in the basin should be discussed among the users, that is, an overall basin wide approach is essential to the water resources development.

143. Against floods. Efforts to mitigate flood damage should be continued. Priority areas to be protected from flood risk will be strategic centers and intensive agricultural land. In formulating a flood control plan, the enhancement of land values in the future by provision of flood control measures should be duly taken into account. Of various structural and non-structural countermeasures against occurrence of flood, some appropriate options should be selected in stages.

144. Water supply. Access to safe and sufficient water supply has long been recognized as an essential measure to lower infant mortality and limit the spread of water-born diseases. Therefore, the extension program of water supply systems should be geared up not only for satisfying people's BHN but also for stimulating economic activities. In this regard, the current IKK programs should be fully supported. Water sources have been springs, rivers or groundwater. In urbanized

areas, some conflicts in water use appear to emerge among water users. The earliest establishment of a long-term source water development program is keenly required.

145. Self-sufficiency in rice. The Region will bear a role as foodstuff production base. Though the Region has a surplus of rice at present, self-sufficiency in rice should be maintained for the time being in view of population growth, part of which is due to migrates from Java, and its expected role of supplying the excess to other deficit regions. Efforts for this increased production should be continued through intensification of packaged technologies, rehabilitation and extensification. Further, adequate supply and proper management of water will become more important for increasing aquaculture and this aspect should be duly incorporated in the resources development plan.

146. Extension. For the recent years, however, more emphasis has been placed on operation and maintenance of existing schemes and farmer's stronger committment to the water management under the budgetary constraint. Further, current low prices of rice adversely affected the development of irrigation projects. However, improvement, upgrading and extension of irrigation schemes will be necessary to meet the demand for rice in and outside the Region with due consideration of the above issues. In this regard, irrigation development should be directed more to diversified crops in addition to rice cultivation. The extension of new irrigation schemes necessary to meet the population growth marginally by 55% in the Region for the coming 20 years is roughly estimated at about 80,000 ha in total (178,000 ha for 7% surplus), though subject to detailed analysis on demand and marketing possibility.

147. Criteria. The Region is ready to accept the share of irrigation development and there are a number of candidate projects. The priority irrigation projects will be selected according to the following criteria:

(i) The irrigation system is designed to grow not only rice but also other crops selected by farmers based on their comparative advantages, income and employment aspects in line with the national policy on crop diversification;

(ii) The irrigation system is managed by farmers and easy to operate, maintain and repair with minimum OMR cost;

(iii) The irrigation system has socio-economic impact on backward areas whose economy comparatively lags behind; and

(iv) The irrigation system is essential for new transmigrants to sustain their livelihood.

148. Hydropower. Hydropower potentials in the Region have not been fully tapped though their development potentials are quite high. According to national energy diversification policy, however, hydropower is merely an option among various potential sources of electricity. Therefore, development of a hydropower scheme should firstly be justified economically, especially in comparison with other alternative sources such as a coal-fired plant or a gasturbine plant. In general, hydropower development may require a longer lead time and a larger initial investment cost. Nonetheless, hydropower development should be promoted in the long-term perspective in the light of its various advantages such as renewable, non-polluting nature, highly flexible reaction to load, much less operating risk which otherwise may occur in fuel procurement, and possible multi-facet benefit to rural

development. Development of mini-hydropower schemes should also be promoted particularly for electrification of communities isolated from the power grid system and for encouragement of local industries.

3. Development Vision in 2008

149. The present status of water resources in 1988 and the development vision in 2008 are presented in Figure 18.

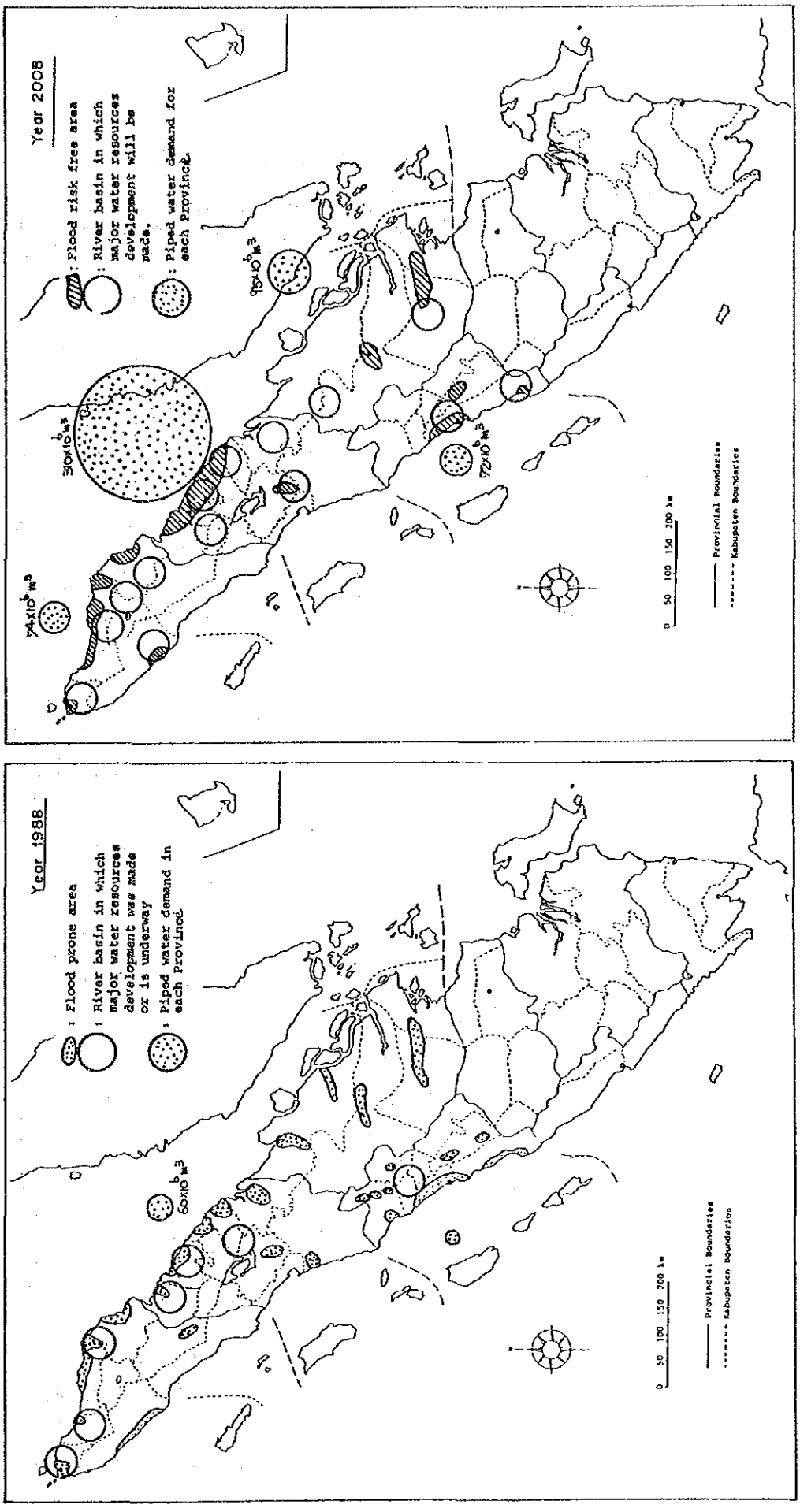

Figure 18. Development Prospect (Water Resource)

C. Mining

1. Distribution of Energy and Mineral Resources

150. Development of Energy and Mineral Resources is directed to the maximum use of natural resources for national development and the supply of basic materials for domestic industry to increase exports, and expand business and job opportunities. The Region is endowed with energy resources such as oil, gas, coal and geothermal heat, metallic and non-metallic mineral resources as shown in Table 49, Figures 30 and 31 of Volume III.

2. Development Potentials

151. Oil and Gas: Indonesia has maintained to produce annually around 500 million barrels of crude oil including condensate, while the culminated to 615 million barrels at maximum in 1977. The Region has played a special role in the country's oil production and export since it produced 7,011 million barrels in total during the period from 1941 to 1986 which accounted for about 60.3% of the cumulative production in Indonesia. The Region's contribution in oil production is expected to remain unchanged as the remaining recoverable reserves is estimated at 63.7% of the total in Indonesia. The production of natural gas in the Region amounted to 878 billion cubic feets in 1987, which accounted for 50.7% of the country's production. The contribution of the Region in natural gas will also continue as the remaining reserves in the Region accounts for 49.3% of the country's total reserves.

152. Coal: In the Region, Ombilin coal mine produced 3,844,731 tons in total during the period from 1977 to 1987, and at present is operating annually at 700,000 tons. The mine has contributed to domestic industry and export. The mine is performing expansion project of production to produce 1.5 million tons in future. In the Region, there are several unexploited coal fields of Meulaboh, South Natal, Sinamar, Rokan, Logas and Cerenti. The Cerenti coal field is particularly expected to have huge reserves though underway to exploit the reserves at present. Other coal fields shall be developed whenever requesting development of a part of the Region or demand of the energy. In the swamp area of Riau, huge amount of peat deposits are located at several locations. The peat should be noted as a future energy source, and study on their utilization is necessary. Neighboring Qurternary volcanos along the Barisan Range, many geothermal features occur. Those energy sources should be studied to develop isolated local areas by multipurpose utilization of steam and hot water.

153. Tin is being mined as a main metallic mineral resources in the Region. Tin production increased to 3,306 tons in 1987 from 1,853 tons in 1975, and it accounted about 11% of total production of Indonesia. Most tin mines are located in Singkep Island in Riau. Bauxite has been produced annually ranging from 1 million tons to 500,000 tons in Bintan Island depending upon consumer demand. The bauxite deposit is of low grade (48% of Al_2O_3). Though feasibility study was repeatedly performed to find away to use it for alumina production, the result was always negative. In the future, the reserves might be reconsidered to be used as the aluminium material, when the present source of aluminium is exhausted or becomes costly. Metallic mineral resources such as gold, silver, zinc and lead are also distributed in the Region, but most potentials are too slim to exploit, except some high grade, but small-size lead-zinc deposit at Tanjung Balit. It is known that many kinds of non-metallic mineral resources are distributed in the Region, but most resources have not been developed or utilized yet, except limestone, granite, quartz sand and marble.

3. Development Strategy of the Mining Sector

154. The Region appears to have bright prospects for the development of energy and mineral resources, but the past survey and investigation are not sufficient to definitively evaluate the potentials, except for oil, gas, a coal field and a few metallic mineral deposits of tin and bauxite. In order to fully utilize those potential resources, continued and phased potential investigation is quite essential. It must include not only study on quality and quantity but also research on possible multipul uses and marketability of those resources.

155. In this regard, the following projects may be selected:

(i) Basic investigation on non-metallic mineral resources in the Region for use of building, industrial, and chemical materials;

(ii) Investigation on potential geothermal development in Aceh, North Sumatra and West Sumatra;

(iii) Coal mining development in the Region (Meulaboh, South Natal, Sinamar, Rokan, Logas and Cerenti);

(iv) Those energy resources should be explored following long-term development program of electric power in the Region;

(v) Investigation of metallic mineral resources, particularly rare metals, gold, zinc and lead; and

(vi) Research on peat should be noted as a long-perspective plan for energy source development and utilization.

In advance of the development and the exploitation of those natural resources mentioned above, assessment of environmental influence should be performed for prevention of environmental destruction.

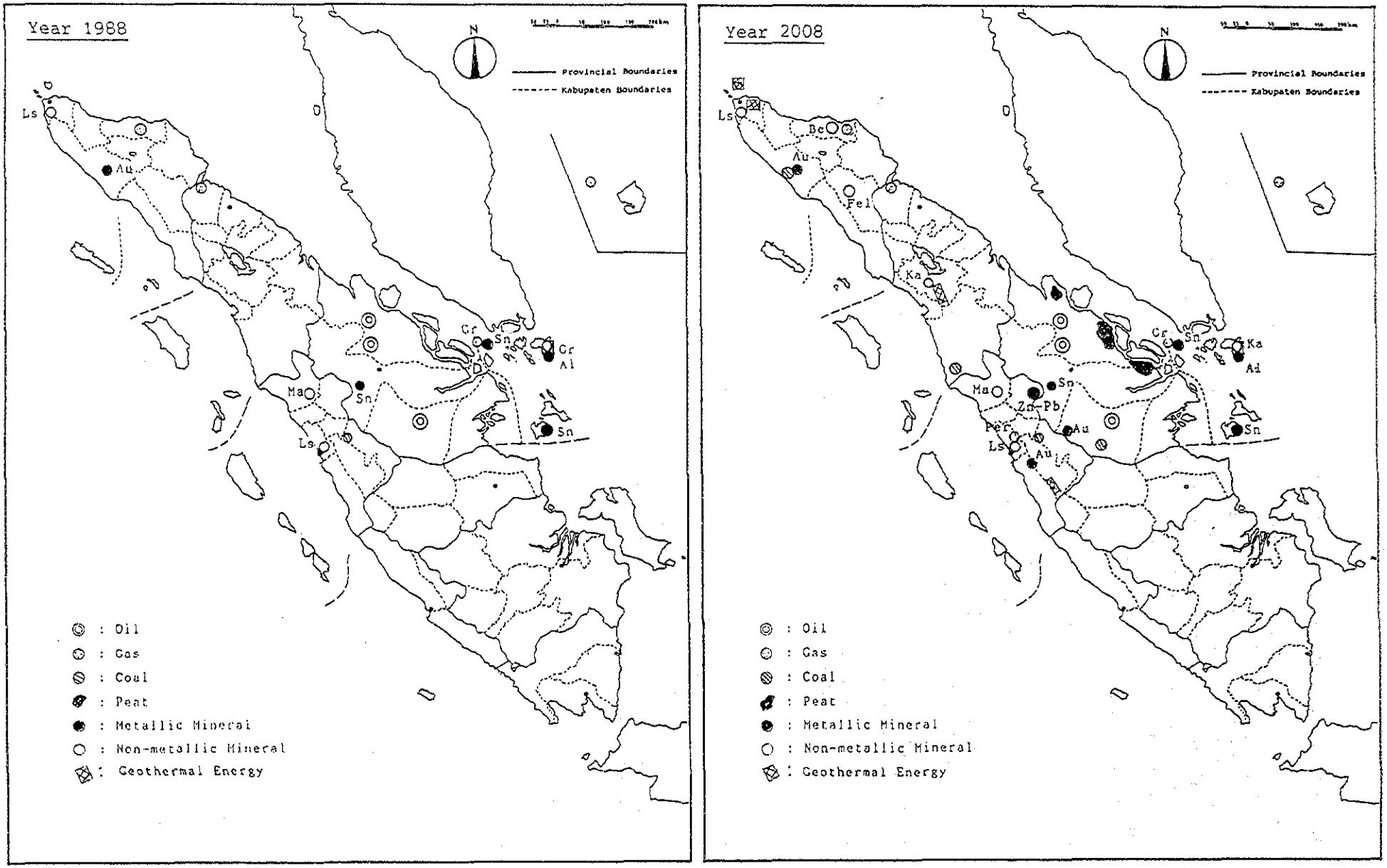

Figure 19. Development Prospect (Mining)

D. Industry

1. Existing Industrial Base

156. Recent development. Industrial development of some significance took place in the Region only recently. Until the early 1980s, industries in the Region were confined virtually to traditional small scale industries. Having achieved dynamic growth in the past decades, the Region is the largest industrial base outside Java today. While its population is 11.4% of the national total, it accounts for 13.2% of the manufacturing value added (excluding oil and gas) of the country in 1988.

157. National significance. The Region accommodates an impressive number of industries of the national importance such as cement, fertilizer, aluminium articles, pulp and paper, palm oil, rubber processing, fish precessing, and some engineering products. Contribution of the industries in the Region to the national economy is most significant through their foreign exchange earnings, being involved in most part of the export of the Region, which accounts for 44% in value of the total export and 21% of the non-oil/gas export of the country in 1987.

158. Medan as the center. Around 57% of the industrial production in the Region is accounted for by Medan and the eastern part of North Sumatra Province. With other industrial centers in Lhokseumawe, Pakanbaru and Batam, the overwhelming dominance of the eastern side of the Region vis-a-vis the western side is noticeable.

159. Sub-sectors. Viewed sub-sector-wise, the machine and basic metal industry is an almost monopoly of the eastern part of North Sumatra province. The basic chemical industry is found only in a few locations such as Lhokseumawe (fertilizer), Aceh Besar and Padang (cement), Medan (tires), and Tapanuli Utara and Bengkalis (pulp and paper). In all other areas industries are either those of the multifarious industry (typically agro-industries) or small industry subsectors.

2. Future Prospects and Strategy of Industrial Development

160. Potentials. Industrial development in the Region has taken advantage of the abundance of natural resources including oil/gas and other minerals, forestry, marine and energy resources, as well as favorable conditions for agriculture. All of these have a big potential for expansion, allowing the Region to continue enjoying this advantage.

161. Disadvantages. It should, however, be recognized that the Region has some disadvantages, particularly in competing with industries in Java. First, long distance to the 100 million population market (Java). Second, inconvenient access to foreign markets which require efficient services, administrative, financial, testing and research. Third, inadequate infrastructures such as electricity telecommunication, transportation, water, education and health facilities. Fourth, insufficient supply of skilled and semi-skilled labor force. Fifth, government regulations and price control which have tended to favor industries close to Jakarta.

162. Efforts. Against these problems, the Government has recently made drastic policy changes to create favorable climate conductive to private enterprises, deregulate production, investment, transportation and enterprises, deregulate production, investment, transportation and

financial and banking sectors, and encourage more market-oriented industries. International financial climate is also changing in favor of Indonesian economy. For example, the World Band established the Multilateral Investment Guarantee Agency (MIGA) to alleviate risks of international investment. The Japanese Government recently supported to establish the Japan International Development Organization (JAIDO) to assist private investment in export-oriented industrial projects. Further government's effort is urgently required to attract domestic and international private investors, particularly in this crucial timing, when the increasing wage level and other circumstances in the newly industrializing areas such as Thailand, Malaysia and Java, make slow down their growth to the near saturation points.

163. Prospects. It is expected that the industry sector in the Region will grow, in terms of value added, around 1.5 times in 5 years until 1993, 2.2 times in 10 years until 1998 and around 5.7 times in 20 years until 2008 (see Figure 20). The sector will also provide employment opportunities to 67,000 people in the five years, 161,000 in the 10 years and 452,000 in the 20 years.

164. Strategy. The following three principles are adopted as the industrial strategy:

(i) To promote export-oriented industries;

   a. based on locally available resources,
   b. with effective linkage to up- and down-stream, and
   c. with high labor absorption.

(ii) To develop the Medan area as the Region's center of supporting industries and Padang as the secondary center for the western part of the Region (and Batam as a unique center for high technology industries).

(iii) To promote small industries.

165. Actions. Present backlog of investment projects which investors have given commitments by way of obtaining approvals or licenses from the authority exceed Rp.5,200 billion, which seem to be enough to attain the short-term development goal. In order to attain the long-term development goal, not only the horizontal expansion but also the vertical expansion is necessary. That is, in addition to expanding the type of industries existing at present, raising the level of processing the resources is very important.

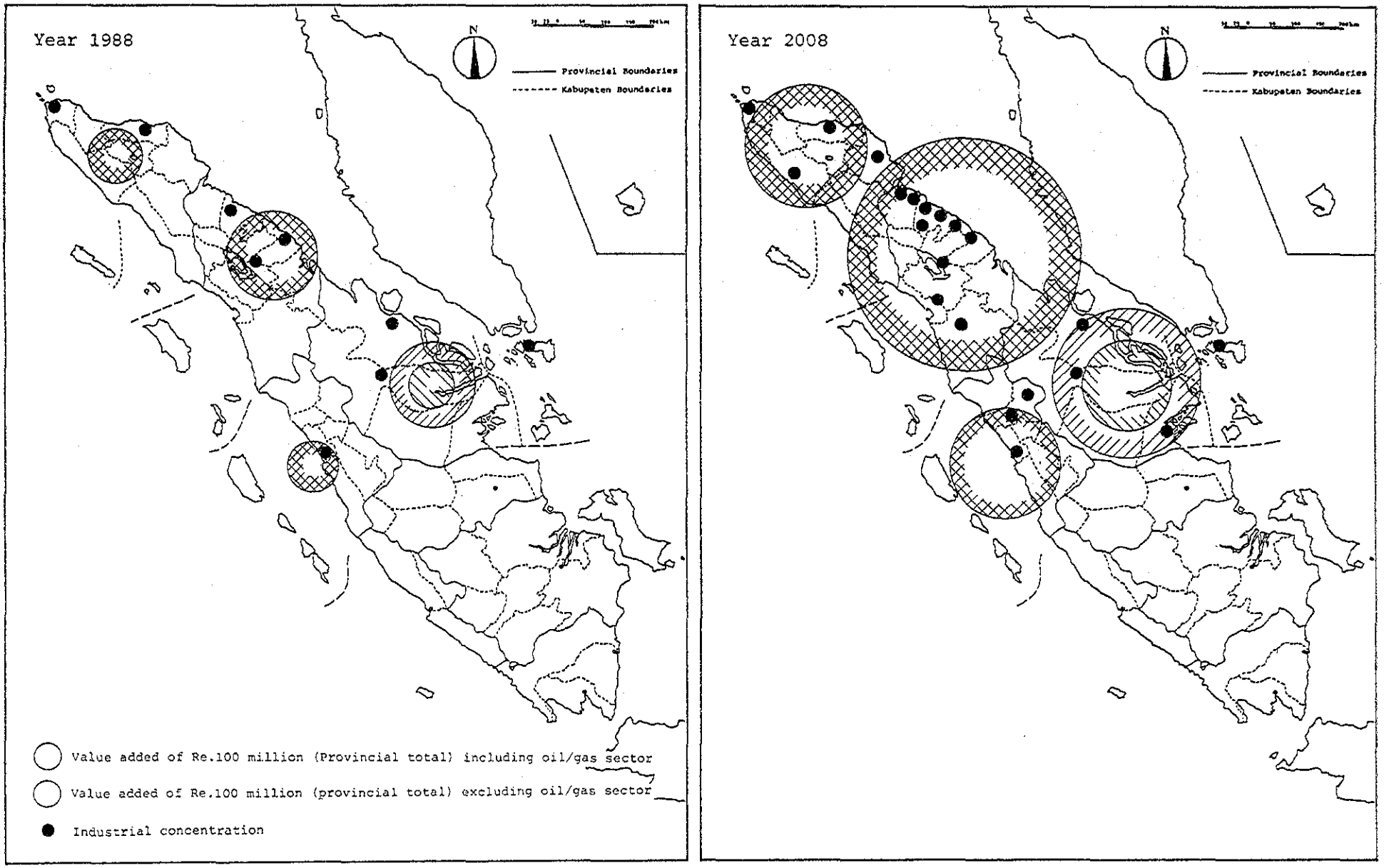

Figure 20. Development Prospect (Industry)

E. Energy/Power

1. Planning Elements

166. Projections. Toward the year 2008, the total final commercial energy consumption in the Region is estimated to increase by 4.6 times from 1988's consumption volume of 24.7 MMBOE[1], while the total nation increases by 3.6 times during the same period. For the electricity, the consumption is projected to grow by 11.8 times bigger. The speed of the growth is calculated as 13.7% per annum average during 1988 to 2008. The Region's energy intensive nature will be apparent in 2008 since the total energy intensity for the Region is assumed to increase faster than the national average. In projecting these consumption outlook however, energy efficiency toward the latter part of development period has been reflected in the growth of energy intensity. In other words, the Region is the energy intensive nature but envisaged to achieve more efficient energy consumption structure within its economic structure. In looking the projected spatial consumption pattern, the economic structure of each province is reflected in the energy consumption outlook. This has resulted in the picture where the industrialization in North Sumatra province leads the overall energy consumption of the Region.

167. Sufficient resources. The magnitude of total final commercial energy requirement in the Region in 2008 is envisaged enormous though, this projected consumption volume amounts to 50% of the current crude oil production volume within the Region. Thus even if the current (1988) petroleum dependent energy supply/consumption structure continues, there wouldn't be any problem in terms of volume balance within the Region, where regional consumption is satisfied by less oil export from the Region. However, in view of the total future national energy consumption, and the role of oil as means of foreign exchange earnings, it gets increasingly important to satisfy the projected energy consumption with diversified energy resources.

168. Strategy. The maximum utilization of alternate energy resources with the sound structure of such energy supply system is the main energy development strategy for the Region. It is suggested that this diversified energy system should be purposed in the power sector in view of increasing demand for electricity and easiness to utilize such alternative energy resources. Simultaneously for outer areas from the main transmission line, the decentralized system development is also recommended to accelerate the rural electrification (RE) as well as to lessen the dependency on oil. In view of developing the above diversified energy supply system, it is increasingly important for natural gas, coal and hydro-power to play significant roles in the Region, with optimum utilization plan of such energy resources (new and renewable energy).

169. Opportunities. With the endowments of above said energy resources, the Region has a great potential to be developed with energy sufficiency and with diversified energy resources. By taking advantage of short distance to those energy resources not like Java, the Region provides ample opportunities for energy intensive development in the national energy system.

170. Pricing structure. Actualization of this direction of development will largely depends on the spatial pricing structure for energy products against the current practice of uniform pricing for electricity and petroleum products. Effective pricing for energy

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[1] MMBOE: Million Barrels of Oil Equivalent.

products should be considered for maximum utilization of endowed alternative energy resources.

2. Development strategies

2.1. Power development

171. Electricity projections. For the projected annual energy requirement of 25,000 GWh in 2008, the required installed capacity is approximated at 5,800 MW, which is about 6 times the aggregate capacity of existing capacity (967 MW in 1988). Since the plan which is already or almost committed for installation in the near future is 1,490 MW of hydropower, 350 MW of coal-fired plant and 217 MW of gas turbine and gasified, being 2,057 MW in total, about 3,700 MW of new plants should be additionally developed for the coming period of 20 years.

172. Strategy. For mid- and long-range program it is recommended to adopt the following strategy, in view of cost effective endowed resource utilization in relation to the scale of consumption. Next ten years after Repelita V (i.e., during Repelita VI and VII), the hydro potential should be focused and developed at the fullest extent. After 2003, the thermal power development should be refocussed in view of thermal base load requirement for the total regional power grid. Natural gas and coal availability will be the decisive factor for this scenario. Although preliminary indicative reserve figures for coal in the Region make the coal fired power plant option attractive, the detailed exploratory survey for fossil fuel resource deposits or reserves is a prerequisite for formulating any long-range power development plan.

173. Coal and natural gas. Since development of coal resources is in view in Riau, it is conceivable, though subject to its technical feasibility, to use the coal not only for the secondary oil recovery in the Duri field but also for power generation, that is, steam passing through the turbines for power generation is reused for steam flooding of the oil layers. As for the primary energy for steam flooding for Duri field, natural gas from Natuna also exists as an option to the coal. The choise among these options is subject to the further study beyond this regional study scope. However from the point of view of regional development effects, the power development plan here envisages the utilization of coal in Cerenti, Riau.

174. Considerations. These power development strategies with due attention on total power supply cost, are transformed into the development plan with individual projects as seen on Tables 9 to 11. Environment assessment should be conducted prior to the development of any type of power plant, hydro or thermal, and necessary countermeasures should be incorporated into every scheme.

175. Interconnection of power supply systems. Another major strategy for the power sector development is the interconnection of the each Wilayah system. It is strongly recommended to interconnect load centers in view of fuller effective utilization of regionally endowed energy resources. In considering the combined volume of electricity consumption in Aceh and in North Sumatra, the unfeasible project may turn out to be feasible and may provide electric power at less cost than isolated supply system. In addition, interconnection increases reliability of power supply in the future when the both sides of the interconnecting line hold power generation system. Interconnection of the power grid systems thus plays a strategic role in the power sector development in the Region.

176. Scenario of interconnection. It is recommended to interconnect Wilayah I and II by 1993 and then with Wilayah III by 2008. Toward the final year of the study time horizon of the year 2008. Interconnection between Wilayah I and II is suggested so as to take advantage of power development in Aceh to improve electricity supply situation Aceh in addition to supplying less expensive electricity to Medan. The delayed interconnection lessens such benefits. Toward the year 2008, power developments within the Region of interconnected Wilayah I and II to satisfy the projected consumption for that Region is getting costly. Thus the interconnecting with Wilayah III should be implemented in view of binary use of coal at Duri field so as to achieve least cost power supply system over the whole of the Region.

177. Rural electrification. The strategy for rural electrification (RE) in the Region is to utilize current institutional set up for rural electrification with introduction of decentralized system based on locally endowed resources for RE at first and in the later stage of development period, those systems are to be connected in view of scale of economy in satisfying the increased demand within each decentralized system. In this way PLN can concentrate on the grid extension electrification with adequate financial returns. Thus the required is the comprehensive strategy to connect and coordinate those potentially available resources not only energy resources but also human, institutional and financial resources for the challenging task of RE in the Region. In this instance the study recommends the "Guideline for study for Accelerating Rural Electrification" as seen in Volume IV.

2.2. Primary Energy Development

178. Natural gas/petroleum product distribution. Currently available natural gas for the regional use is estimated as 156 MMSCED[2], (66 MMSCFD from Arun, 54 MMSCFD from Rantau, and 46 MMSCFD from Pangkalan Brandan). Scenario I of Table 58 (Chapter VI, Volume III) is formulated with this volume.

179. New discovery. With the discovery of natural gas at offshore of Pangkalan Brandan, natural gas development is in view and it becomes possible to replace a part of projected petroleum product consumtpion. Scenario II of Table 59 (Chapter VI, Volume III) is formulated with the assumption of this natural gas development. The above newly discovered field still needs a few more years to reach the proven reserve figure however it is expected to start the production in the end of Repelita V.

180. Utilization study. Under Scenario II the amount of natural gas supply and demand is estimated at 356 MMSCFD in 2008 and that in 2008 as 425 MMSCFD. These volume enable to construct a natural gas separation plant which can provide an ample opportunity to develop down stream pertro-chemical industries as well as LPG production. In further, CNG for automobile use also provides the opportunity for domestic utilization of natural gas. Therefore this study recommends to carry out the natural gas utilization study right after obtaining proven reserve figure of the newly discovered field. With this natural gas development and diversified energy system, the supply and demand volume of petroleum products in the Region in 2008 under Scenario II could be possible to be curved to a mere doubling amount of 1988 level.

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2 MMSCFD: Million Standard Cubic Feed per Day

181. Oil distribution. As for the replenishment system for increasing petroleum consumption, the current plan to expand depots capacities, opening up new depots and distribution center in Telukbayur should be carried out as planned. In the mid- to long-term, in view of efficient petroleum product distribution not only for the Region but also the west coast of whole Sumatra, the petroleum product pipeline system should be considered, which connects Dumai and Telukbayur.

182. Coal. For coal development strategy in the Region, it is recommended to develop Ombilin to the fullest extent to satisfy the regional growing demand and to develop the new coal deposits to answer the export demand after the year 2003. It is planned for Ombilin to boost coal production to 2.1 million tons per year toward the year 2000 where 1 million tons for domestic and export use and 1.1 million tons for coal fired thermal power plants of 330 MW capacity. However, it is viewed that the maximum production level at Ombilin may stay at 1.5 million tons.

183. New mines. If the export market for Ombilin to be kept, the other coal depots have to be developed to replace Ombilin coal use in the Region so that the replaced Ombilin coal will be supplied for the export market. In this instance, development of coal deposit in Meulaboh comes in, it is recommended to develop Meulaboh during Repelita VI so as to replace the coal from Ombilin to PT Andaras cement. If the detailed exploratory survey for Meulaboh turns out that quality of coal there makes unfeasible for transportation of Meulaboh coal, it is suggested to transfer 100 MW capacity at Ombilin to Meulaboh. In order to formulate the definite plan for coal development strategy considering the above options, it is a must to carry out detailed exploratory survey for known coal deposits.

184. Coal at Cerenti. Subject to the international price for crude oil and benefit/cost comparison to the other options, the Study envisages coal in Riau represented by Cerenti as primary energy for secondary recovery of Duri oil field. Preliminary consideration in adopting this option is the direct investment effect of this option to the Region as well as indirect domestic economic effects.

2.3. Traditional Energy

185. Fuel wood. Fuel wood characterizes the household energy supply/demand in the Region, where as commercial energy such as LPG, kerosene and natural gas are available for just a limited number of household in the urban population. The supply and demand balance for the fuel wood at the provincial level in the Region presently seems adequate. However at the district level, it shows sign of potential shortage with increasing prices for fuel wood. Given the estimated population growth and the increase of the number of households with upward trend of household energy use, the sustainability of the current fuel wood situation is questioned. In further in view of energy products availability with household income level, it is difficult to envisage that the transition from traditional to commercial energy will take place next 10 years.

186. Improved stove. In these instances, efforts should be directed to enhance the thermal efficiency in fuel wood use in the rural household. The currently wide used fuelwood stoves are the open fired type with extremely low energy efficiency. The related studies show the efficiency of such stoves is mere 5 - 8%, in comparison to 24% by the efficiency improved stove. With the dissemination of the improved stove, the current level of fuelwood consumption is possible to be reduced to 1/2 to 1/3. The dissemination of the improved stove could also complement betterment of the life in the rural population

especially for women and children. It is the work for women and children to collect the fuel wood and to cook. The results of the case study for West Sumatra villages in 1983 shows that the time spent in fuel wood collection is 6.6 man-hours/week and the time spent for cooking is 4.2 man-hours/day. With the introduction of the improved stove, the more time for other work on study would be available.

187. The above strategies are transformed into projects listed in the Long List, and Power Development Plan in Tables 66 to 68 of Vol. III.

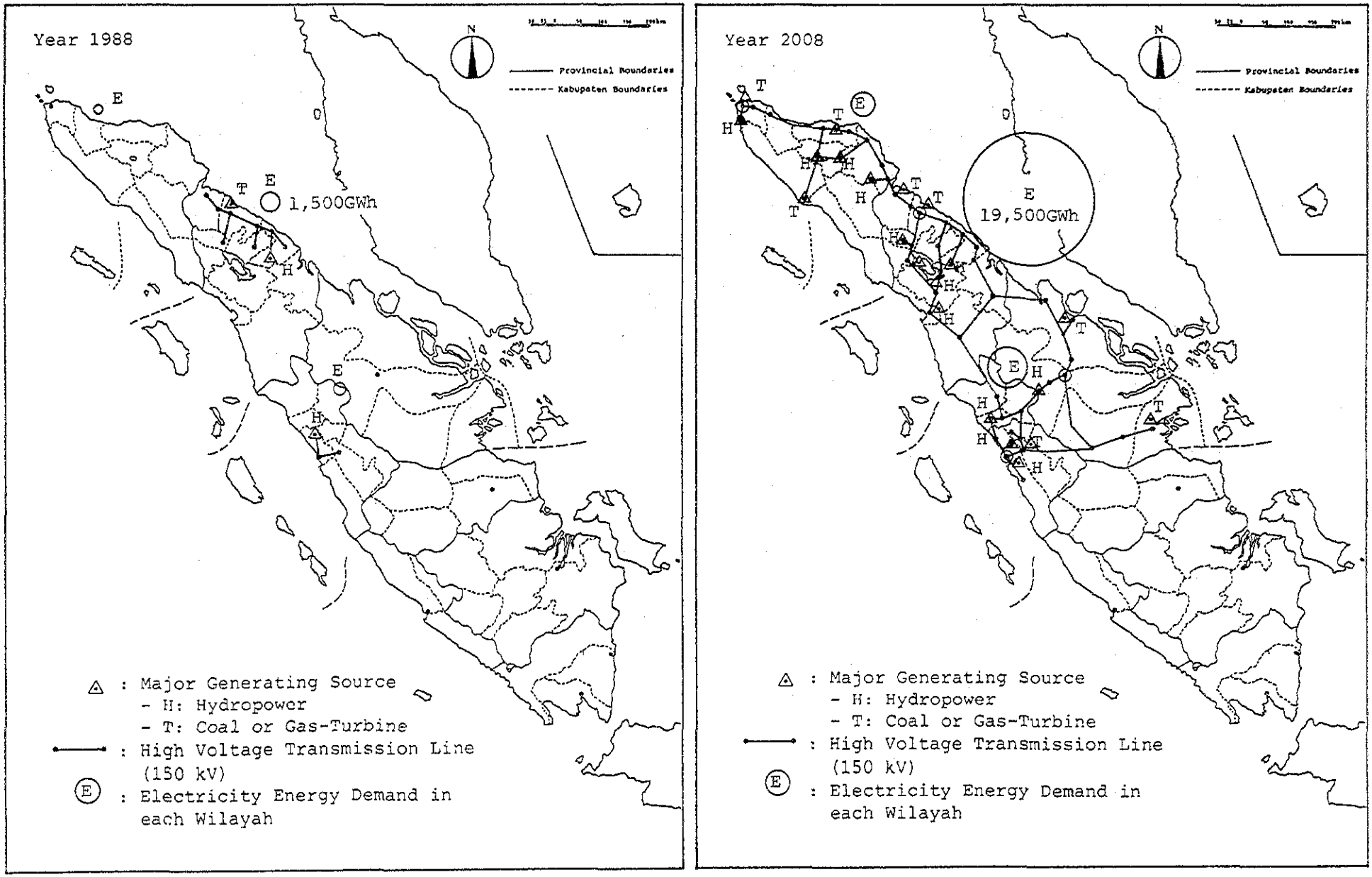


Figure 21. Development Prospect (Energy)

F. Transportation

1. Role of Transportation Sector

188. Indonesia is composed of more than 13,000 islands and stretches over a length of 5,000 km, from Sumatra in the west to Irian Jaya in the east. Due to the archipelagic nature of the country, transportation and communication system among those islands are of vital importance for Indonesian national integration and economic development. Among those islands, Sumatra, its northern part particularly, has relatively well developed transportation infrastructure, compared to other islands of the nation.

189. But it could be pointed out when the existing transportation network in the study is reviewed from the stand-point of intra-regional interdependence that the transportation network, as a system, is not so made as to fully function to smoothen inter-provincial economic activities. Rather it could be said that each of the provinces in the study area seems to have persued their own way of develoment in transportation regardless of other progvinces. It might not be exaggeration to say that each of the region has developed their transportation network centered around their provinces' major cities and their main intended linkages were not with other provinces in the area.

190. In addition, due to geographical heterogeneity, the patterns of regional development even within a same province differ one another and they are not systematically linking each other. Especially, the development patterns and processes between the regions in the eastern and western coastal areas are different in essence and they are not always coordinating systematically.

191. The main reasons for the above issues in transportation development seem to come from the following facts:

- The absolute amount of investment for transportation in the past has been inadequate.
- The investment in the past was biased rather to relatively developed areas in any province.
- Measures for comprehensive transportation planning, standing on integrated scope of view, which pays attention to the interdependent relation among regional economies have not ever been taken.

2. Historical Review of Transportation Development

192. For the description of economy in the North Sumatra as well as that of Indonesia as a whole, the structure of economy first founded under the colonial policy by foreign powers should not be ignored. Indonesia has long been put under colonial policy by Dutch since early 17th century until the independence of the nation in the 1940s. As is the case with most of the countries in Asia, economic system in Indonesia was reformed into that of raw material supply for the industrialization of this European nation.

193. Colonial economy under the foreign power had introduced plantation system for the planting of such estate crops as oil palm, rubber and coconut for international market at the cost of planting of substantial food crops. Under the situation, socio-economic infrastructures, chiefly those for transportation, were provided mainly for the transportation of these products.

194. As the plantation economy in Indonesia was developed revolved around the island of Java, transportation system of this country was formed centered around the island. The sealines, for instance, were first introduced for the transportation of plantation products to Java and overseas. Railways as well, were constructed for the purpose of transportation of industrial raw material and mining products to the nearby ports for the shipment to the other parts of Indonesia.

195. Although, great efforts to correct this skewed structure of national economy were taken and a variety of transportational infrastructure development programs were initiated after the independence of the nation, homogeneous and internally balanced distribution of transportation facilities with satisfactory standard has not yet been realized.

196. After president Soeharto assumed the presidency in 1969, Nation's Five Year Plan (Repelita) was institutionized and development target was set up for the modernization of the nation. The historical process in development of transportation sector for each of the Repelita are described elsewhere in Chapter VII, Volume III.

197. The most remarkable event in the transportation development in the study area might be the opening of the trans-Sumatra Highway in 1984. This event is deemed first achievement of combining of mutually independent local economies within the region. It is needless to say that wider scaled inter-industrial activities among different provinces have become possible owing to the opening of the road.

198. As seen above, not so many years have passed since the study area had received full fledged scale of investment. Further it could be pointed out that most of the development plans have come up with for imminent need where most of the transportation development plan are conducted regardless of other plannings, due mainly to small amount of investment as against the vastness of land and hetergeneity of geography, and lack of enunciated concept for the incentive roles of transportation in the development of regional economy.

2. Goals and Strategies for Transportation Development

199. For the realization of favorable traffic condition not only in terms of economic development but of enhancement of living foundation within the Region, but also in terms of national integration of the transportation system including land, ship and air, the following goals and strategies are proposed sectorwise.

2.1. Road

200. Goals are:

- Formation of balanced road network within the Region
- Eradication of the transportation-poor

Strategies are:

- Betterment of existing roads through maintenance works and rehabilitation
- Betterment of road linkages which connect vital points of production, consumption and vital points in transportation

2.2. Railway

201. Goal is:

- Improvement of railway systems which cooperate with other transportation facilities and regional industrial activities

Strategies are:

- Improvement of obsolete operation systems and facilities
- Reinforcement of truck for heavier freight cars including container cars and improvement of railway alignment
- Improvement of rolling stock and locomotives

2.3. Waterway

202. Goal is:

- Creation of integrated and improved waterways as a network

Strategies are:

- Expansion of port facilities (berth, yard, transition house and so on) for commercial ports
- Efficient management
- Improvement of inland waterways
- Shipping service to isolated islands

2.4. Airway

203. Goals are:

- Creation of an integrated and improved air network within the Region as a condition for national development
- Eradication of the transportation-poor

Strategies are:

- Expansion of airport facilities for the accommodation of larger aircrafts and modernization of safety control systems
- Frequent services to isolated areas
- Enhancement of airport amenity

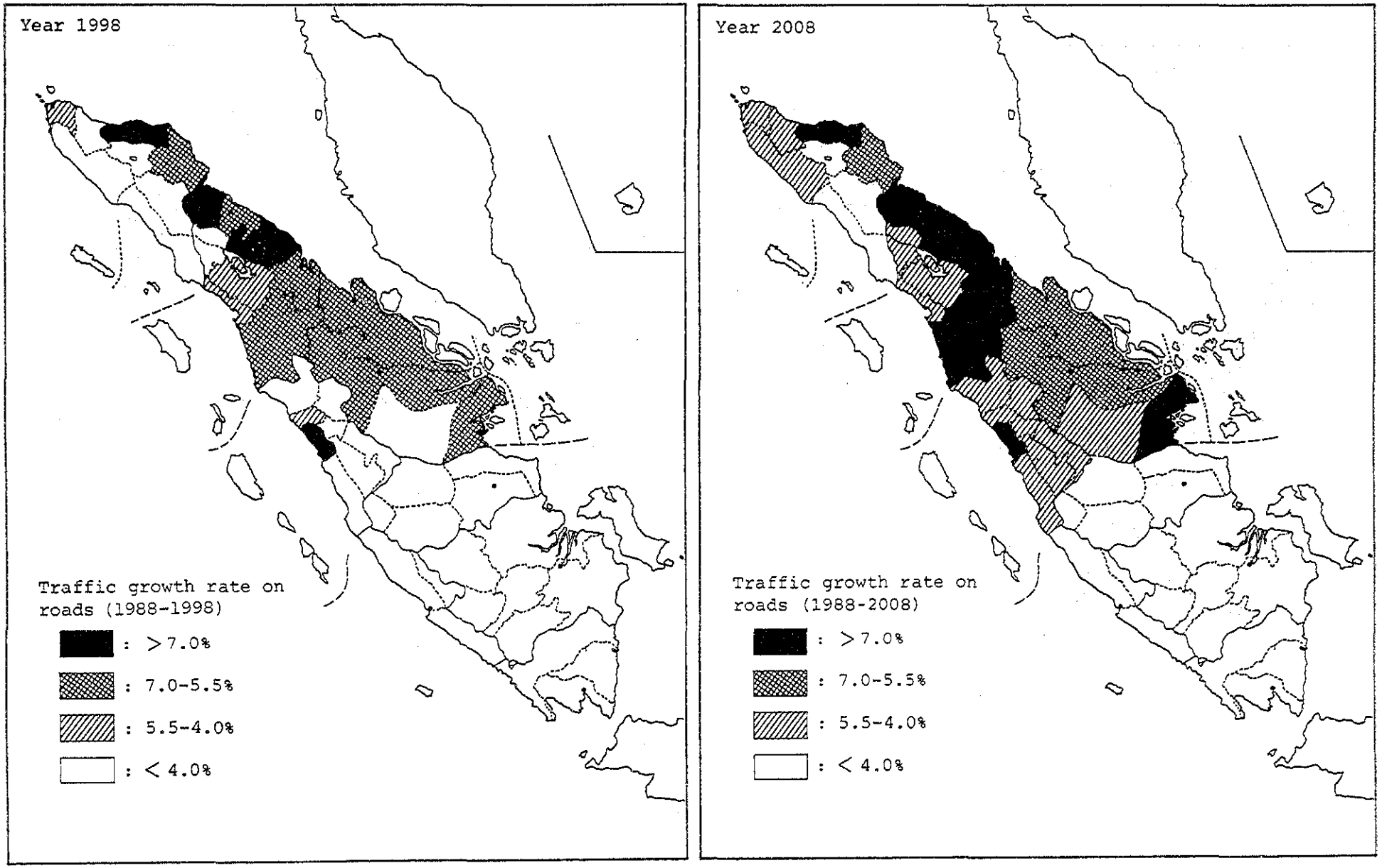
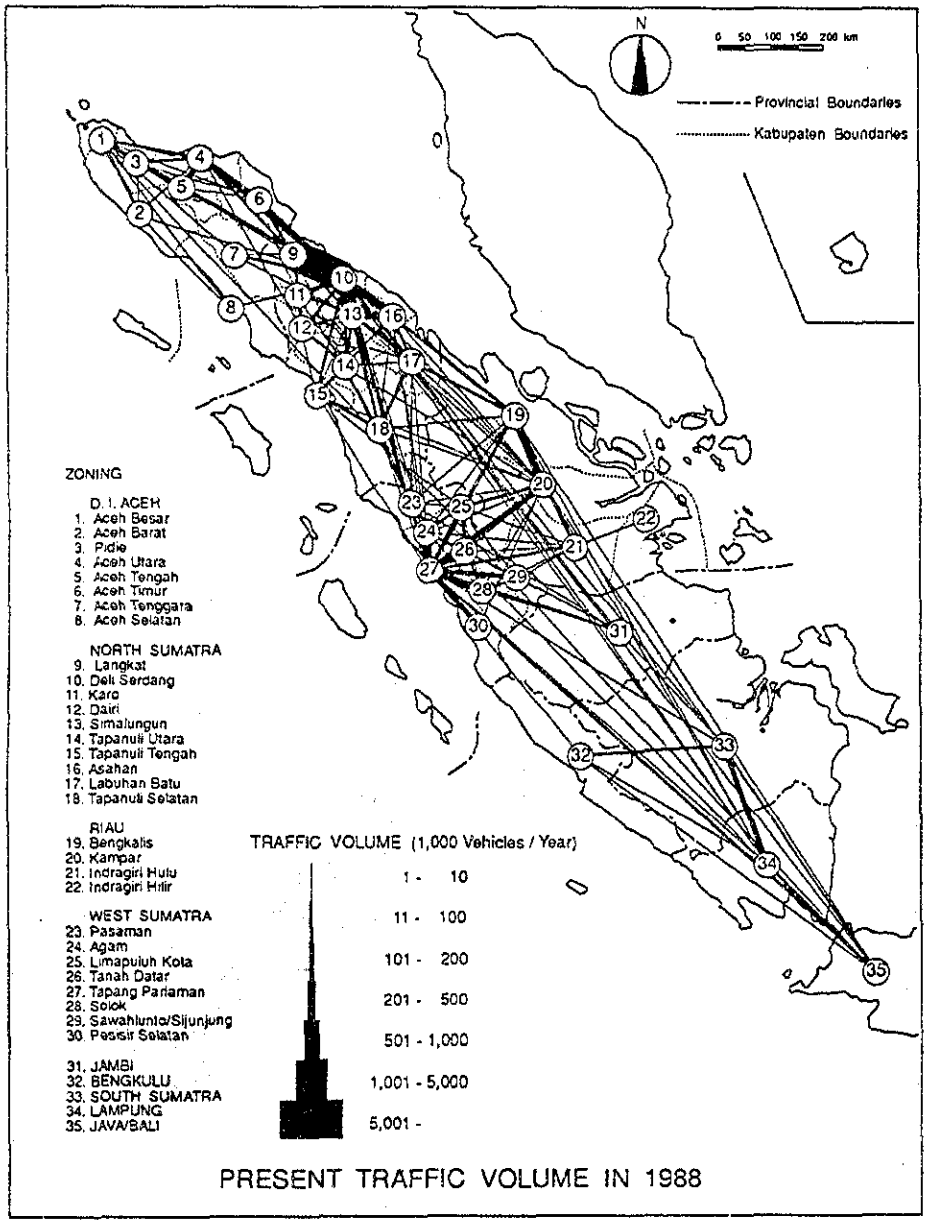


Figure 22. Development Prospect (Transportation) - 1



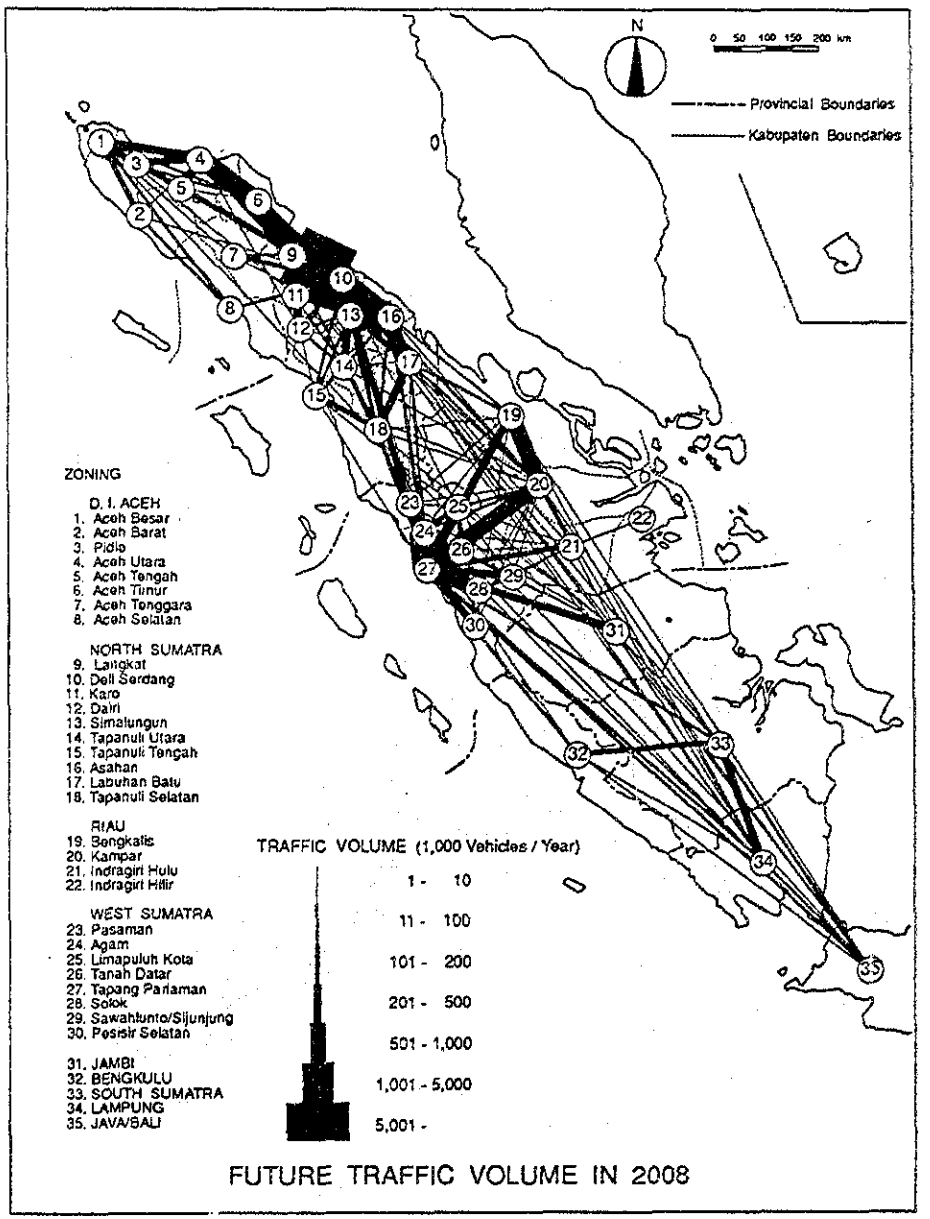


Figure 23. Development Prospect (Transportation) - 2

G. Telecommunication

1. General

204. In Indonesia the telecommunication sector has been making significant progress in terms of the number of telephone subscribers. It has increased about 10% annually during the last ten years. Nevertheless, the demand for telephone services has increased much faster, thereby causing an imbalance in the demand and supply of telecommunication services. From the international point of view, however, the telephone penetration ratio still remains the lowest among the ASEAN countries (Table 29).

Table 29. Telephone Penetration Ratio in ASEAN Countries

Country	Telephone Penetration Ratio
Indonesia	0.4
Malaysia	6.3
The Philippines	1.0
Singapore	32.5
Thailand	1.5

Note: Telephone penetration ratio is calculated as main telephone sets per 100 inhabitants.
Source: ITU, Year Book of Common Carrier Telecommunication Statistics, 1987.

Improvement of this situation has been difficult due to severe budget constraints. The target of 0.9 penetration ratio during Repelita IV now seems almost impossible to achieve. It is apparent that this delay in service provision has had some adverse effects on the Region's overall development.

205. Set against this general background, this Study will focus on the following points:

- Clarifying the present status of the telecommunication sector in the Region;
- Identifying its development needs;
- Specifying the sectoral development concept; and
- Preparing projects or programs for supporting and strengthening social and economic infrastructures in the Region.

2. Analysis of the Present Situation

206. From the management viewpoint, there are several major problems with the sector. The telephone penetration ratio in the Region remains at a low level compared with the international level, but is higher than the national figure: Region 0.44, Indonesia 0.40. Considering the level of telephone service provisions, the rate of automization of switching equipment is high, but the rate of automization of switching centers is low (Region 28.6%, Indonesia 40.0%). It is still very difficult for many subscribers to make long distance calls by means of direct dialing. There are still many applicants waiting for subscription to telephone services in big and medium switching centers in the Region. This is especially true in

Medan, Batam, Banda Aceh, Pekanbaru and Padang, as is shown below in Table 30. The installation rate in 11 major cities is 68%.

Table 30. Installation Rates in Major Centers

City	Line Units (1)	Subscribers (2)	Waiting Applicants (3)	Demand (4)=(2)+(3)	Installation Rate (1)/(4)%
Banda Aceh	3,000	2,970	2,072	5,042	60
Lhokseumawe	2,000	1,975	399	2,374	84
Langsa	800	796	242	1,038	77
Medan	35,000	33,620	20,519	54,139	65
Binjai	1,000	992	509	1,501	67
P. Siantar	4,000	3,952	369	4,321	93
Padang	11,000	7,628	6,231	13,859	79
Bukittinggi	2,000	1,983	206	2,189	91
Pekanbaru	5,000	4,916	4,026	8,942	56
Dumai	600	595	1,083	1,678	36
Batam	3,000	1,693	2,081	3,774	79
Total	67,400	61,120	37,737	98,857	68

On the other hand, there are many kecamatans in the Region which do not have telephone services. For example, telephone lines have not yet been installed in 88 kecamatans in Aceh and in 122 kecamatans in North Sumatra. There is a considerable backlog of engineering and construction work owing to the lack of investment funds.

3. Development Strategies

207. With regard to the telecommunication development of the Region, the following objectives are of high priority, considering the present situation of telecommunications and the development goals to be attained in 2008:

- To expand telecommunication facilities based firmly on demand with due consideration to efficiency. Emphasis should be placed on high yield investment and strengthening the infrastructural base. Industrialized areas, commercial areas and administrative centers are of high priority;
- To increase the telephone penetration ratio;
- To advance the automization of subscriber dialing with due consideration to the satellite telecommunication system;
- To improve service quality;
- To lessen disparities between urban and rural telecommunication services, stressing the use of the satellite telecommunication system, and the extension of rural telecommunication networks;
- To develop manpower for the purpose of preparation for establishing a digital network; and
- To improve operating and maintenance capability.

4. Development Vision in 2008

208. The development status of telecommunications in 1988 and the development vision in 2008 are presented in Figure 24.

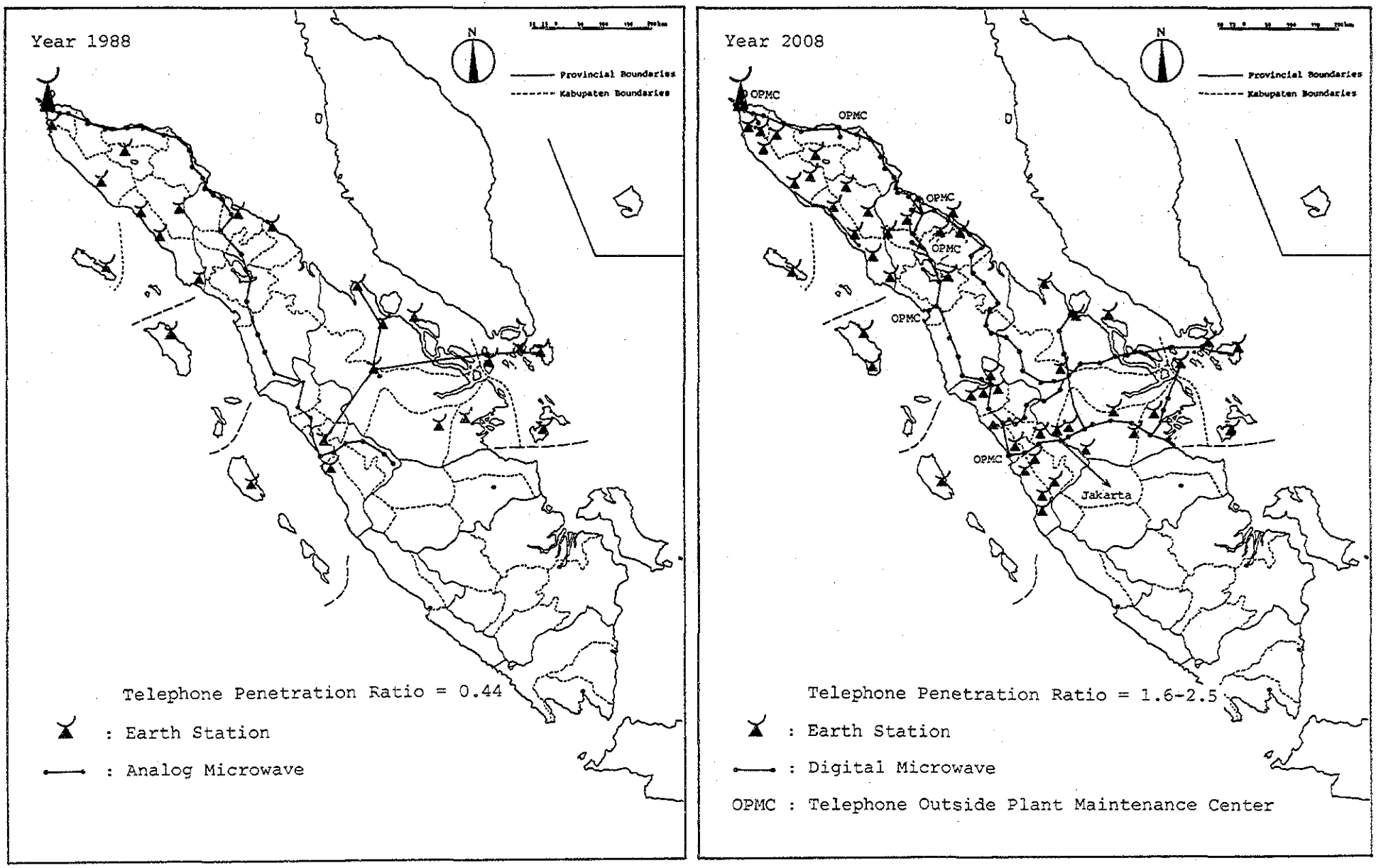


Figure 24. Development Prospect (Telecommunication)

H. Forestry/Environment/Land Use

1. Forestry

209. Goals. Forestry production should be increased to meet industrial and energy needs by way of better management and utilization of productive natural forests, expansion of industrial timber plantation (HTI) and other man-made forests. Meanwhile, their consumption should be reduced by way of modernization and/or efficiency improvement of forestry-related industries. Compared with other productive sectors, however, forestry development needs a much longer gestation period and its benefit should not be weighed in terms of short term economic returns, but attention should be paid to its contribution to environmental conservation. Especially to promote increment of the production, various measures should be taken to conserve natural forests and to step up afforestation/reforestation to keep effective watershed management and soil conservation in the Region.

210. Current production. The Region currently has 67 HPH (concession right) sawmills, 453 non-HPH sawmills, 15 plywood factories and 3 pulp and paper mills. One of the major problems they are about to face is how to tackle the difficulty to access to and the declining availability of suitable timber resources. Therefore, it is an imperative to encourage to reexamine and to strengthen effectiveness of the existing natural forest management system (TPI) in a manner suitable to local conditions of the existing forest cover in the Region and to establish industrial timber plantation. In the long run, it will be useful to start a research program to identify lesser-known unutilized tree species for future exploitation and to develop suitable technologies to process such species.

211. Watershed management. In the Region, eight watersheds (four in North Sumatra and two in Aceh and Riau respectively) are identified as in the most critical condition, with critical land totaling 311,700 ha. For most of the eight watersheds, flood control projects are either being implemented or in the planning stage. In order to complement these works, it will be necessary to step up afforestation/reforestation efforts in the upstream areas. Besides, patches for the eroded areas are scattered in Aceh, North Sumatra and West Sumatra, which become to some 1.67 million ha, and they also require afforestation/reforestation or regreening to conserve soil conditions and to utilize non-industrial wood for local people. Because most of the erosion are brought about by more or less uncontrolled activities to develop agricultural land (e.g., shifting cultivation on steep slopes) or illegal tree cutting by non-HPH sawmills or by local people to obtain firewood, so afforestation/reforestation programs must be organized, not simply to recover forest/vegetative land but also to sustain continued utilization of wood and land for local people.

212. Social forestry. Social forestry has a long history in Indonesia, but these projects will have to be designed and implemented in conjunction with effective watershed reforestation and regreening in order to establish various types of agro-forestry land use systems which combine agricultural growing trees on uplands with arable crops, livestock rearing and rangelands in accordance with community forestry development scheme.

213. Environmental considerations. Forest, as a decisive element in the ecosystem and renewable natural resources, plays a major role in sustaining environment including land, water, air and climate and subsequently social benefit. All development efforts should therefore

be carried out in a balanced way, whereby sectoral and regional targets are achieved and the environment is preserved in the long term.

2. Environment

214. Taking into account the current environmental conditions and issues, the following environmental considerations should be taken to promote and attain the sustainable development in the Region:

(i) Watershed Management:

- to implement and complete planned and on-going watershed management programs with closer cooperation of concerned agencies;
- to improve and establish watershed management systems, especially planning methods, technologies and farming system research on marginal lands; and
- to undertake experimental watershed management projects as a model development of watershed management in the Region.

(ii) Forest and Aquatic Resources:

- to promote forest and aquatic resources inventorying, classification, and land use planning;
- to research lesser-known useful species, reproduction and ecological conditions, and habitats conservation; and
- to develop reserves and national parks, and to integrate resources utilization.

(iii) Biological Diversity:

- to promote inventorying of biological resources and to research ecological conditions; and
- to assess and review of adverse impacts of development projects to the biological resources.

(iv) Pollution Issues:

- to strengthen pollution control activities with establishing "Polluter Pay Principle";
- to promote environmental impact assessment in accordance with the existing EIA system; and
- to monitor environmental conditions especially in large and congested urban areas and to establish proper environmental management systems.

(v) Environmental Assessment:

- In all projects labeled "Environmental Consideration" in the Long List (Vol. IV), environmental aspects must be fully taken into account before the implementation decision is made.

3. Land Use

215. Current land use. The land use intensity in the Region is shown in Table 31. In the Region, about 55% (14.4 million ha) of the total area is converted by the Permanent Forest Land and rest of 45% (12.0 million ha) is by the Convertible Land. The land use intensity in the Convertible Land is about 0.70, and that in the Permanent Forest Land is about 0.10. Despite of its rather wide convertible Land (3.6 million ha), North Sumatra shows the highest land use intensity (0.89) in its Convertible Land. Moreover, it is notable that more than 40% of its Permanent Forest Land has been changed from forest to another land utilization. Thus, North Sumatra could be under relatively tight land use conditions, and also it would be needed more effective land use management programs. West Sumatra also has tight land use potential, but its forest area in the Permanent Forest Land seems to have been kept relatively good conditions as well as Aceh. On the other hand, Riau still has considerable room for spatial development and its land use intensity in the Convertible Land is the lowest (0.58) in the Region.

216. Potential evaluation. The result of land potential evaluation of each Development Area by using the criteria, the agreed forest function area and erosion area, is shown on Table 32 and is summarized hereunder:

(i) Development Areas which need proper soil conservation or land rehabilitation programs (having more than 200,000 ha of erosion area) are: 11) North Tapanuli, 12) Southern Tapanuli, and 14) Central West Sumatra.

(ii) Development Areas which should put high priority on forest conservation and re/afforestration programs in the Permanent Forestry Land (less than 0.5 of forest remaining ratio) are: 9) East Coast, 10) Karo Highland, and 13) Nias.

(iii) Development Areas whose development strategy should be put higher priority on land use intensification than others are: 1) Aceh Besar, 8) Medan Metropolitan, 9) East Coast, and 13) Nias. Because, these areas have relatively high land use intensity (more than 0.9) and there are little room of land use extension.

(iv) Development Areas which have extensive land use potential (more than 100,000 ha) for new development activities are the following 9 areas: 2) North Aceh, 5) West Aceh, 6) South Ace, 12) S. Tapanuli, 19) Mentawai, 20) Kampar, 21) Bengkalis, 22) Indragiri Hulu, and 23) Indragiri Hilir.

217. Strategy. Taking into account the result of land use potential evaluation mentioned above, the following points should be applied on land use strategy for development of the Region:

(i) Since almost all lands with steep slope are included in the Permanent Forest Land, development activities in the Permanent Forest Land should be avoided, in principle, except for forestry development with proper reforestation programs.

(ii) Development activities especially large scale projects should be conducted in the Convertible land taking into account of wildlife conservation.

(iii) Land use intensification should be put higher priority than land use extensification, and enhancement of land productivity should be also promoted for increase of agricultural production with proper erosion control.

(iv) Soil conservation and land rehabilitation measures should be introduced to the cultivation areas having erosion problems.

(v) Reforestation of forest production/concession areas should be strengthened with proper forestry management.

(vi) Main infrastructure-related land issues are the construction of new roads which penetrate tropical primary forest area, and land aquisition for other new kinds of infrastructure such as industrial sites, dams and airports. These issues should be addressed on individual project basis within a broad framework of land use policies.

Table 31. Evaluation of Land Use Intensity in the Region

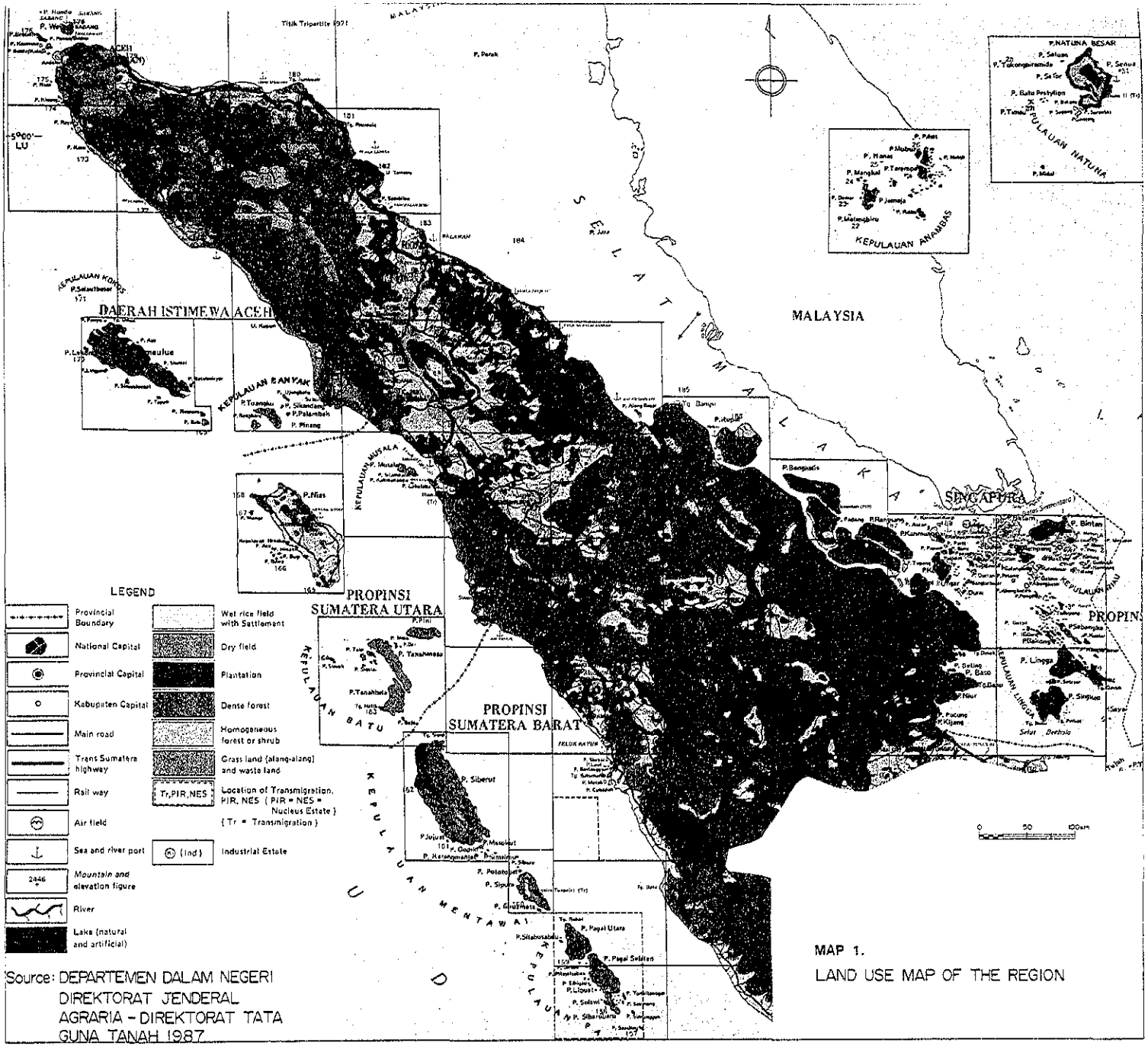
Category	Aceh x1,000ha	Aceh %	North Sumatra x1,000ha	North Sumatra %	West Sumatra x1,000ha	West Sumatra %	Riau x1,000ha	Riau %	Region x1,000ha	Region %
1.Permanent Forest Land										
(1)Forest	2,883.9	52.1	2,075.7	29.0	2,200.2	52.0	3,790.2	40.1	10,950.0	41.5
(2)Bush/Scrub/Grassland	221.1	4.0	834.6	11.6	472.0	11.2	418.1	4.4	1,945.8	7.4
(3)Cultivated/Settled/Others	177.0	3.2	616.7	8.6	271.8	6.4	426.7	4.5	1,492.2	5.7
(4)sub total	3,282.0	59.3	3,527.0	49.2	2,944.0	69.6	4,635.0	49.0	14,388.0	54.5
2.Convertible Forest Land and Others										
(5)Forest	760.9	13.7	415.6	5.8	431.2	10.2	2,029.7	21.5	3,637.4	13.8
(6)Bush/Scrub/Grassland	663.3	12.0	726.4	10.1	278.6	6.6	1,075.1	11.4	2,743.4	10.4
(7)Cultivated/Settled/Others	832.8	15.0	2,499.0	34.9	576.2	13.6	1,716.2	18.1	5,624.2	21.3
(8)sub total	2,257.0	40.7	3,641.0	50.8	1,286.0	30.4	4,821.0	51.0	12,005.0	45.5
(9)total [(4)+(8)]	5,539.0	100.0	7,168.0	100.0	4,230.0	100.0	9,456.0	100.0	26,393.0	100.0
3.Forest Remaining Ratio in Permanent Forest Land [(1)/(4)]	-	0.88	-	0.59	-	0.75	-	0.82	-	0.76
4.Land Use Intensity in Permanent Forest Land [(3)/(4)]	-	0.05	-	0.17	-	0.09	-	0.09	-	0.10
5.Land Use Intensity in Convertible Land [((6)+(7))/(8)]	-	0.66	-	0.89	-	0.66	-	0.58	-	0.70
6.Total Land Use Intensity [((3)+(6)+(7))/(8)]	-	0.74	-	1.06	-	0.88	-	0.67	-	0.82

Source: Estimated by the Team

Table 32. Evaluation of Land Use Potential

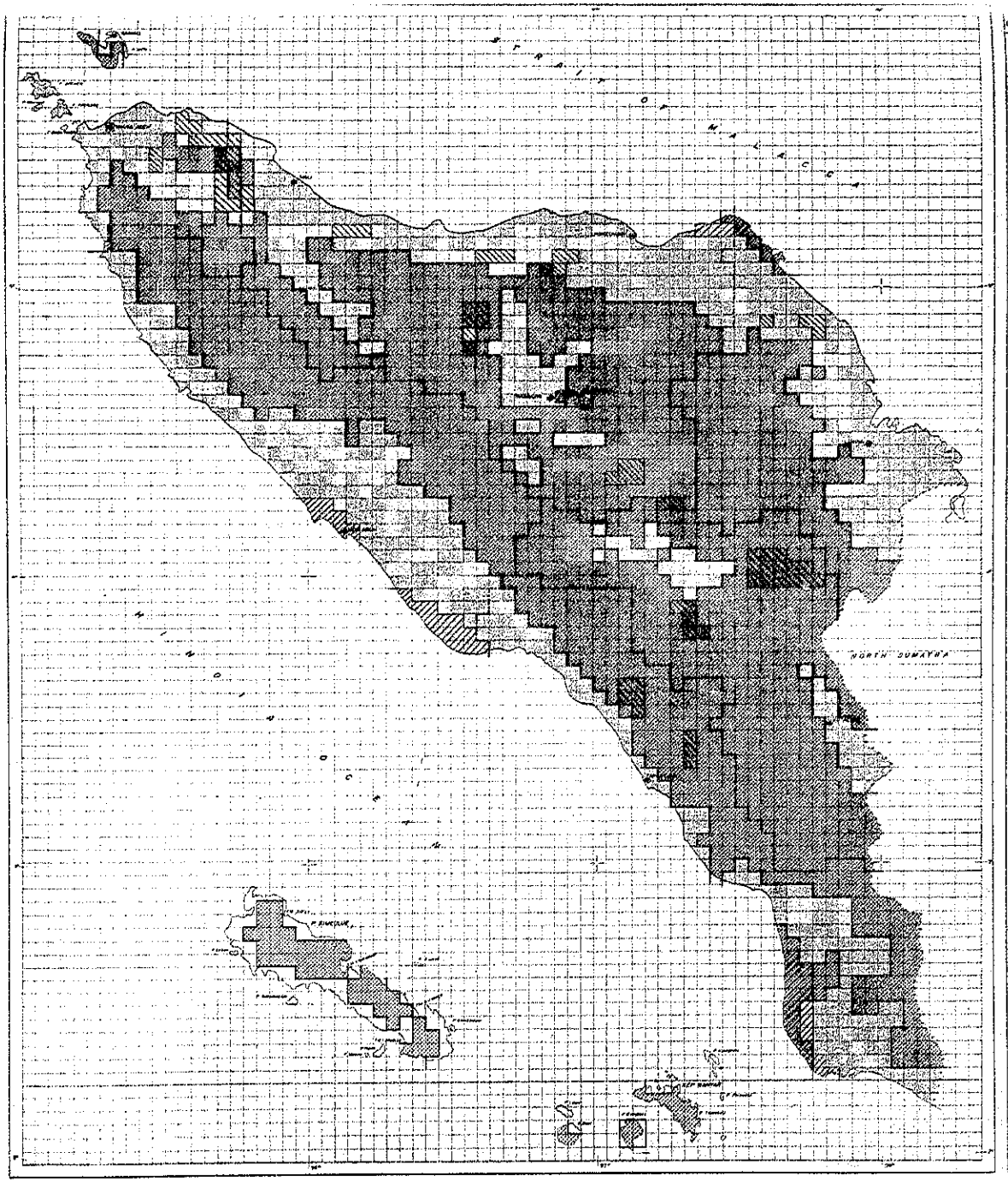
Province	Development Area	Total Area x1000ha	Erosion Area x1000ha	Forest Remaining Ratio*	Land Use Intensity**	Total Potential Land Area x1000ha	Total Potential Land Area %	Potential Area for New Dev.*** x1000ha	Potential Area for New Dev.*** %
Aceh	1) Aceh Besar	326	45	0.6	0.9	150	46	15	5
	2) North Aceh	1,375	58	0.9	0.8	618	45	124	9
	3) East Aceh	776	10	0.8	0.8	311	40	62	8
	4) Southeast Aceh	962	53	1.0	0.7	181	19	54	6
	5) West Aceh	1,085	0	0.9	0.5	526	48	263	24
	6) South Aceh	840	20	0.9	0.4	323	38	194	23
	7) Aceh Islands	175	0	-	-	73	42	-	-
	sub-total	5,539	186	0.9	0.6	2,182	39	873	16
North Sumatra	8) Medan Met.	26	0	0.0	1.0	26	100	0	0
	9) East Coast	2,912	168	0.5	1.0	1,984	68	0	0
	10) Karo Highland	527	95	0.5	0.8	192	36	38	7
	11) N.Tapanuli	1,061	246	0.6	0.7	260	25	78	7
	12) S. Tapanuli	2,110	341	0.7	0.8	618	29	124	6
	13) Nias	532	128	0.5	0.9	199	37	20	4
	sub-total	7,168	978	0.6	0.9	3,279	46	328	5
West Sumatra	14) Central W.S.	546	205	0.6	0.8	213	39	43	8
	15) Pasaman	784	143	0.7	0.8	213	27	43	5
	16) Lima Puluh	343	173	0.7	0.6	18	5	7	2
	17) Southeast W.S.	1,352	168	0.7	0.8	227	17	45	3
	18) P. Silatan	570	101	0.8	0.7	146	26	44	8
	19) Mentawai	635	0	0.9	0.2	212	33	170	27
	sub-total	4,230	790	0.7	0.7	1,029	24	309	7
Riau	20) Kampar	2,835	0	0.8	0.7	1,335	47	401	14
	21) Bengkalis	3,065	0	0.9	0.5	1,364	45	682	22
	22) Ind. Hulu	1,585	0	0.9	0.5	745	47	373	24
	23) Ind. Hilir	1,161	0	0.9	0.6	767	66	307	26
	24) Riau Islands	810	0	-	-	610	75	-	-
	sub-total	9,456	0	0.8	0.5	4,821	51	2,411	25
Region	Total	26,393	1,954	0.8	0.7	11,311	43	3,920	15

notes: *: Forest Remaining Ratio in Permanent Forest Area =Current Forest Area /Permanent Forest Area.
**: Land Use Intensity in Convertible Area.
***: Potential Area for New Development =Land Use Intensity x Total Potential land Area.
Source: Estimated by the Team



Source: DEPARTEMEN DALAM NEGERI
DIREKTORAT JENDERAL
AGRARIA - DIREKTORAT TATA
GUNA TANAH 1987

MAP 1.
LAND USE MAP OF THE REGION



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LEGEND

- PROVINCIAL BOUNDARY
- BOUNDARY OF DEVELOPMENT AREA
- CULTIVATION AND SETTEEMENT AREA (Existing)
- FOREST AREA (Existing)
- GRASS LAND AND OTHERS
- SEVERE EROSION AREA
- SWAMP AREA
- LAKE
- PERMANENT FOREST AREA
- NO DATA

MAP 2.

EXISTING LAND USE AND LAND POTENTIAL AREA

(D. I. ACEH)

D.I. ACEH

SOURCES	BASE MAP	THEMATIC	SHEET
J.I.C.A.	NAME	SIGNATURE	
Drawn By			
Checked By			
Approved By			
Implemented By			

DIRECTORATE OF CITY AND REGIONAL PLANNING
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- CULTIVATION AND SETTEENENT AREA(Existing)
- FOREST AREA (Existing)
- GRASS LAND AND OTHERS
- SWAMP AREA
- SEVERE EROSION AREA
- LAKE
- PERMANENT FOREST AREA

MAP 3.

EXISTING LAND USE AND LAND POTENTIAL AREA

(NORTH SUMATRA)

SOURCES	BASE MAP	ENGINEER	SHEET
DESIGN	NAME	SIGNATURE	
DRAWN BY			
CHECKED BY			
APPROVED BY			
ESTIMATED BY			

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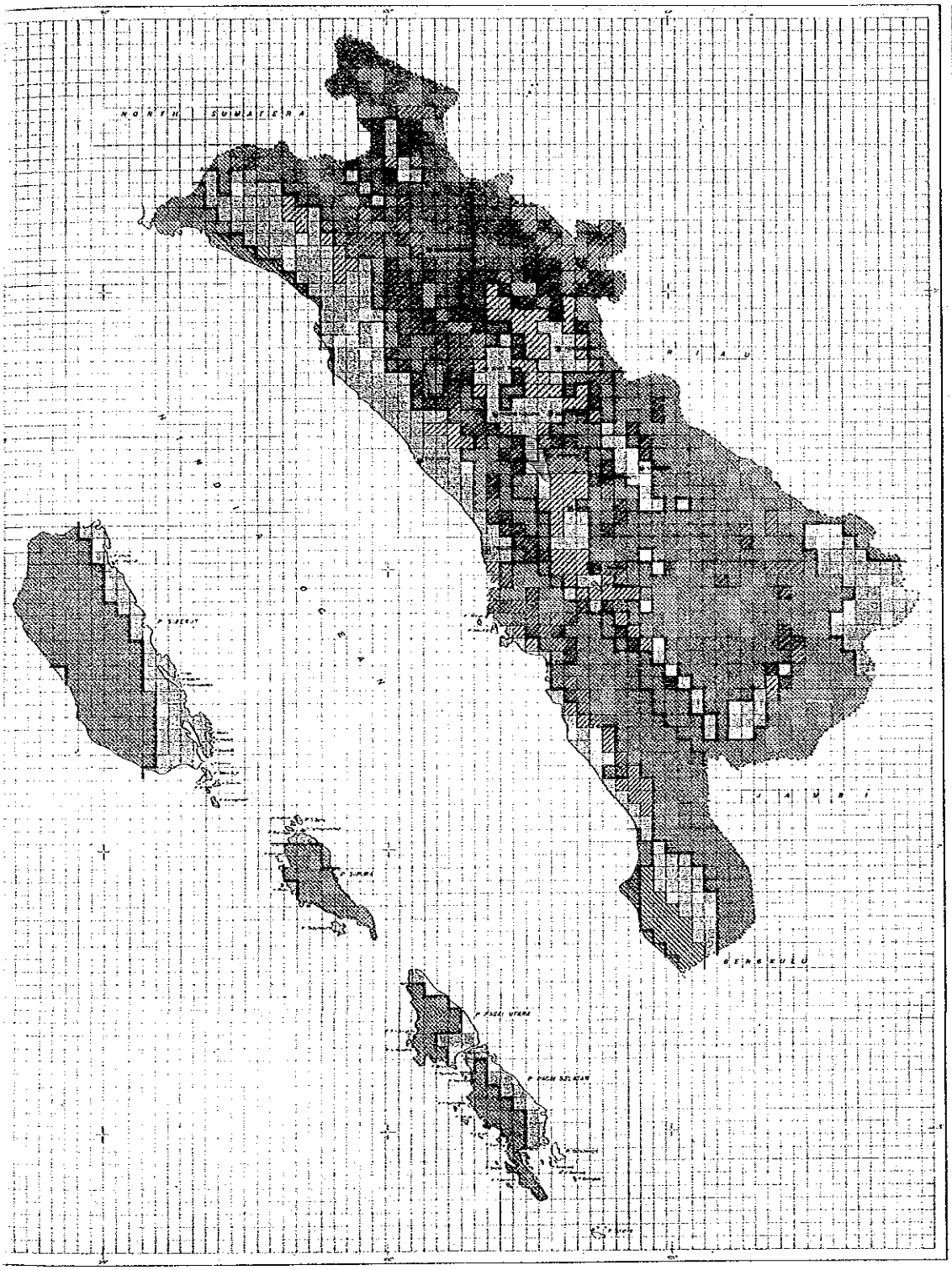

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LEGEND

- PROVINCAL BOUNDARY
- BOUNDARY OF DEVELOPMENT AREA
- CULTIVATION AND SETTEEMENT AREA(Existing)
- FOREST AREA (Existing)
- GRASS LAND AND OTHERS
- SWAMP AREA
- SEVERE EROSION AREA
- LAKE
- PERMANENT FOREST AREA

MAP 4.

EXISTING LAND USE AND LAND POTENTIAL AREA (WEST SUMATRA)

SOURCES	BASE MAP	PUBLISHED	SHEET
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CHECKED BY			
APPROVED BY			
COMPILED BY			

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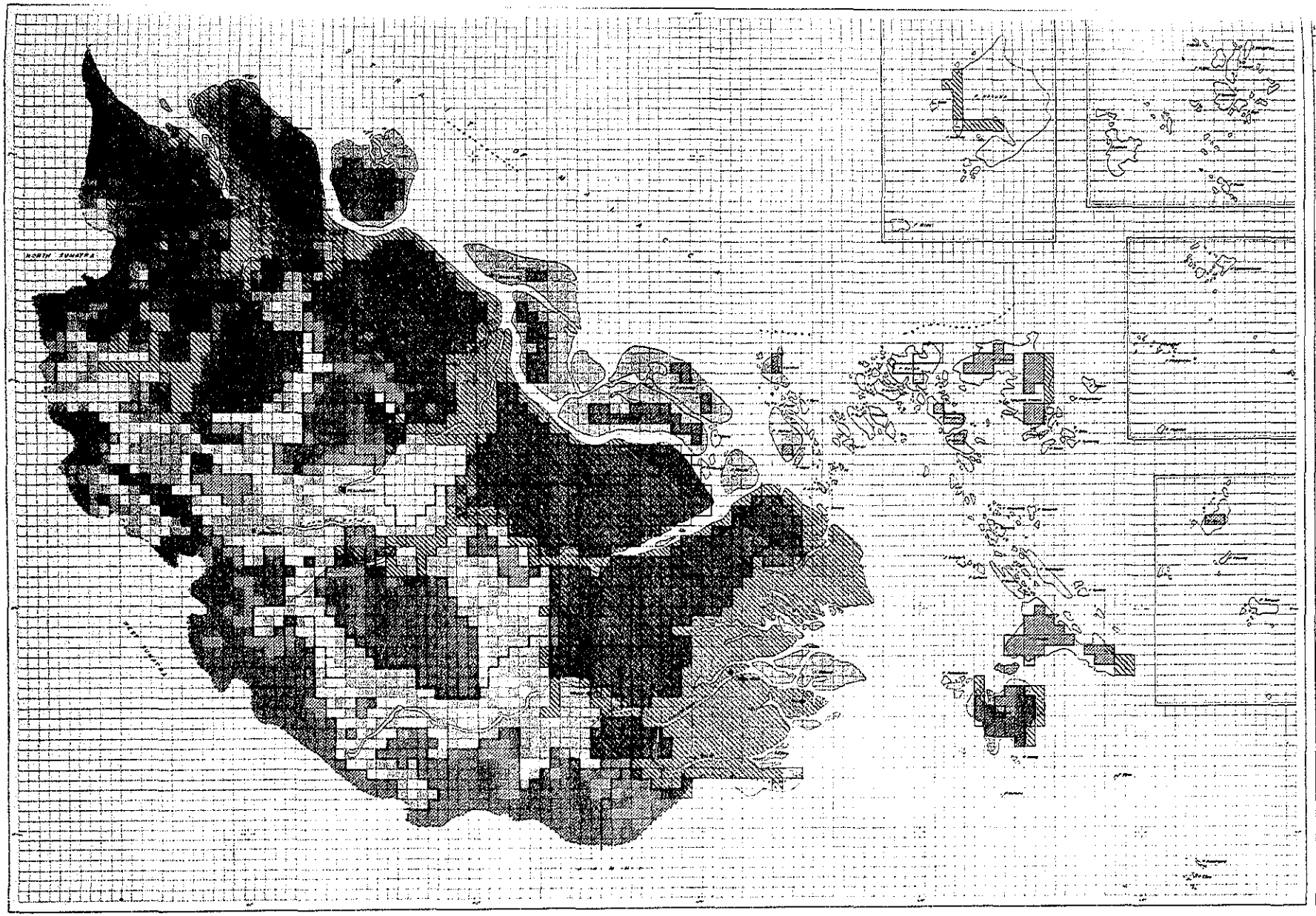
DIRECTORATE GENERAL OF HUMAN SETTLEMENTS
DEPARTMENT OF PUBLIC WORKS



JICA
(Japan International Cooperation Agency) / BAPPENAS

THE STUDY ON THE INTEGRATED REGIONAL DEVELOPMENT PLAN FOR THE NORTHERN PART OF SUMATRA, INDONESIA

LEGEND

- PROVINCAL BOUNDARY
- BOUNDARY OF DEVELOPMENT AREA
- CULTIVATION AND SETTLEMENT AREA(Existing)
- FOREST AREA (Existing)
- GRASS LAND AND OTHERS
- NO DATA
- SWAMP AREA
- SEVERE EROSION AREA
- LAKE
- PERMANENT FOREST AREA

MAP 5.

EXISTING LAND USE AND LAND POTENTIAL AREA (RIAU)

DIRECTORATE OF CITY AND REGIONAL PLANNING
DIRECTORATE GENERAL OF HUMAN SETTLEMENTS
DEPARTMENT OF PUBLIC WORKS

I. Tourism

1. Development Goals

218. The major development strategy may be summarized as follows:

- to develop tourism routes responding to different submarkets based on the tourism networks in the Region.
- to improve or build up the relevant infrastructure such as roads, seaports, airports, telecommunications, water supply, and so forth, to strengthen the tourism networks, and to induce private investments. Practically, it is desirable to implement integrated development programs with other related sectors.
- to take necessary actions for conservation of tourism resources such as historic remains, nature reserves, cultural activities and so forth.
- to promote the private tourism industry with incentives such as tax exemption and subsidy.
- to develop human resources in the tourism industry and the relevant government offices and to standardize the level of services responding to various needs of visiting tourists.

219. It will take long time and a great deal of cost to do all the above, however. Therefore, we recommend the following strategy: improvement in the service sector should come first to enhance service quality; this should be supported by the government's investment in tourism-related minimum infrastructure. Then, with more tourists visiting the Region private investors may well be attracted to make investments in tourism facilities. As a result, more tourists will come, and more infrastructure can be developed subsequently.

2. Growth Targets for Tourism in the Region

220. The number of foreign tourists to Indonesia in 1988 has surpassed the target of 1,254,000 tourists set for 1988 and has reached 1,286,000 bringing in foreign exchange amounting to US$1,061 million. However, even with very effective measures from the public and private sectors, tourism is not likely to keep increasing at the present fast pace after 1988/89. The achievement of sustained growth for the next 20 years depends to a great extent on the capability of the public sector to launch the highly ambitious marketing and promotion program. Without intensive and adequate promotion, the international tourists will fail to come and Indonesia will face serious problems in making sufficient returns on its investments in the tourism industry.

221. Table 33 presents the growth targets for tourists from the international markets. As a basis for the projection of tourist flows to the Region a moderate growth of 6.4% has been used. At this growth rate, arrivals will reach 1.3 million in 2008 which is more than triple arrivals in 1988.

Table 33. Growth Targets for Foreign Visitor Arrivals (1988-2008)

(x 1,000)

	1988	1993	1998	2003	2008	Average Annual Growth Rate
Aceh	3	7	13	20	37	13.6%
North Sumatra	116	189	277	368	465	7.2%
West Sumatra	26	44	59	74	96	6.7%
Riau	233	329	425	564	700	5.7%
Region	378	569	773	1,026	1,298	6.4%

Source: Team's estimate.

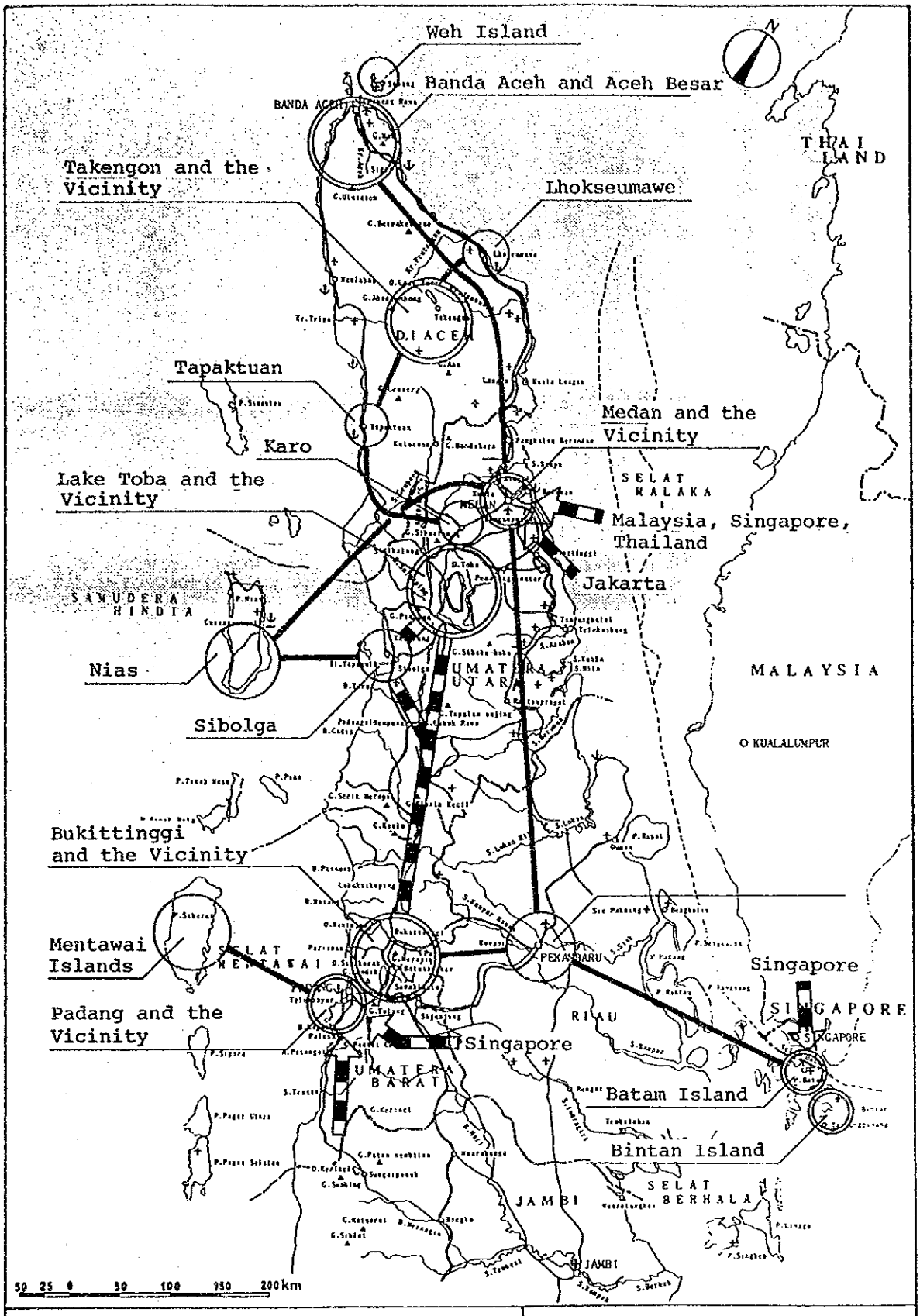
3. Development Concept for the Potential Areas in the Region

222. Based on the inventory of tourism objects and possible activities (see Volume III, Sectoral Analysis), the following areas have been identified as a main tourism development area:

Aceh	- Banda Aceh and Aceh Besar
	- Takengon and the vicinity
North Sumatra	- Medan and the vicinity
	- Lake Toba and the vicinity
West Sumatra	- Padang and the vicinity
	- Bukittinggi and the vicinity
Riau	- Batam Island
	- Bintan Island

223. Some other areas have been identified as a sub tourism development area. Figure 25 presents the tourism network system in the Region.

224. The tourism development concept for each potential area is shown in Table 34. Needless to say, the main areas should be given the higher development priority than the sub areas, as the former areas are very important key components for the formation of efficient and attractive tourism network system which will determine major tourist routes and flows in the Region. The sub areas will utilize efficiently their own attractiveness to a great extent only after the establishment of the region-wide network.



LEGEND :

Main Area — Main Axis

Sub Area — Sub Axis

Figure 25.

Tourism Network System in the Region

THE STUDY ON THE INTEGRATED REGIONAL DEVELOPMENT PLAN FOR THE NORTHERN PART OF SUMATERA

Table 34. Development Concept for Each Area

Potential Area	Development Status	Target Market			Development Concept toward 2008
		International	Foreign resident	Domestic	
Banda Aceh and Aceh Besar	main area	◎	○	○	Urban sightseeing for Acehnese cultural heritage and beach resort development. Accessibility improvement from Medan, one of main gateway cities to the region
Weh Island	sub area	○	◎	○	Marine sports resort and comfort ferry service from Banda Aceh to Sabang
Lhokseumawe	sub area		○	◎	Beach resort development and Urban sightseeing for young people's educational tour (industrial complex)
Takengon and the vicinity	main area	○	◎	○	Lake resort and wild life tour base development including hunting. Accessibility improvement from Lhokseumawe
Tapaktuan	sub area			◎	Recreation area development for day trippers
Medan and the vicinity	main area	◎	○	◎	Major gateway city development. Urban sightseeing, shopping and entertainment
Lake Toba and the vinicity	main area	◎	◎	◎	Lake resort development utilizing Toba Batak cultural hertige. Tourism network development with Karo highlands and Minang highlands.
Nias	sub area	◎	○	○	Marine sports and beach resort development and sightseeing for unique Nias cultural heritage. Accessibility improvement from Sibolga by ferry and Medan by air plane.

Table 34. Continued

Potential Area	Development Status	Target Market			Development Concept toward 2008
		International	Foreign resident	Domestic	
Karo	sub area	○	◎	◎	Weekend resort and recreation area development
Sibolga	sub area	○	○	◎	Beach resort development and sightseeing for cultural heritage
Padang and the vicinity	main area	○	○	◎	Gateway city development to Minang highlands and Mentawai islands. Urban sightseeing and beach resort development
Bukittinggi and the vicinity	main area	◎	◎	◎	Highland resort development utilizing Minang Kabau cultural heritage. Accessibility improvement from Lake Toba area and Riau
Mentawai Islands	sub area	◎	○	○	Adventurous sightseeing for naive way of life. Tourism route development with Nias, Minang highlands
Batam Island	main area	◎	○	○	Gateway to Riau archipelago development. Beach resort development for tourists from and via Singapore, and business tourism development in accord with on-going industrial and commercial developments in the island.
Bintan Island	main area	◎	○	○	Marine sports and beach resort development in cooperation with Batam Island development
Pekanbaru and the vicinity	sub area	○	○	◎	Sightseeing for cultural heritage and wild life tour development

J. Urban and Rural Development

1. Development Issues

225. Based on the present situation the following development issues are extracted:

(i) to support IUIDP (Integrated Urban Infrastructure Development Program) in the Region technically and financially for further implementation of urban development. Close coordination with different donor agencies, such as IBRD, ADB and so forth is necessary for this program;

(ii) to stabilize and diversify major cities' urban activities, in particular, Medan and Padang;

(iii) to develop hinterland service functions in medium- and small-size urban centers to serve local villages, and transmigration settlement areas. For this purpose, improvement of road networks especially linking to smaller centers is crucial in hinterlands; and

(iv) to execute multi-sectoral development programs such as PDP (Provincial Development Program) and ADP (Area Development Project) for the areas located in strategic hinterlands. It is necessary for the formation of the program to integrate various sectors into some program packages under the common and unified planning goals and objectives

2. Development Objectives

226. The planning objectives for urban and rural development may be crystalized into the followings:

(i) to achieve more balanced spatial development and increased regional integration, namely, to build up balanced settlement patterns harmonized to the efficient urban system and hierarchy based on the appropriate functional interdependency among cities and rural areas;

(ii) to provide adequate urban services capable of meeting basic human needs in the Region, in particular, to improve urban and rural infrastructure such as water supply, drainage system, solid waste management system, electricity, sanitation facilities, housing, communication facilities and so forth. The emphasis should be put on secondary cities as well as the primary city;

(iii) to realize more rapid labor absorption, in particular, in urban centers, and to increase and diversify income-earning opportunities, in particular, in rural areas; and

(iv) to establish an efficient institutional framework and to strengthen financial capabilities of the local government for urban and rural development.

3. Development Concept

227. The 71 SUAs (Strategic Urban Area; see Volume III, Sectoral Analysis) in the Region are classified into the following 6 hierarchical categories based on future functional roles in the urban system. This classification is utilized as planning guidelines for the establishment of the regional urban system.

(i) National Development Center (NDC)

Primary urban growth center with diversified urban functions and functional hub in the urban system not only in the Region, but also in the national level.

(ii) Regional Development Center (RDC)

Urban growth center with high potential for growth in the Region, namely, with the higher administrative status and functions than cities in the other categories except NDC, and/or with high industrial growth potential. NDC and RDC will function as the primary node in the regional urban system.

(iii) Interprovincial Development Center (IDC)

Urban growth center with potential for growth in interprovincial functional linkages and communication. IDC will function as the secondary node in the regional urban system.

(iv) Provincial Development Center (PDC)

Urban center mainly with hinterland support functions in provincial and inter-kabupaten (subregion) levels.

(v) District Development Center (DDC)

Urban center with hinterland support functions in kabupaten and inter-kecamatan (subdistrict) levels.

(vi) Local Service Center (LSC)

Service center of kecamatan.

The proposed urban system in the Region is shown in Figure 26 based on the classification.

228. Two different strategic development areas are defined for urban and rural development. Their definitions are as follows:

(i) Strategic Urban Development Area: this area is defined as an urban development hub which has high development potentials and is expected to function as an important central node in the proposed future urban system. In this category some rural areas which have strong physical and functional linkages to urban centers are also included.

(ii) Key Hinterland Development Area: this area is defined as a strategic hinterland which is at present relatively less developed and will decline without strong support from development activities, even though it has a latent but high development potential. In other words, this is an area which should receive strong policy support at present; otherwise it might give adverse effects on the development of the whole Region in the future. If the area is developed properly and smoothly, it will strengthen not only its own economic and social base but also that of the strategic urban development area.

229. Harmonizing the development of the two different areas will be quite crucial to the development of the Region as whole. Area categorized into the two defined areas are listed below.

Strategic Urban Development Area

(i) Banda Aceh
(ii) Lhokseumawe-Langsa
(iii) Medan-Tanjung Balai/Kisaran
(iv) Sibolga-Padangsidempuan
(v) Padang-Urban centers in the Minang highlands
(vi) Pekanbaru-Bankinang
(vii) Dumai
(viii) Batam-Tanjung Pinang

Key Hinterland Development Area

(i) Aceh Besar-Pidie
(ii) Western Coastal Zone of Aceh
(iii) Tapanuli Selatan
(iv) Nias
(v) West Pasaman
(vi) Pesisir Selatan
(vii) North Kampar and West Bengkalis
(viii) Indragiri Hulu and Indragiri Hilir

4. Employment Prospects[1)]

230. A rapidly increasing employment in the Region during the Repelita V period (see para. 70), accounting more than 1 million should be absorbed mainly within rural areas which hold more than 75% of the total population. The Government introduced a variety of policy measures to cope with the employment problems in rural areas directly or indirectly through development of small-scale, traditional and informal enterprises, as well as cooperatives. These policy measures are summarized below.

(i) Credit Schemes: A variety of credit scheme for small scale, offering loans ranging from as low as Rp. 20,000 and upto Rp. 75 million for a multitude of purposes including small investment credit (KIK), permanent working capital credit (KMKP), credit to small farmers, credit to small tenders, mini credit and village credits. In operation since December 1973, the objectives of the KIK/KMKP scheme are: creation of employment development of entrepreneurship, expansion of local markets, and the general promotion of productive economic activities.

(ii) Agricultural Program: To increase agricultural output and hence the income of more people in rural areas, the government has been conducting agricultural program of intensification, extensification, diversification and rehabilitation and supply seeds, fertilizers as well as irrigation networks.

(iii) Village Assistance Program: Since the first year of Repelita I, the government has provided annual cash grants to each village. The amount of the grants continuously increased from Rp. 100,000 per village (1969) to Rp. 300,000 (Repelita II), Rp. 1 million (1979) and Rp. 1.6 million (1988/89). These money was used to build and improve rural infrastructures (small dams, irrigation channels, roads, bridges, school buildings, community halls, village offices, mosques and churches) and created new rural employment. Most workers in these programs were the low income groups.

[1)] This section is heavily relied on "Employment Creation for Rural Development in Indonesia" by Mr. Sunardi Setyo Budi, Final Report, Seminar in Economic Development, IDCJ, Tokyo, December 1989.

(iv) Rural Inudstries: In order to give small farmers and landless with additional income sources outside agricultural sector, the Government set up a special agency to provide technical and managerial guidance called BIPIK (Small-scale Industry Development Guidance), and encouraged to promote small-scale industries.

(v) Projects Under Presidential Instruction (INPRES): There are several types of projects in rural areas that should be implemented in large numbers. To speed up the procedures, the President issued special instructions called INPRES. There are INPRES for primary schools, public health, reforestration and markets. The funds allocated to those programs have been continuously increasing.

(vi) Volunteer Services (BUTSI): The Indonesian Board for volunteer services referred to as BUTSI is a government body sending educated youths to the village to serve as facilitators to accelerate the progress of rural development. Volunteer workers serve the village for two years and work full time with the various organizations and community leaders in five defined areas, namely, local government, education and training, health and family planning, infrastructure and production.

(vii) Vocational Training: The Government operates vocational training centers around the country offering courses for a duration of three months in a range of skills including automechanic, electronics, welding, carpentry and joinery, building construction, plumbing and sheet metal. The training is a part of manpower planning to enhance productivity, to enable manpower movement and promotion of personnel in a company, to adjust and adapt skills to new working requirements in accordance with the advancement of technology, to make employment easier for new workers applying for a job, as well as for self-employment and independent business.

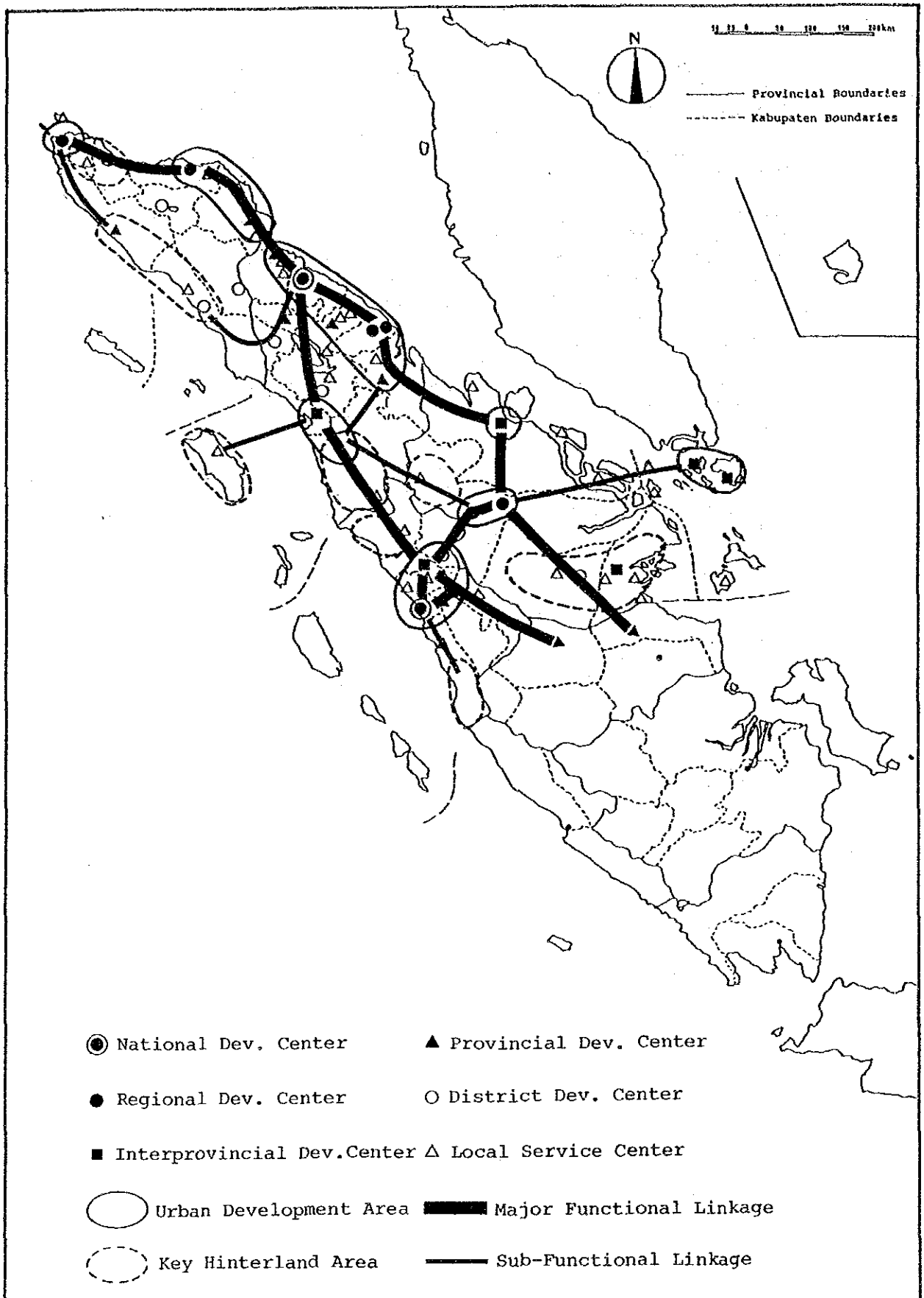


Figure 26. Function Linkage of Urban Development Area and Key Hinterland Area

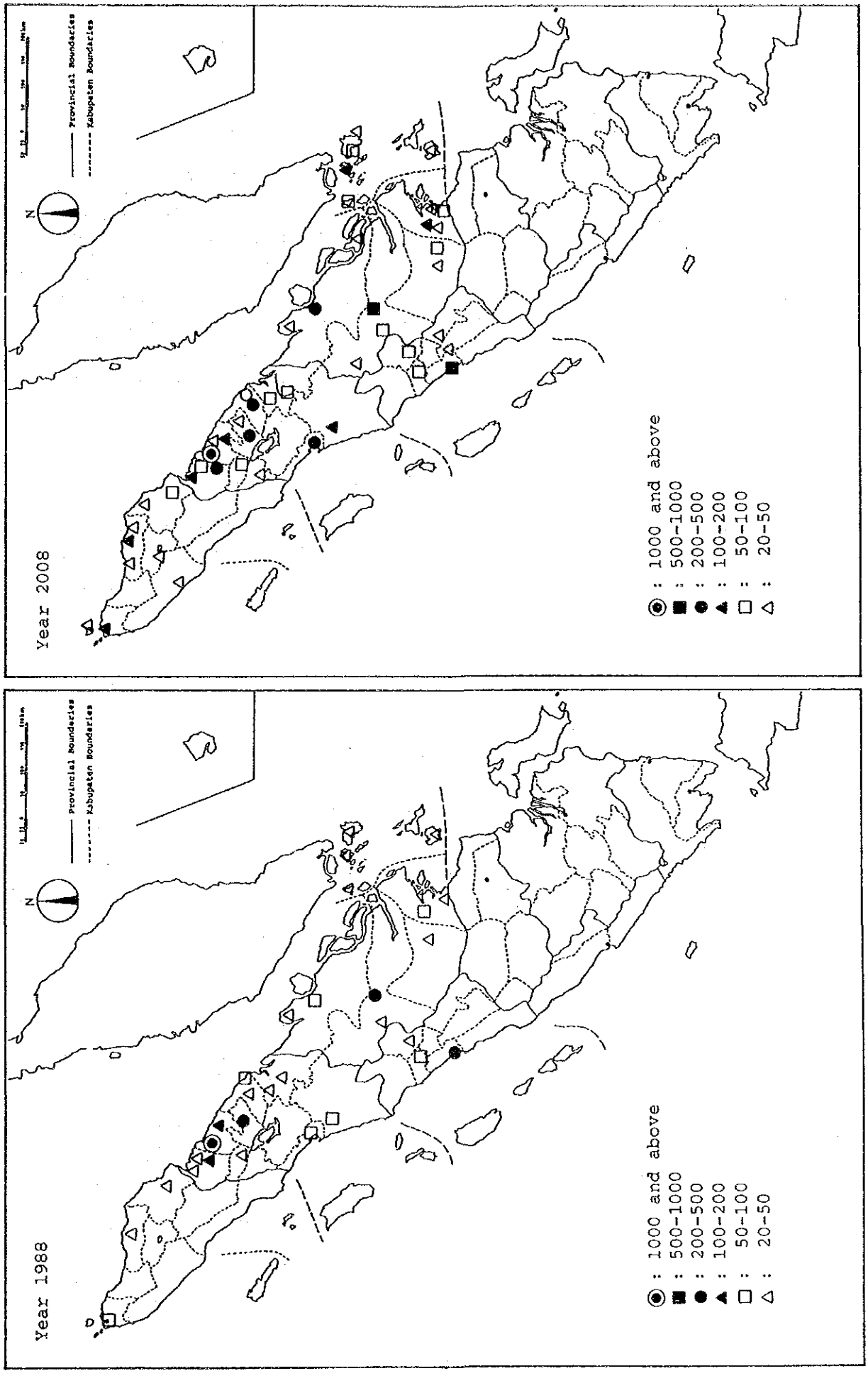


Figure 27. Development Prospect (Urban Growth)

VII. SELECTION OF PRIORITY PROJECTS

1. Project Identification

231. There are two typical ways of identifying projects in regional planning. One is to identify such projects as make up part of a national network or program. (Microwave system construction or agricultural extension centers, for example.) These projects are "top-down" by nature and their formulation is governed by sectoral priority and national consistency. The other way of identification is to heed local needs. (Feeder roads or small fishing ports, for example.) Projects identified this way are "bottom-up" (at least in their orientation) and attentive more to local specifics than to the overall structure. It is ideal if "top-down" projects fulfill local needs without conflict and "bottom-up" projects beautifully fit into the national framework. And this is exactly what regional planning aims at. This, however, does not occur easily in reality.

232. One motivation behind our adopting the IDEP approach is to overcome the above difficulty. To avoid too strict sectoral priority on the one hand and too inefficient project proliferation on the other, the IDEP approach uses a two-way process of project identification. As explained earlier, 11 sites are first selected as high-priority areas on various strategic accounts. After a close study of local conditions, projects are designed which will facilitate the area's efficient development while interacting with each other (IDEP projects). Separate from this procedure, projects necessary from the sectoral viewpoints are also identified throughout the Region (sectoral projects). Those sectoral project ideas and the IDEP project ideas are then subjected to joint review in which sectoral ones are modified to heed IDEPs' particular needs while IDEP ones are scrutinized with respect to their consistency with the overall framework. The outcome of this joint review is a set of projects (both sectoral and IDEP) which are mutually supportive and consistent. This process is repeated several times as the Study proceeds with feedback of new situations and reactions. The final set of identified projects can be found in the Long List of Volume IV. They total 430. Those projects which consist of an IDEP are separately listed in the IDEP's section in Chapter VIII. The total number of those IDEP projects is 291.

233. The project ideas basically come from four sources:

(i) Study Team
(ii) Central government ministries and agencies
(iii) Local government agencies
(iv) Donor agencies

Though many project ideas are due originally to outside sources, they have undergone an extensive process of scrutiny and modification by the Team to be formulated into the final version. The Long List thus tries to be both comprehensive and original, searching for relevant project ideas from as many sources as possible and tailoring them to the Study's particular framework. Nonetheless, the Team does not claim that it is exhaustive or that projects not listed there be dismissed. Rather, it would be justifiable and appropriate to treat the List as tentative, something to be reviewed and renewed continually as the situation tends to be diverted from the predicted course.

2. Priority Setting

The projects on the Long List are those which should be initiated sometime during 1989-2008. The Team, at the second step, classifies them according to their appropriate timing of implementation, hereby setting priority on them. Namely, all the projects (sectoral and IDEP) are evaluated with respect to a certain set of criteria (discussed below) and classified into either one of the following three categories:

S: short range, initiation during 1989/90~1993/94
M: middle range, initiation during 1994/95-1998/99
L: long range, initiation during 1999/2000-2008/2009

The results of this classification, or priority setting, are shown in the last column (labeled "Priority") of the Long List. The numbers of projects under the three categories are 250(S),149(M) and 31(L), respectively. This tilted distribution is due to the fact that many projects have a long gestation period and that the Team classified such projects into S as far as some forms of initial activities (like a feasibility study) are expected or needed soon. For each of those projects rated as S, that is, those which deserve immediate implementation during 1989/90-93/94 (Repelita V), a project profile is prepared separately to give some more information on its nature. These profiles constitute Chapter II of Volume IV.

3. Criteria for Priority Setting

235. Criteria used for setting priority among projects are as follows:

1. How much benefit can be expected?

1.1. Production increase
1.2. Export increase
1.3. Employment generation
1.4. Income generation
1.5. Higher quality of life
1.6. Environment conservation

2. How efficiently can the benefit be gained?

2.1. Utilization of the past investment
2.2. Shorter lead time to bear benefit

3. How equitably can the benefit be distributed?

3.1. Benefit to the Region
3.2. Benefit to less developed areas

4. How difficult/urgent is it to implement the project?

4.1. Total cost required
4.2. Technical/political difficulty
4.3. Maturity
4.4. Urgency

236. Criteria for project evaluation cannot be specified without referring to the strategies. In accordance with our master strategy of growth with equity, the Team has stressed aspects related to, first, efficient utilization of limited resources (item 2) and, second,

equitable distribution of the fruits (item 3). Benefit of the project (item 1) is, of course, the primary concern in every project evaluation, but what kinds of benefit is a question whose answer also depends on the strategy. Again in line with the master strategy, item 1 is further broken down into production and export increase on the one hand and employment and income generation on the other. Item 1.5., higher quality of life, measures contribution both to the fulfillment of basic human needs (BHN) and to the enhancement of living amenity. Environment conservation through development is another important type of benefit to aim at. Each item's weight is specified as shown in the evaluation sheet reproduced below (Table 35).

237. Each project is assessed with respect to those criteria and rated item by item at either 5, 3, 2, 1 or 0. After calculating the weighted sum of the itemized scores, the Team rearranges the projects, sector by sector, in order of score. The scoring range between the highest and the lowest point is then divided evenly into three, and projects whose score ranks among the top third are labeled S (= short range), among the middle third, M (= middle range), and among the lowest, L (= long range). Table 35 shows the evaluation sheet used to facilitate the above procedure.

4. High Priority Projects

238. Priority projects rated S (total 250) are those to be initiated during 1989/90-93/94. From among them 132 (Vol. I, p.45) projects are further selected as high priority. They deserve immediate action because of their primary importance either to an IDEP or to a sector. Their selection is based on judicious judgment, best possible at this time. Nonetheless the Team does not imply by the term high priority that their feasibility is guaranteed. They should also be subjected to a scrutiny before implementation, and in that sense they are no superior to other S-ranked priority projects. As explained earlier in Section 1, there basically is no distinction between IDEP projects and sectoral projects. They were formulated on the same ground and their status is the same insofar as the Long List and priority setting are concerned. In selecting high priority projects, however, the Team has favored the IDEP projects over the sectoral projects since the IDEP concept lies at the core of this Study. As a result, more IDEP projects are selected as high priority than sectoral projects are (127 to 5). In their presentation, the high priority IDEP projects are so marked in the IDEP lists in Chapter VIII. To facilitate its next-step action, a Guideline for Study is prepared for each high priority project (except those for which a similar document is already being prepared elsewhere). The Guidelines for Study (total 62) are included in Chapter III of Volume IV.

5. Total Project Cost Required During Repelita V

239. It is not realistic to estimate the total cost of these high priority projects. However, the Team considered it important to know at least the magnitude of the required project cost to be implemented by the public during Repelita V. Subject to feasibility study, the total amount for the 177 high priority IDEP projects (this number is larger than 129, because there are considerable number of double counting projects in different IDEPs), was estimated at Rp. 3.6 trillion (US$2,095 million). In addition, there are 42 S-ranked projects outside the 11 IDEPs to be implemented by the public during Repelita V, whose cost was roughly estimated at Rp. 1.6 trillion (US$954 million). Thus, the magnitude of the public investments required during Repelita V would be about Rp. 5.2 trillion (US$3,049 million) for 219 priority projects in the Region. Details are shown in Tables 36 and 37, for within and outside IDEPs, respectively.

Table 35. Project Evaluation Sheet

Evaluation Item	Weight (A) Score (A) x (B)	Score (B)					Weighted
1. How much benefit?	4						
1.1. Production increase	(2/3)	5	3	2	1	0	
1.2. Export increase	(2/3)	5	3	2	1	0	
1.3. Employment generation	(2/3)	5	3	2	1	0	
1.4. Income generation	(2/3)	5	3	2	1	0	
1.5. Higher quality of life	(2/3)	5	3	2	1	0	
1.6. Environment conservation	(2/3)	5	3	2	1	0	
2. How efficient?	2						
2.1. Utilization of the past investment	(1)	5	3	2	1	0	
2.2. Shorter lead time to bear benefit [a]	(1)	5	3	2	1	0	
3. How equitable?	1						
3.1. Benefit to the Region	(3/10)	5	3	2	1	0	
3.2. Benefit to less developed areas	(7/10)	5	3	2	1	0	
4. How implementable?	3						
4.1. Total cost required [b]	(1)	5	3	2	1	0	
4.2. Technical/political difficulty	(1/2)	5	3	2	1	0	
4.3. Maturity	(1/2)	5	3	2	1	0	
4.4. Urgency	(1)	5	3	2	1	0	
Total	10						(50 - 0) [c]

Notes: a) Up to 2 years (5), 3 - 4 years (3), 5 - 6 years (2), 7 - 8 years (1), 9 years and more (0).
b) Up to $ 1 million (5), 1 - 10 million (3), 10 -50 million (2), 50 - 100 million (1),100 million and over (0).
c) 50 is the highest possible score, 0 the lowest.

Table 36 High Priority Projects in 11 IDEPs for Public Investment

Number		P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9	P-10	P-11	Total
	(Sector)	N. Aceh	W. Aceh	Medan	Tapanuli	Nias	Minang	Sijunjung	Mentawai	Rokan	Indragiri	Riau	
A	Agri/ Fishery	3	3	1	7	4	2	2	2	1	4	1	30
B	Water Resources	2	3	2	3	1	2			2	3		18
C	Mining		1		1			1			1		4
D	Industry	2	1	2	1	1	1	0	1	0	1	1	11
E	Energy/ Power	2	3	7	4	2	3	2	1	2	2	2	30
F	Transpor-tation	4	4	6	4	3	4	2	1		3	2	33
G	Telecommuni-cation	1	1	4	2	1	4	1	1	1	2	1	19
H	Forest/ Environ't	1		1		1			1	1	2		7
I	Tourism			1		1						1	3
J	Water Supply		1	1	1						1		4
K	Urban Dev.		1	2	2		1			1	1		8
L	Rural Dev.											1	1
P	Market Study	1	1	1	1	1	1	1		1	1		9
	Total	16	19	28	26	15	18	9	7	9	21	9	177

Investment ($M)													
	(Sector)												
A	Agri/ Fishery	19.1	23.0	2.0	26.8	5.8	4.4	4.0	7.7	1.8	5.0	3.0	102.6
B	Water Resources	4.6	5.2	50.0	35.0	20.0	60.0			37.0	4.9		216.7
C	Mining		0.5		2.4			1.6			2.2		6.7
D	Industry	5.4	0.4	15.4	0.4	0.4	0.4	0	0.4	0	0.4	0.4	23.6
E	Energy/ Power	20.0	6.2	465.0	75.7	2.0	186.2	3.0	1.0	3.0	1.7	1.5	765.3
F	Trans-portation	102.6	49.0	150.0	121.0	31.0	140.0	10.0	0.5		35.0	3.0	642.1
G	Telecom-munication	0.6	1.7	84.1	12.0	2.0	22.4	2.0	0.5	10.0	13.0	5.0	153.3
H	Forest/ Envir't	0.5		1.5		2.0			0.5	0.5	2.0		7.0
I	Tourism			29.0		20.0						31.2	80.2
J	Water Supply		17.0	5.0	5.0						15.0		42.0
K	Urban Dev.		10.0	20.0	15.0		5.0			5.0	10.0		65.0
L	Rural Dev.											1.0	1.0
P	Market Study	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0		9.0
	Total	153.8	114.0	823.0	294.3	84.2	419.4	21.6	10.6	58.3	90.2	45.1	2,114.5

Source: Team's estimation (US$1 = Rp. 1,700)

Table 37 Projects Outside IDEPs for Public Investment

US$ million

	Project	Aceh	N. Sumatra	W. Sumatra	Riau	Total (US$ Million)
A-18	Pilot Fish Processing	0.7				0.7
B-2	Rivermouth Improvement	2.5	2.5	2.5		7.5
B-10	Krueng Aceh Irrigation	35.0				35.0
B-43	Lower Asahan Dev.		40.0			40.0
B-44	Bilah-Barumen Basin		2.0			2.0
C-1	Non-Metallic Mineral Center		6.0			6.0
D-1	Industry Extension Service	2.5	2.5	2.5	2.5	10.0
D-2	Small Industry (BIPIK)	2.5	2.5	2.5	2.5	10.0
D-3	Agro-industry	2.5	2.5	2.5	2.5	10.0
D-5	Institute for Industry Tech		5.0			5.0
D-12	Distributed Data Processing				50.0	50.0
E-4	Mini-Hydropower	17.5				17.5
E-30	Kota Panjang Hydropower				200.0	200.0
E-31	Power Grid System				100.0	100.0
F-12	Besting-Langsa Rail	70.0				70.0
F-20	Banda Aceh Airport	7.0				7.0
F-55	Dumai Part (Ext)				87.0	87.0
F-56	Pekanbaru Port				1.5	1.5
F-59	Benkalis Ferry				1.0	1.0
F-66	Pekanbaru Airport				7.0	7.0
G-5,39	Kotamalya Telephone	57.0			103.2	160.2
G-36	Telecom Tray			2.4		2.4
G-45	Data Communication System				20.0	20.0
H-7	Watershed Manag't Center		11.0			11.0
I-1	Tourism Manag't Center	4.5	4.5	4.5	4.5	18.0
K-4	Banda Aceh Drainage	25.0				25.0
L-4	Pidie Area Development	50.0				50.0
Total		(13) 276.7	(10) 78.5	(6) 16.9	(13) 581.7	(42) 953.8

Source: Teams estimation (US$1 = Rp.1,700)

VIII. INTEGRATED DEVELOPMENT PROGRAM (IDEP)

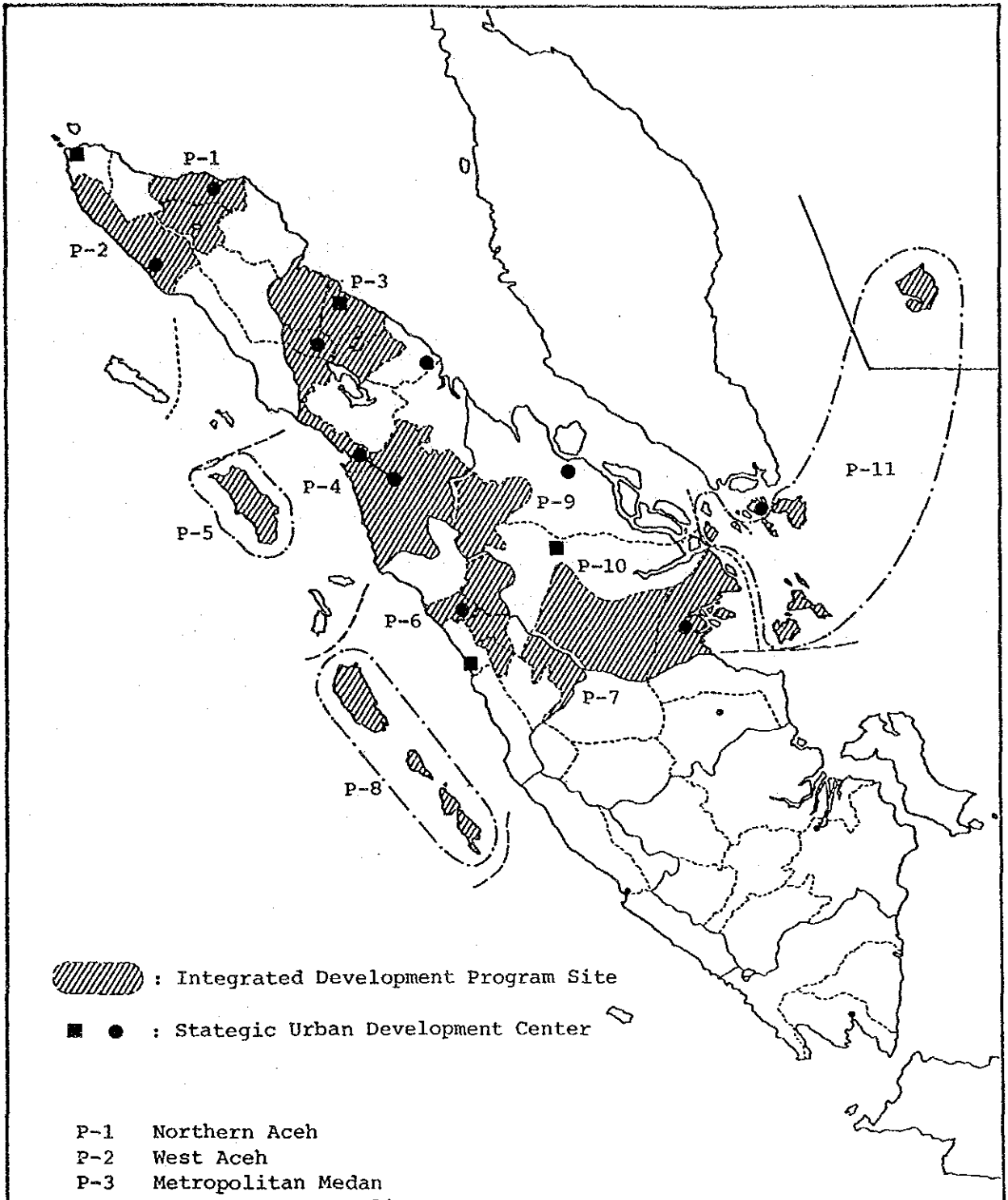
240. This Chapter describes the 11 IDEPs identified in the Study (see Figure 28 for their location). The descriptions basically deal with (i)background, (ii)program area, (iii)development potentials and constraints, (iv)development goals and strategies, (v)identified projects, and (vi)selection of priority projects and their mutual relation. Each Section also contains a map showing the current land use pattern of the IDEP site. To compare the IDEPs' characteristics in the Region's perspective, projections of population, population density, non-oil/gas GDP and per capita GDP for 1988-2008 are tabulated in Tables 38 and 39.

Table 38. Population by IDEP

Province	IDEP		Population (x1000)					Land Area	Population Density				
			1988	1993	1998	2003	2008	(km2)	1988	1993	1998	2003	2008
Aceh	P-1	Northern Aceh	976	1,111	1,253	1,401	1,563	10,330	94	108	121	136	151
	P-2	West Aceh	294	327	362	407	462	10,097	29	32	36	40	46
		IDEP Sub-total	*1,270*	*1,438*	*1,615*	*1,808*	*2,025*	*20,427*	*62*	*70*	*79*	*88*	*99*
		Aceh	*3,225*	*3,656*	*4,105*	*4,586*	*5,121*	*55,390*	*58*	*66*	*74*	*83*	*92*
North	P-3	Metropolitan Medan	5,910	6,617	7,370	8,223	9,245	20,690	286	320	356	397	447
Sumatra	P-4	West Coast Tapanuli	1,223	1,386	1,557	1,748	1,974	21,095	58	66	74	83	94
	P-5	Nias Island	585	667	753	849	962	5,318	110	125	142	160	181
		IDEP Sub-total	*7,717*	*8,670*	*9,680*	*10,820*	*12,181*	*47,103*	*164*	*184*	*206*	*230*	*259*
		North Sumatra	*10,104*	*11,284*	*12,534*	*13,954*	*15,658*	*71,680*	*141*	*157*	*175*	*195*	*218*
West	P-6	Minang Highlands	1,611	1,671	1,732	1,796	1,863	10,406	155	161	166	173	179
Sumatra	P-7	South Sijunjung	150	168	184	198	214	4,259	35	39	43	47	50
	P-8	Mentawai Islands	51	53	55	58	61	7,018	7	8	8	8	9
		IDEP Sub-total	*1,812*	*1,892*	*1,971*	*2,052*	*2,138*	*21,683*	*84*	*87*	*91*	*95*	*99*
		West Sumatra	*3,839*	*4,044*	*4,236*	*4,442*	*4,665*	*42,297*	*91*	*96*	*100*	*105*	*110*
Riau	P-9	Rokan Basin	169	207	245	287	336	6,726	25	31	36	43	50
	P-10	Indragiri River	784	880	982	1,094	1,226	27,460	29	32	36	40	45
	P-11	Riau Islands	420	450	482	517	556	7,487	56	60	64	69	74
		IDEP Sub-total	*1,373*	*1,537*	*1,709*	*1,898*	*2,118*	*41,673*	*33*	*37*	*41*	*46*	*51*
		Riau	*2,821*	*3,289*	*3,801*	*4,378*	*5,031*	*94,562*	*30*	*35*	*40*	*46*	*53*
	IDEP Total		**12,172**	**13,536**	**14,975**	**16,577**	**18,461**	**138,886**	**93**	**103**	**114**	**127**	**141**
	Northern Sumatra		**19,989**	**22,273**	**24,676**	**27,369**	**30,475**	**263,929**	**76**	**84**	**93**	**104**	**115**

Table 39. GDP (Non-Oil/Gas) by IDEP

Province	IDEP		Non-Oil/Gas GDP (Rp. billion, 1983 constant prices)				GDP Growth Rate (%)				GDP per Capita (Rp. million)			
			1988	1993	1998	2008	1988-1993	1993-1998	1998-2008	*1988-2008*	1988	1993	1998	2008
Aceh	P-1	Northern Aceh	485	660	916	1,820	6.4	6.8	7.1	*6.8*	0.50	0.59	0.73	1.16
	P-2	West Aceh	124	164	223	439	5.7	6.4	7.0	*6.5*	0.42	0.50	0.62	0.95
		IDEP Sub-total	*608*	*824*	*1,140*	*2,259*	*6.2*	*6.7*	*7.1*	*6.8*	*0.48*	*0.57*	*0.71*	*1.12*
		Aceh	*1,568*	*2,095*	*2,872*	*5,549*	*6.0*	*6.5*	*6.8*	*6.5*	*0.49*	*0.57*	*0.70*	*1.08*
North	P-3	Metropolitan Medan	2,607	3,486	4,859	10,517	6.0	6.9	8.0	7.2	0.44	0.53	0.66	1.14
Sumatra	P-4	West Coast Tapanuli	381	513	729	1,747	6.1	7.3	9.1	7.9	0.31	0.37	0.47	0.89
	P-5	Nias Island	111	147	213	528	5.9	7.6	9.5	*8.1*	0.19	0.22	0.28	0.55
		IDEP Sub-total	*3,098*	*4,146*	*5,801*	*12,792*	*6.0*	*6.9*	*8.2*	*7.3*	*0.40*	*0.48*	*0.60*	*1.05*
		North Sumatra	*4,093*	*5,455*	*7,593*	*16,485*	*5.9*	*6.8*	*8.1*	*7.2*	*0.41*	*0.48*	*0.61*	*1.05*
West	P-6	Minang Highlands	583	760	1,028	1,997	5.5	6.2	6.9	*6.4*	0.36	0.45	0.59	1.07
Sumatra	P-7	South Sijunjung	65	86	115	219	5.5	6.0	6.7	*6.2*	0.44	0.51	0.62	1.03
	P-8	Mentawai Islands	9	10	13	21	3.3	4.5	5.1	*4.5*	0.17	0.19	0.23	0.34
		IDEP Sub-total	*657*	*856*	*1,155*	*2,237*	*5.4*	*6.2*	*6.8*	*6.3*	*0.36*	*0.45*	*0.59*	*1.05*
		West Sumatra	*1,528*	*1,998*	*2,679*	*5,060*	*5.5*	*6.0*	*6.6*	*6.2*	*0.40*	*0.49*	*0.63*	*1.08*
Riau	P-9	Rokan Basin	73	95	126	257	5.3	5.8	7.4	*6.5*	0.43	0.46	0.51	0.77
	P-10	Indragiri River	246	307	406	849	4.6	5.7	7.6	*6.4*	0.31	0.35	0.41	0.69
	P-11	Riau Islands	190	247	326	641	5.4	5.7	7.0	*6.3*	0.45	0.55	0.68	1.15
		IDEP Sub-total	*509*	*649*	*858*	*1,747*	*5.0*	*5.7*	*7.4*	*6.4*	*0.37*	*0.42*	*0.50*	*0.82*
		Riau	*1,236*	*1,592*	*2,104*	*4,264*	*5.2*	*5.7*	*7.3*	*6.4*	*0.44*	*0.48*	*0.55*	*0.85*
	IDEP Total		**4,873**	**6,475**	**8,954**	**19,035**	**5.9**	**6.7**	**7.8**	*7.1*	**0.40**	**0.45**	**0.60**	**1.03**
	Northern Sumatra		**8,425**	**11,141**	**15,248**	**31,357**	**5.7**	**6.5**	**7.5**	*6.8*	**0.42**	**0.50**	**0.62**	**1.03**



P-1 Northern Aceh
P-2 West Aceh
P-3 Metropolitan Medan
P-4 West Coast Tapanuli
P-5 Nias Island
P-6 Minang Highlands
P-7 South Sijunjung
P-8 Mentawai Islands
P-9 Rokan Basin
P-10 Indragiri River
P-11 Riau Islands

Figure 28. Delineation of IDEP Sites

A. Northern Aceh Integrated Development Program

1. Background

241 This IDEP area consists of Kab. Aceh Utara (its capital being Lhokseumawe) and Kab. Aceh Tengah (with Takengon as the capital). It occupies a land area of 10,330 sq km with the population of 923 thousand. The population density is 89 persons per sq km, which is much higher than the provincial average of 59. The area includes one of the most important natural gas resources of the country, which has been exploited since mid-1970s mainly for export as liquified gas as well as, to some extent, for domestic consumption after processing into fertilizer. The area is expected to become a major industrial center of the Region with these industries as the nuclei.

242. The area has rich water resources, a good portion of which still remains untapped. With this resource coupled with the soil and climatic advantages, the area has a potential to become an advanced agricultural zone, raising the opportunities to the development of agro-industries. On the other hand, some conflicts could surface in the long run with regard to the allocation of the water of the river Peusangan among the agriculture, industry, domestic water supply, etc.

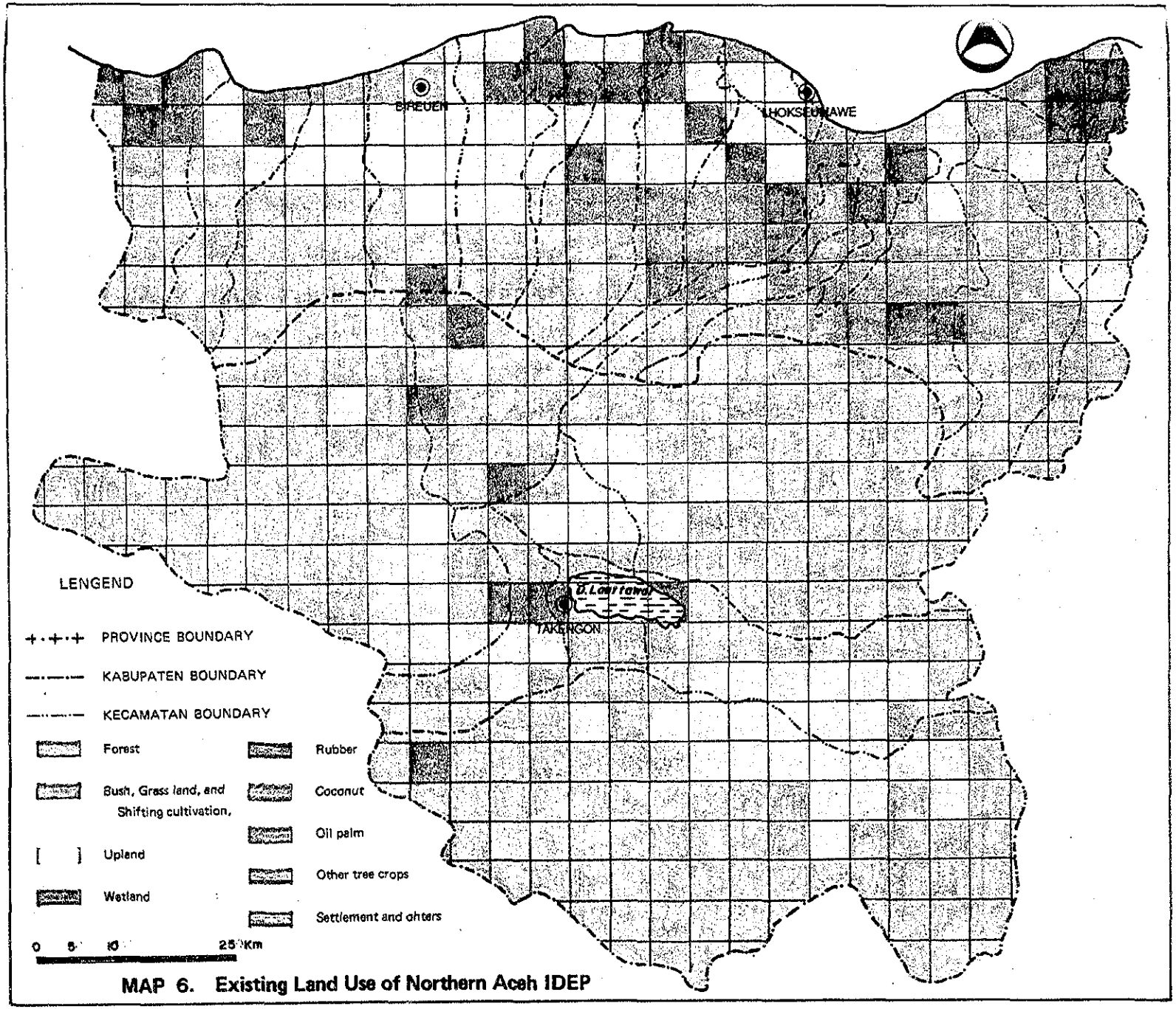
243. On the other hand, lack of basic infrastructures is badly felt. Some issues in environmental protection have been raised. And there is a concern that a serious social issue has emerged between the industries and the surrounding community. That is, the former tends to form an enclave and do not contribute significantly to the latter's well-being, as far as the resident population sees it. The income level of the resident population is generally much lower than those employed in the industries, who are largely brought from outside of the area. An integrated approach is very necessary to the fuller realization of development in the area.

2. Program Area

2.1. Geography and Climate

244. From the coast line in the north, the elevation gradually ascends toward inland. The southern part of the area is a high mountain range, the highest point, Mt. Geureudong, rising to 2,855 m above sea level. Annual rain fall is around 1,500 mm along the coast and increases as one moves to the south up to over 3,000 mm in the southern-most part of the area. Land use in the area is characterized by a high proportion of forest, over 80% in Aceh Tengah and 52% in Aceh Utara.

245. There are rivers such as Jambu Aye, Peusangan, and several others, all rising in the Barisan mountain range and discharging into the Andaman Sea, a little off the Straits of Malacca. With the total catchment area of some 11,000 sq km (mostly within this IDEP area), these rivers can potentially irrigate over 80,000 ha and have hydropower generation potentials of around 1,000 MW. Actually, however, in the Peusangan basin only around 5,000 ha is supplied with sufficient water to grow two crops of rice annually. (22,500 ha will be irrigated when the ADB financed Arakundo-Jambu Aye Irrigation and Flood Control Project completes in 1990.) Beside an existing micro power plant of 375 kW (not MW) capacity, the vast hydropower potentiality is left untouched.



MAP 6. Existing Land Use of Northern Aceh IDEP

2.2. Productive Sectors

246. Agriculture: If the oil and gas sector is excluded, the economy of the area is still dominated by agriculture. In Aceh Utara, in spite of the recent industrialization, agriculture (including fisheries) still accounts for 39% of non-oil/gas regional GDP in 1987. In Aceh Tengah, the share of agriculture is much higher (59% in 1985. More recent data is not available). In the coastal low land paddy is the main crop, with soybeans and other palawija crops. About 350,000 tons of wet land paddy were harvested from 85,000 ha in 1988 (over 80% of these are attributed to the low land in Aceh Utara). In the highland, arabica coffee and other tree crops are planted and constitute the main livelihood of the population. Coffee planted area was 32,700 ha in Aceh Tengah in 1987. Aceh Province has a history of raising cattle with nation-wide fame. The area has 130,000 heads of cattle and 90,000 of buffaloes (in 1988, most of which are in Kab. Aceh Utara). Slaughtering is done by traditional manner which is inefficient and unsanitary.

247. Fisheries: The fisheries sector in this area is represented by tambak production, being one of the main centers of Indonesia in this activity. Marine products are one of the important non-oil/gas export items of the Province earning $9 million in 1987. The sector accounted for 12% of GDP in Aceh Utara in 1988.

248. Forestry: As mentioned earlier, the forest cover in the area is quite extensive and 4 enterprises are engaged in logging operation with concession totaling 154 thousand ha in 1987/88. Main local consumers of the timber are a pulp and paper mill in Lhokseumawe and a plywood industry in Langsa (1 little outside the area).

249. Industry: The industry sector accounts for 20% of the regional GDP of Aceh Utara in 1987 and 4% in Aceh Tengah in 1985. It is dominated by the large industries in Lhokseumawe; one natural gas liquefaction plant, two fertilizer plants, and one craft paper mill, altogether employing over 6,000 persons. Beside, there are only 12 medium sized enterprises (multifarious industries) with a total of about 800 workers. Ten of these are in Aceh Utara and include 1 workshop, 2 cold storages, etc. The remaining two are coffee processing units in Aceh Tengah. A variety of small/cottage industries are scattered around in the area (but mostly in Aceh Utara) and some 25,000 persons are engaged in them.

250. Mining: Oil and gas excepting, no mineral and non-mineral underground resources have so far been mined on a meaningful scale in the area, although possible reserve of marble and gypsum is reported.

2.3. Infrastructure

251. Transportation: In land and sea transportation, the area occupies an important place in the Province. The national highway connecting Banda Aceh with Medan and further south runs along the coast line in the area. Within the area, the Bereuen-Takengon road has been improved and the Lhokseumawe-Takengon road has recently been constructed (though not yet paved). An artificially dredged port has been constructed in Lhokseumawe to serve as the main port of the Province. There are a public berth and two private berths for the exclusive use of the fertilizer companies in the same basin of 10 meter deep. The total tonnage is on a rapid increase, from 0.6 million tons in 1983 to 1.8 million tons in 1987 (excluding natural gas). There is an airport in Lhokseumawe which can accommodate aircrafts up to the size of Hercules. The airport is serviced by flights only between Medan.

252. Energy: Demand for electricity has been growing fast. The sale of electricity by PLN Wilayah I, which serves the entire Province, has increased at the average annual rate of 17% during the 10 years between 1976/77 and 1986/87 and reached 92.2 GWh, per capita value of which still remains, however, only about one third of that in Java. The installed generation capacity of PLN Wilayah I has increased from 9 MW in 1974/75 to 147 MW in 1987/88 (mostly thermal power). But it can hardly meet the actual need, leaving the large unmet demand by the industries in Lhokseumawe to the captive capacity of some 350 MW.

253. Telecommunication: The area has a good access to the trunk route of the national microwave telecommunication networks. There are, however, only one automatic switching center in Lhokseumawe and the telephone exchanges in other towns are manual switch (in 1988). The existing facilities fall far short of the demand. While the line unit capacity of the Lhoksuemawe telephone exchange is 2,000, all of which have virtually been subscribed and there were 399 applicants on the waiting list in 1988, which increased much more in 1989. Similar situation is found in Takengon, etc. A number of kecamatans in the area have not yet been served by the telephone networks.

254. Urban centers: The area includes one urban center of the regional importance, Lhoksuemawe, whose population is 53,591 (represented by that of Kec. Banda Sakti in 1988) and a district development center, Takengon having population of 21,433 in 1987. Beureun is assuming the role of an important service center for agricultural activities in the western part of the area. Urban facilities in these towns are not adequate even for the present need, typically, water supply in Lhokseumawe. With the expected growth of these towns, improvement of these facilities will be more seriously required.

255. Environment: Due to the existence of the large industries in Lhokseumawe, proper control of environmental pollution has become an important issue. Effective forest conservation and reforestation/ afforestation is also very necessary, especially in the watershed of the main rivers.

3. Development Potentials and Constraints

256. Development potentials of the area are:

- natural gas (the Arun field in the east of Lhokseumawe with confirmed deposits of 16 trillion cf is in production. Potential deposits in other locations are being prospected.)
- water resources for irrigation and hydropower generation (in the rivers of Jambu Aye and Peusangan),
- rice and diversified food crop production in low land,
- coffee and other tree crop production as well as horticulture and animal husbandry in the highland, and
- in the long run, advantageous geographical location of the area as the gateway of the Pacific Rim to the west.

257. More specifically, the agricultural production in the low land in this IDEP area will be strengthened by the development of irrigation systems. Since this area already produces surplus rice to feed the local population, the further expansion of irrigation should be associated with the diversification of marketable crops with improvement of post-harvest processing technology. Recently, farmers in this area has achieved some success in the horizontal diversification introducing soybeans, corn and other palawija crops in

the cropping pattern. Further progress is expected by their initiatives.

258. Comparative advantage in the agriculture in the highland within this IDEP area are the favorable climatic, soil and topographical conditions suitable for coffee, horticulture and animal husbandry as witnessed, in particular, by the recent advancement of the area's arabica coffee in the international epicurean markets. The land is particularly good for high class vegetables and fruits such as broccoli, cauliflower, asparagus, celery, carrot, apple, peach, cantaloup, as well as flowers of the temperate zones. The temperature varies from 10 to 30 degrees centigrade and 21 degrees in average (in Takengon which lies at 1,205 m above the sea level). Accordingly, this highland is more suitable for such vegetables than other places in northern Sumatra (A-8). The poor accessibility from the farm-gates to the markets (expected in Medan, Singapore, Middle East, etc.) makes, however, this proposition infeasible at present. Supply of qualified seeds and seedlings is another fundamental requirement. The land is also suited for fattening cattle and milk cows. Even the animal husbandry in other parts of the IDEP area can be strengthened by making use of this condition for preslaughtering fattening purpose. In this connection, the absence of modern abattoirs is the bottleneck to supply the meat to foreign and domestic markets.

259. Fisheries along the coast line can be expanded substantially to the extent that Lhokseumawe becomes the main outlet for the frozen fish (mainly shrimp and tuna, A-15) of the Province, if its port facility and services can be developed to the level comparable to the present Belawan Port.

260. Possible industrial opportunities are as follows:

- If the proposed Aromatic Center project is successfully implemented, downstream industries such as polymer production and then plastic processing (for household and industrial uses) will be a logical development. Associated engineering industries such as die and mold making can also be promoted. These are, however, a medium term possibilities unless the industries are started by imported materials.
- Agro-industries are promising, such as slaughtering, tannery, leather products, and animal feed production in relation to the expected growth of the livestock sub-sector; oil milling, canning, juice extraction, jam making, etc. induced by the increased production of food crops, fruits, and vegetables. Packing materials for these products will also provide good opportunities.
- In association with the fishery development, construction of cold storage for shrimp, tuna-like fish, etc. (for export) will become necessary.
- Industries to provide services to the large industries such as printing, laundry, catering, packing material production, computing (including software), etc. will find their places.
- Consumer goods industries including pre-cooked food, building materials, furniture, etc. for the urban population in the area and outside can also be promising.
- Export oriented industries such as electronics, garments, etc. may be possible involving foreign investments.

These industries will tend to be located in and around Lhokseumawe but some agro- and related industries will be established in other places as well.

261. Constraints are:

- lack of fund (private investments should play a very important role but those from local sources are not yet very active),
- lack of trained manpower (being met by immigrants at present),
- contractual binding of the use of the natural gas resources,
- insufficient urban infrastructure,
- social conflicts between the communities, new industries vs the rural population (possible problem),
- vulnerable environment (possible threat), etc.

4. Development Goals and Strategies

262. Among the development objectives of the Region, this IDEP area will make substantial contribution to the following, which will hence be an important part of the development goals of the area:

- To become the food supply base in rice as well as other crops (by becoming an advanced agricultural zone and a center of agro-industries).
- To remain a major foreign exchange earner of the country (through the export of natural gas as well as agricultural and industrial products).
- To become an industrial production base (with the gas-based industries as the nuclei).
- And thus to contribute to the economic take-off of the country.

Additionally the development goals/objectives of this area will also include:

- To become an energy supply base of the Region (principally in hydropower and, to lesser extent, in gas).
- To maintain and improve the social integrity among the population.
- To increase the employment opportunities for the local population as well as for outsiders, through the development process.

263. In order to achieve the above-mentioned goals/objectives following strategies are recommended:

In the agriculture sector;

- To exploit the water resources for irrigation and hydropower generation in full, particularly those of the rivers of Jambu Aye and Peusangan, paying due attention to well-balanced water allocation among sectors.
- To promote crop intensification and diversification, especially in lowland in association with irrigation.

In the industry sector;

- To encourage agro-processing industries initially in Lhokseumawe and later in other urban centers also.
- To exploit all other possibilities for industrialization, including gas based industries.
- To promote private investments by creating sound investment climate through improvement of infrastructure (including

industrial estates in and around urban centers), minimizing bureaucracies, etc.

In the social, infrastructural and environmental aspects;

- To provide the local residents with maximum possible opportunities to take part in the development through employment, supplying goods and services, etc.
- To improve vocational training and extension services.
- To improve basic infrastructures, namely, road (with main emphasis in the triangle of Lhokseumawe, Bereuen and Takengon), the Lhokseumawe port, telecommunication (both in urban and rural areas), urban service facilities particularly water supply and low cost housing in Lhokseumawe), etc. to support above-mentioned development.
- To adopt more strict measures to protect environment and to monitor closely. Particular attention should be paid to large industries and forestry.

5. Identified Projects

264. Identified projects are shown in Table 40. Technical relations between projects are explained in Figure 29.

6. Selection of Priority Projects

6.1. Highest Priority Projects

265. In view of the integrated regional planning, the most important long-term issue for this IDEP is forming strong linkage between the agriculture and industry sectors, since most of the agricultural products, in which this IDEP area has comparative advantage, need some processing for marketing outside the area; horticulture products for an example. Thus the production and marketing study of core projects for this IDEP (Project number P-12 in Table 40. Hereafter, similar notations refer to the Table) merits high priority.

266. Another important issue is the optimum allocation of water in the river Peusangan among various sectors. The Peusangan Basin Overall Development Project (B-5) should, therefore, be accorded with the highest priority in this context. (Terms of reference of the study has already been prepared by the Ministry of Public Works.)

267. Since the environment is vulnerable to the development of the type envisaged in this area, it is very necessary to further strengthen the system to monitor the possible air and water pollution and to introduce obligatory execution of environmental impact assessment for every planned industrial ventures. Also the early implementation of the Re/Afforestation project (H-6) in the highland should be promoted. These should be classified among the highest priority projects. In addition, following projects are of high importance in the respective sector.

6.2. Productive Sectors

268. In order to exploit fully the development potential of the productive sectors in the area, following projects should be given high priority:

Agriculture

269. So far as the Arakundo-Jambu Aye Irrigation and Flood Control project are nearly completed and the Pante Long II Irrigation (rehabilitation) project are in progress, farmers in the low land are expected to further intensify the paddy cropping and diversify it. In the medium term, a supporting measures such as the Wetland Food Crop Intensification and Diversification program (A-6) could be implemented.

270. It has been proved by the Dutch project that the arabica coffee produced in the highland can find highest priced markets if its quality can be guaranteed. Private investments are invited to exploit the wider market possibilities of this product. In order to capitalize on the possibilities of the high grade horticulture production for outside markets, the first step to be taken is the establishment of the Higher-Altitude Horticulture Development program (A-8), of vegetable seeds and fruit seedlings, a high priority project in the short run.

271. An early implementation of the Animal Nutrition and Marketing Improvement program (A-9) will be effective to further strengthen the historically active livestock business in the area and hence this is another proposition with high priority in the short run.

Fisheries

272. In this sector the high priority should be accorded to the modernization of traditional fish ponds so that the brakish water aquaculture in this area, already most developed in Indonesia, can be further advanced. Ensuring the successful implementation of the Brackish Water Aquaculture Intensification project (A-15) started by the World Bank is thus very important. The project is to modernize fish ponds of some 5,000 ha during the Repelita V period out of potential 17,000 ha in Kab. Aceh Utara. In order to further expand this effort, a survey and project preparation is necessary for the area not covered by project A-15. Thus, an early implementation of the Study of Brackish Water Aquaculture Sites project (A-5) is recommended.

Industry

273. Private investments are to be promoted for establishing Agro-Industries (D-26, including coffee). Implementation of the proposed Aromatic Center (D-34) is very important for the development of the gas downstream industries. In this connection, the study of the polymer production industries (D-35) could be encouraged. High priority is, also, to be given to promoting the early implementation of the Industrial Estate project (D-7) in Lhokseumawe, especially for supporting investments in agro-industries. The project (D-4) for the Development of Marketable Handicraft Products could be promoted in view of narrowing the urban-rural income gap.

6.3. Project in Infrastructural Sectors

274. For strengthening the physical infrastructures which support above mentioned production activities, it is very much desired to promote following projects.

Energy

275. In order to catch up the increasing demand for electricity in the area and in the Region, there are a number of important projects. Of these it is proposed to assign the short term high priority to undertaking a feasibility study on the Peusangan 4 Hydropower project (E-6). It is also very desirous to implement the hydropower development projects of the Peusangan 1 and 2 (E-5) and 4 (E-6), for which studies have been completed, and to initiate an in-depth studies on the hydropower development in the Jambu Aye upstream reaches (Ramasan 1 and 2 and Jambu Aye 5, E-8). From the equity considerations, it is hoped that the Rural Electrification program (E-2) will be intensified.

Transportation

276. During the Repelita V period, high priority will be given to the Arterial Road Upgrading (F-1), Road Disaster Prevention (F-2) and the Lhokseumawe Port Expansion (F-16), in view of keeping pace with the increasing traffic. Of these a feasibility study has been completed for the port project[1] .

277. In the medium term, however, improvement of the Lhokseumawe-Takengon road (F-9) will assume a crucial importance for the horticulture development in the highland for it provides safe transportation of perishable products to the markets.

Telecommunication

278. It is hoped that the plan set forth in Repelita V to increase the telecommunication facilities in the urban centers (G-6), especially in Lhokseumawe, will be realized in full (that in Repelita IV failed to be achieved).

Water Supply

279. From the standpoint of the equity and the basic human needs, it would be very important to promote an early implementation of the Urban Water Supply project (B-4) in Lhokseumawe, where only 800 families have access to running water (F/S completed).

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[1] According to the master plan of the project, the public berth will have the capacity to handle 400,000 tons per year, the volume of the traffic expected in the year 2000.

Table 40. Northern Aceh IDEP Project List

P-1	Northern Aceh															
Code	Project	REPELITA V					REPELITA VI					REPELITA VII & VIII	High	GFS	Pub Inv Rep. V
		89	90	91	92	93	94	95	96	97	98	1999 - 2008	Priority		(US$M)
	I. Productive Sectors														
A- 1	Dev. of Appropriate Agr. Mechanization			--	++	++	++	++							
A- 5	Study of Brackish Water Aquaculture Sites				--	-									
A- 6	Wetland Food Crop Intensif. and Diversif.	-	++	++											
A- 8	Higher-Altitude Horticulture Development		-	++	++	++	++	+					0		1.6
A- 9	Animal Nutrition and Marketing Improvement		--	++	++	++							0	0	7.5
A-12	Smallholder Coffee Development							-+	++	++	++				
A-15	Brackish Water Aquaculture Intensification	++	++	++			++	++	++	++	++		0		10.0
A-17	Lake Fishery Developement				--	--	++	++	++	++					
D- 4	Dev. of Marketable Handicraft Products		-	+	++	+							0	0*	0.4
D-15	Plastic Technology Service Center						--	++	++						
D-26	Agro-Industries		--	++	++	++							0	0*	
D-28	Fishery/Aquaculture-Related Industries			--	++	++	++								
D-29	Livestock-Related Industries			--	++	++	++								
D-31	Craft Industries			--	++	++	++								
D-32	Plastic Products Industries						--	++	++	++					
D-33	Other Consumer Goods Industries			--	++	++	++								
D-34	Aromatic Center	--	-+	++	++	+							0		
D-35	Polimer Production Industries				-	++	++	++					0		
D-36	Other Intermediate Goods Industries				--	++	++								
D-37	Light Engineering Industries		-	++	++	++	++								
H- 2	Integrated Foresty Planning						--	--							
H- 6	Re/Afforestation			--	++	++	++						0		0.5
I- 3	Lake Tawar and the Vicinity Tourism Dev.		-	--	++	++	++								
	II. Infrastructural Sectors														
B- 4	Urban Water Supply and Imp. (Lhokseumawe)	-	++	++	++	++							0		2.0
B- 5	Peusangan Basin Overall Development		--	--									0		2.6
B- 6	Kr. Pase Urgent Flood Control			--	++	++	++								
B-35	Kr. Tuan Irrigation				--	++	++	++	++	++					
B-36	Kr. Pandrah Irrigation				--	++	++	++	++	++	++				
B-37	Kr. Peudada Irrigation					--	--	-+	++	++	++				
D- 7	Industrial Estate/Area (Lhokseumawe)		--	++	+								0	0*	5.0
E- 2	Rural Electrification	++	++	++	++	++	++	++	++	++	++	++++++++++++	0	0*	5.0
E- 5	Peusangan-1 & 2 Hydropower (64MW)			+	++	++	++	++	++	++	+				
E- 6	Peusangan-4 Hydropower (31MW)		--	-+	++	++	++	++	++	++			0		15.0
E- 8	Jambu-Aye Hydropower Schemes					--	-	+	++	++	++				
E- 9	Gas-fired Thermal Plant				--		++	++	++						
E-10	High Voltage Transmission Line (150kV)			--	--		++	++	++	++	++	++++++++++++			
F- 1	Arterial Road Upgrading		--	-	++	++	++						0	0*	50.0
F- 2	Road Disaster Prevention		--	-	++	++	++						0	0*	30.0
F- 4	Bridge Replacement Program		--	++	++	++							0	0*	19.0
F- 8	Takengon-Sidikalang Road Betterment						++	++	++	++					
F- 9	Lhokseumawe-Takengon East-West Road						++	++							
F- 9	Takengon-Meulaboh East-West Road					--	--	++	++	++	++				
F-13	Langsa-Lhokseumawe Railway Reconstruction									--	--				
F-16	Lhokseumawe Port Expansion				++	++							0		3.6
G- 1	Medan-Banda Aceh Digital Microwave System											--++++++			
G- 6	Kabupaten Local Telephone Network Expansion						++	++	++						
G- 8	Subscriber Radio System (Phase II)											++++++++			
G-10	100 Small Earth Stations Provision							++	++	++					
G-12	Coin Telephone Sets Provision			++	++	++	++	++					0		0.6
G-14	Telephone Outside Plant Maintenance Center						++	++				++++			
J- 1	Urban and Rural Water Supply Program I	-	++	++	++	++	++								
K- 5	Kampung Improvement Support Program	-	-+	++	+										
K- 6	Urban Road Improvement Program		--	++	++	++									
	III. Others														
P-12	Production and Marketing Study		--										0	0*	1.0
														Total	153.8

Notes: 1. ---- denotes "study," ++++ "implementation."
2. On-going projects are excluded from the list.
3. "GFS" stands for Guideline for Study. An asterisk (*) indicates that this Guideline for Study is common to several IDEPs.
4. Public investment is for Repelita V. The figures are subject to further study.

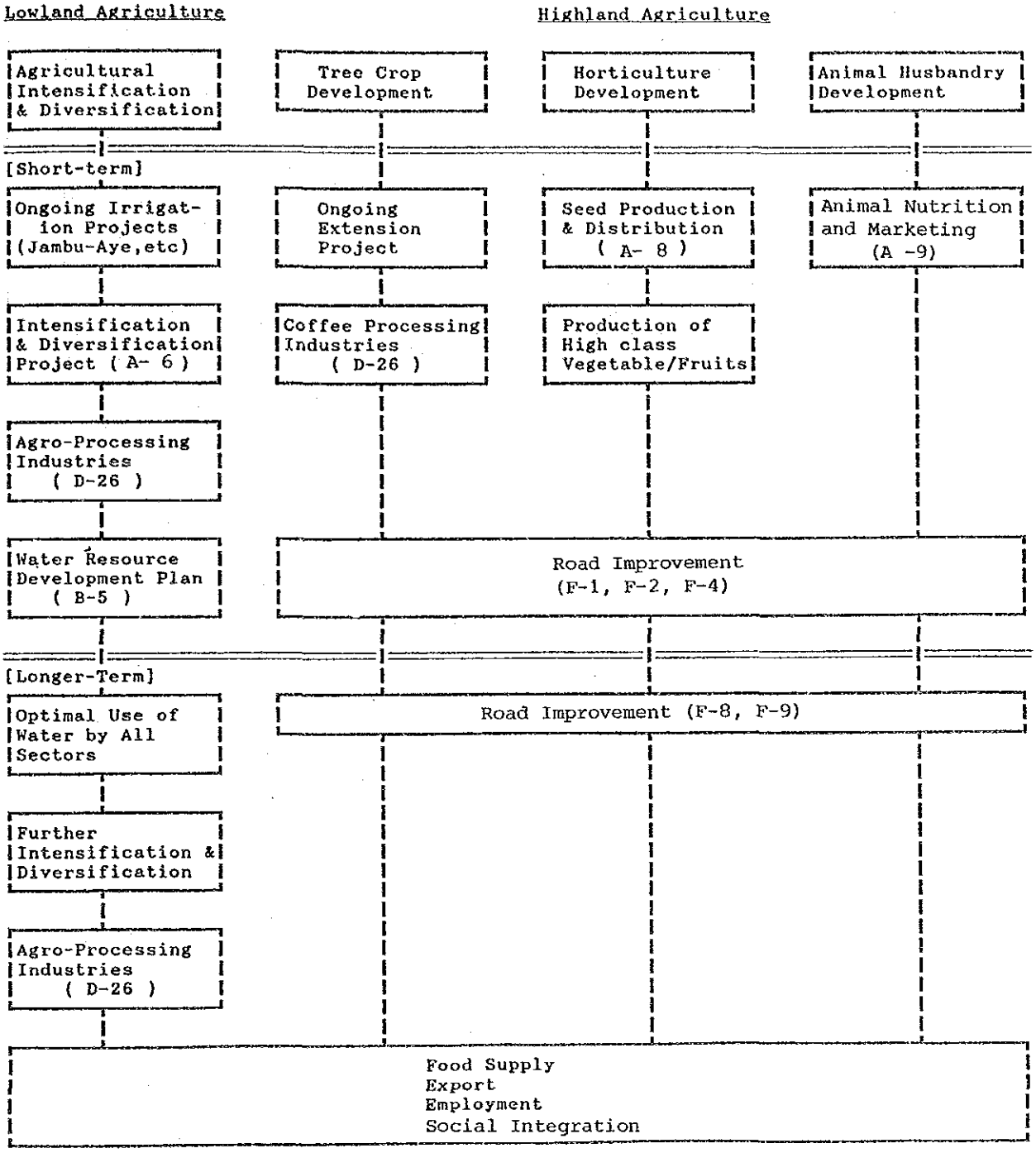

Figure 29. Relationship among Core IDEP Projects (Northern Aceh IDEP)

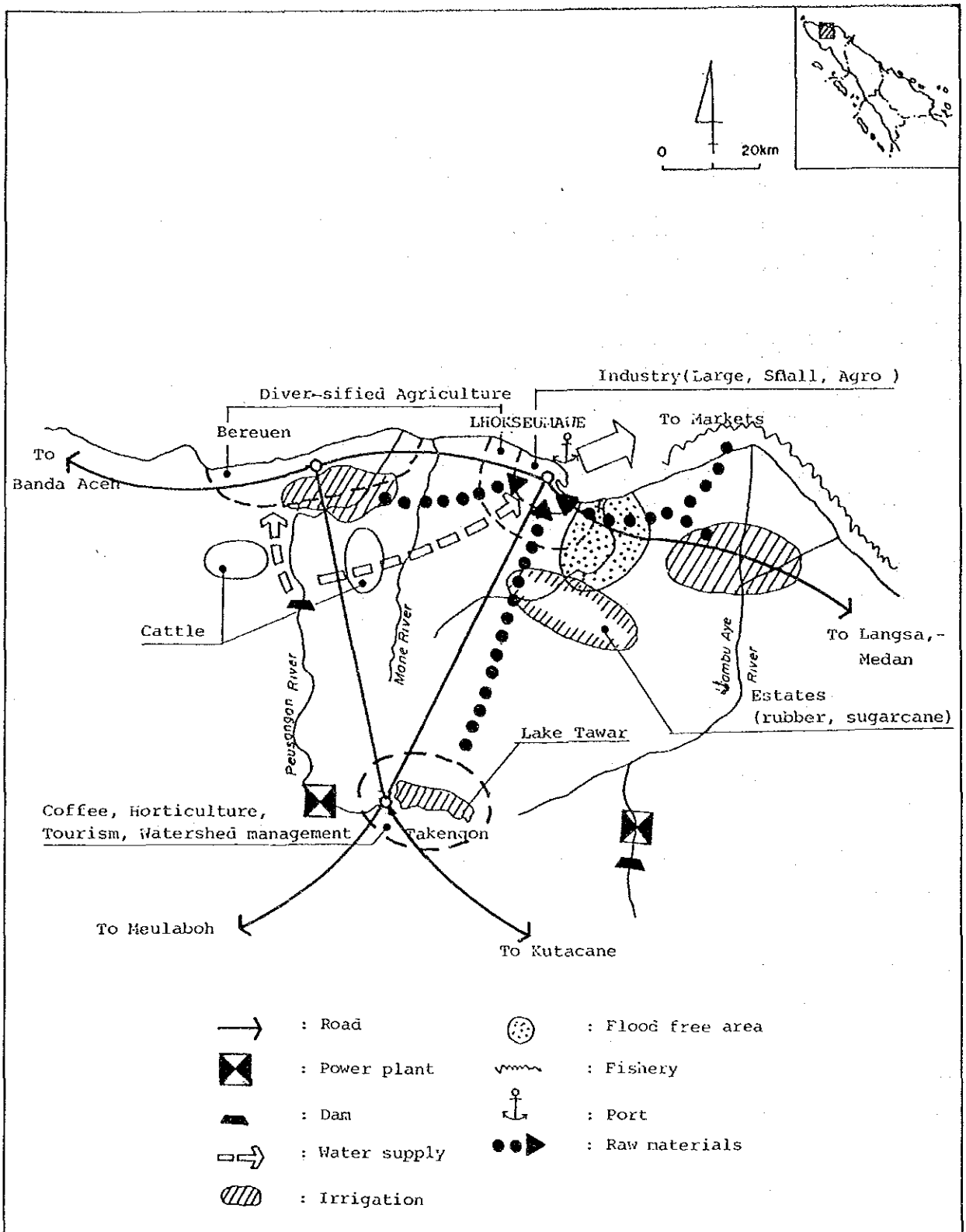

Figure 30. Northern Aceh IDEP Development Scheme