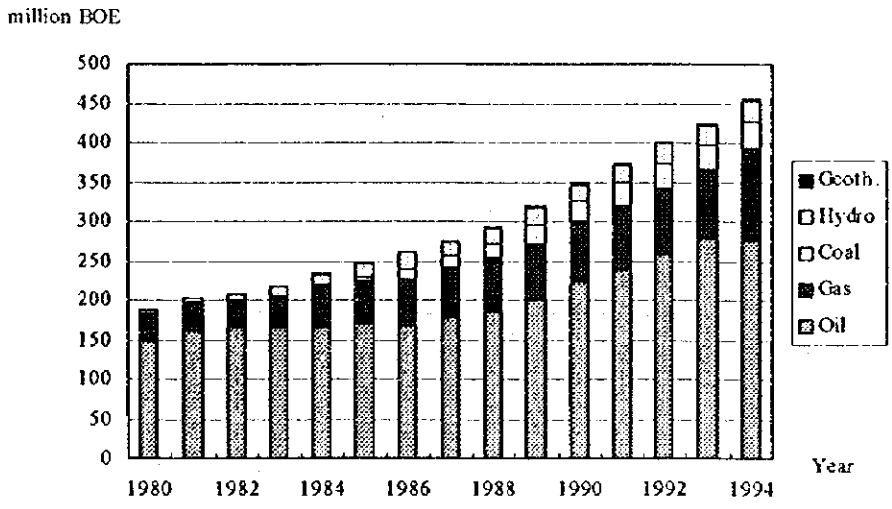
4.3 Resources and Energy

This section reviews energy resources, energy supply and demand, and energy policy and planning in Indonesia, in order to provide structural constraints for a prototype model for a long term planning framework. The structural constraints are designed to reduce the gap between the results of the model and the actual development plan. In this section, the trend and the future plan in the energy sector in Indonesia are summarised. Furthermore, the future supply and demand of the energy are calculated from the intermediate demand of the IOPM forecast, and it is compared with the existing plan in Indonesia.

Indonesia is a country rich in energy resources. It has 48.4 billion barrels of oil, 5,961 billion cubic meter (bcm) of natural gas, 36.3 billion tons of coal, 75.0 GW (10^9 Watt) of hydro, and 16.0 GW of geothermal power. About 40 % of the total resources are recoverable. In 1994, Indonesia's energy consumption was the equivalent of 457.7 million barrels of oil. (refer to Figure 4-13) According to the Markal Study of BPPT, Indonesia's primary energy consumption, including biomass energy, will increase to 1,004.2 million barrels in 2001, 1,688.8 million barrels in 2011, and 3,055.1 million barrels in 2021.

Figure 4-13 Change of Primary Energy Mix in Indonesia



Source : Petroleum Report 1996, Embassy of USA

4.3.1 Oil

Indonesia is the third oldest oil producer in the world. Production began more than a century ago. In the Indonesian economy in the early 1980's, oil accounted for nearly two-thirds of the Government revenues. However, the rate of oil revenue has decreased year by year.

(1) Reserves

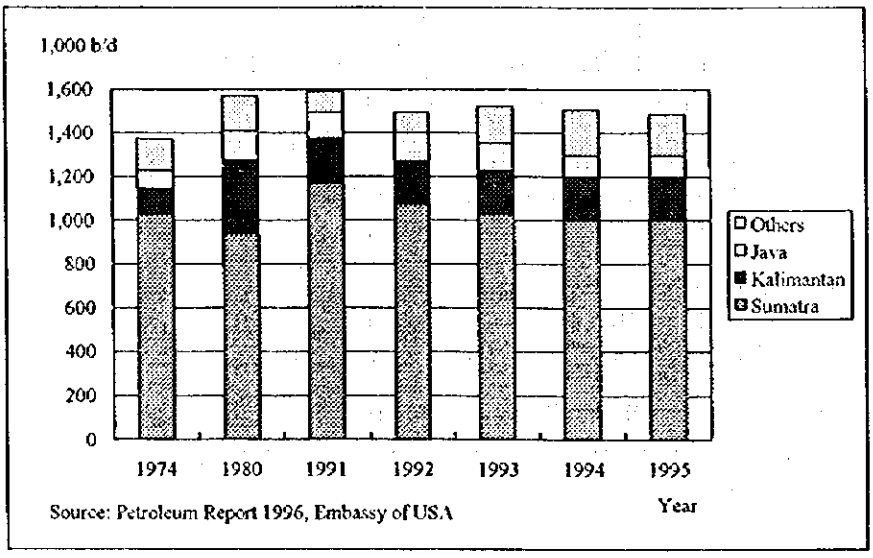
In Indonesia, 10.41 billion barrels of crude oil and condensate are proven deposited. Of this amount, 5.58 billion barrels are recoverable reserves. When the present production level were maintained, the rate of reserves to production would last about 10 years. At present, Indonesia has more than 220 oil fields, most of which are medium or small scale fields, while large-scale oil fields are located at Minas in the Sumatra. It is said that crude oil production in Indonesia, without major new discoveries, would drop to below one million barrels per day by the end of the century.

(2) Production

Indonesian crude and condensate production in 1995 averaged 1.49 million barrels per day (b/d). Of this amount, the Sumatra, which includes the Malaca Strait and Natuna, produced about one million b/d, following by the 0.2 million b/d of the Kalimantan, 0.1 million b/d of the Java, and 0.2 million b/d of the remaining regions (refer to Figure 4-14). The country's proven oil reserves stood at 10 billion barrels at the end of 1995, although the government estimates potential reserves to amount to nearly 50 billion barrels. Many of the unexplored oil basins, however, are in difficult locations, to make an access i.e., in remote areas or offshore in deep water. Oil contractors continue to make efforts on smaller fields and to enhance oil recovery in older fields on and offshore. Pertamina foresees that production of crude oil and condensate will slowly decline during the Repelita VI from 1.53 million barrels per day to 1.50 million barrels per day. However, without major new discoveries, sustaining the above levels of oil production will be difficult.

In 1995 MIGAS estimated that crude production will decrease at about five percent a year to 1.35 million b/d in 1997, 1.15 million b/d in 2000, and 1.065 million b/d in 2005. Some private sector analysts have predicted that crude oil production, enhanced oil recovery operations, and estimated new field production, would drop below the million barrels per day mark at around the end of the century.

Figure 4-14 Trend of Oil Production by Region

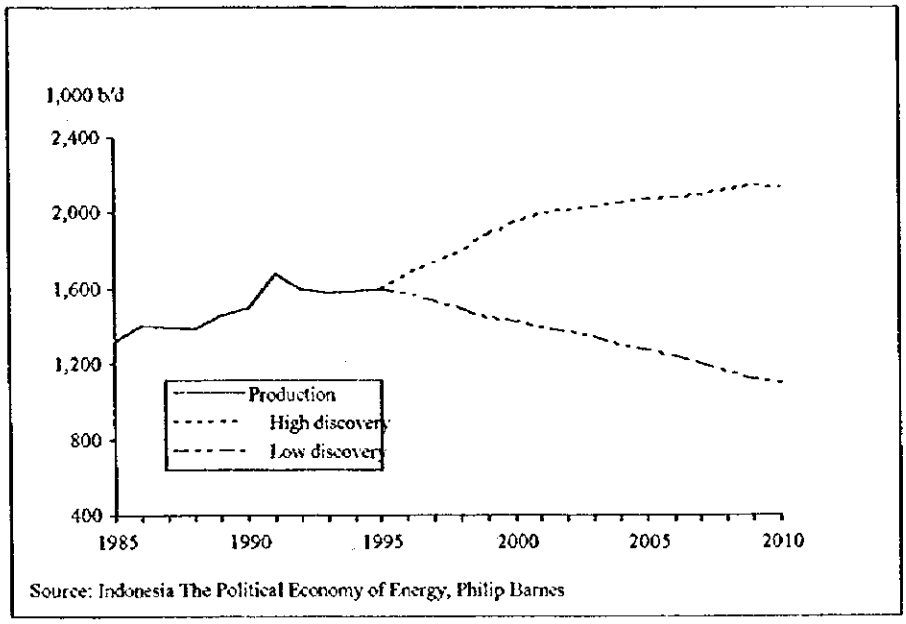


Source: Petroleum Report 1996, Embassy of USA

According to the Ministry of Mines and Energy, even if domestic demand were to remain flat, Indonesia would need to discover 500 million barrels of oil a year to maintain current export levels. Oil reserves discovered by contractors during 1985 to 1992 averaged just over 100 million barrels per year. However, over the last 20 years or so, additions to reserves averaged just over 400 million barrels per year.

Figure 4-15 gives an indication of the range of feasible future production levels for hydrocarbon liquids to the year 2010. The high level scenario assumes a discovery rate of some 1.2 billion barrels of crude oil per year and a recoverable resource base of around 80 billion barrels as well as an increase in natural gas liquids production. In this case, production will continuously increase until the end of the century to above two million b/d, a level that is quite close to the upper limit of the total estimated potential. With a much lower discovery rate of 400 million barrels of crude oil per year, current levels of production can be maintained for only a few years.

Figure 4-15 Indonesian Oil Production Profiles



Source: Indonesia The Political Economy of Energy, Philip Barnes

Indonesia currently has eight refineries, with an installed capacity of 988,800 b/d though an effective capacity is capable of refining more than one million b/d of crude oil. In 1995, these refineries processed a total of 297.4 million barrels of crude oil (or 814,900 b/d), a slight increase from the previous year's level (refer to Table 4-29). So, Pertamina needs additional fuel processing capacity of about 500,000 b/d to keep up with the domestic demand for fuel.

Table 4-29 Current Refinery Capacity

(Unit: 1000 b/d)

Refinery	Location	Installed Capacity	Effective Capacity	1993 Crude Processed	1994 Crude Processed	1995 Crude Processed	Crude Input
Pangkalan Brandan	N Sumatra	5.0	5.0	5.1	5	4.6	Rentau
Dumai	C Sumatra	120.0	130.0	116.5	105	124.5	Minas,Duri
Sungai Pakning	C Sumatra	50.0	45.3	39.4	43.5	44.6	Minas, Lalang, Pedada, Lirik
Musi	S Sumatra	132.0	135.6	113.1	112.3	117.9	Minas, Duri, Ramba, Jene, ALC, SPD, TAP, JPO
Total Sumatra		307.0	315.9	274.1	265.8	291.6	
Balikpapan	E Kalimantan	253.0	263.8	236.2	249.2	232.1	Sangata, Minas, Duri, Belida, Widun
Total Kalimantan		253.0	263.8	236.2	249.2	232.1	
Cepu	C Java	3.8	3.8	2.6	3	2.9	
Cilacap	C Java	300.0	320.0	297.3	290.8	288.3	Minas, Arjuna, ALC, Duri, Handil, Walio, Badak
Balongan	W. Java	125.0	125.0				Duri, Minas
Total Java		428.8	448.8	299.9	293.8	291.2	
Total		**988.8**	**1028.5**	**810.2**	**808.8**	**814.9**	

Source: Petroleum Report 1996, Embassy of USA

(3) Consumption

In 1995, Indonesia exported 301.8 million barrels of crude and condensate and 78.4 million barrels of oil products, and imported 68.3 million barrels of crude and condensate and 45.0 million barrels of oil products, i.e. the net export was 276.9 million barrels. Domestic consumption of oil rose from 195.7 million barrels in 1988 to 318.8 million barrels in 1993, however, oil consumption in 1994 went down to 259.7 million barrels. (refer to Table 4-30) Oil consumption accounted for about 60 % of the primary energy use in Indonesia, so the government is promoting the use of energy substitutes for oil in order to delay becoming a net oil importing country. According to the sixth five year plan (the Repelita VI), the domestic consumption of crude oil will increase to 360.0 million barrels during the plan period. However, oil share in the supply of primary energy goes down from 60.0 % in the first year of the fifth Five-year plan to 52.3 % in the final year.

Table 4-30 Change of Net Oil Export

(Unit: million bbl)

	1988	1989	1990	1991	1992	1993	1994	1995
Exports								
Crude and Condensate	276.6	291.5	288.3	330.5	293.1	283.3	324	301.8
Products	63.7	55.3	53.1	56	64.5	58.2	63.2	78.4
Total	340.3	346.8	341.4	386.5	357.6	341.5	387.2	380.2
Imports								
Crude and Condensate	31.2	28.1	45.7	44.4	60.8	56.4	58.1	68.3
Products	13.3	21.3	24.2	24.9	38.2	46.2	38.1	45
Total	44.5	49.4	69.9	69.3	99	102.6	96.2	113.3
Net Exports	295.8	297.4	271.5	317.2	258.6	238.9	291	266.9
Production	491.5	514.2	533.7	581.2	550.7	557.7	550.7	542.4
Dmestic Consumption	195.7	216.8	262.2	264	292.1	318.8	259.7	275.5

Source: Petroleum Report 1996, Embassy of USA

In terms of products, annual growth rates of gasoline and automotive diesel oil posted an increase of 6.2% and 6.1% respectively for the past decade. Fuel oil for power plants, meanwhile, posted a 5% annual growth rate. According to some forecasts, which assume a 6% average annual increase in GNP (the trend during the past few years), commercial primary energy demand can be expected to reach around 2.8 million barrel oil equivalent per day by 2010. This is comparable to the 1.38 million barrels oil equivalent per day level posted in 1993. Even though there is a substantial increase in domestic gas use and additional coal and hydro use for power generation, it is unlikely that the demand for oil will decrease below 1.5 to 1.6 million barrel per day by 2010 (refer to Table 4-31).

Table 4-31 Oil Demand by Markets

(Unit: m b/d)

	1993	2010	Growth Rate (%)
Transport	0.26	0.76	6.5
Industry	0.15	0.24	2.8
Residential + Services	0.14	0.26	3.7
Electricity Generation	0.10	0.12	1.1
Others	0.06	0.21	7.6
Total	0.71	1.59	4.9

Source: Indonesia: The Political Economy of Energy, Philip Barnes

4.3.2 Natural Gas

(1) Reserves

Indonesia has abundant natural gas resources. Indonesia's estimated gas resources are 5,961 billion cubic meter (bcm), of which 3,198 bcm are proven and probable reserves. Major gas fields are located in Natuna, East Kalimantan, and North Sumatra and account for more than 80 % of the total proven and recoverable reserves. Exploration activities for natural gas have not been developed good enough as compared to those for crude oil sector. Therefore, the natural gas sector has still a good possibility to expand its reserves. The rate of reserves to production, sustaining the current production level, is about 40 years.

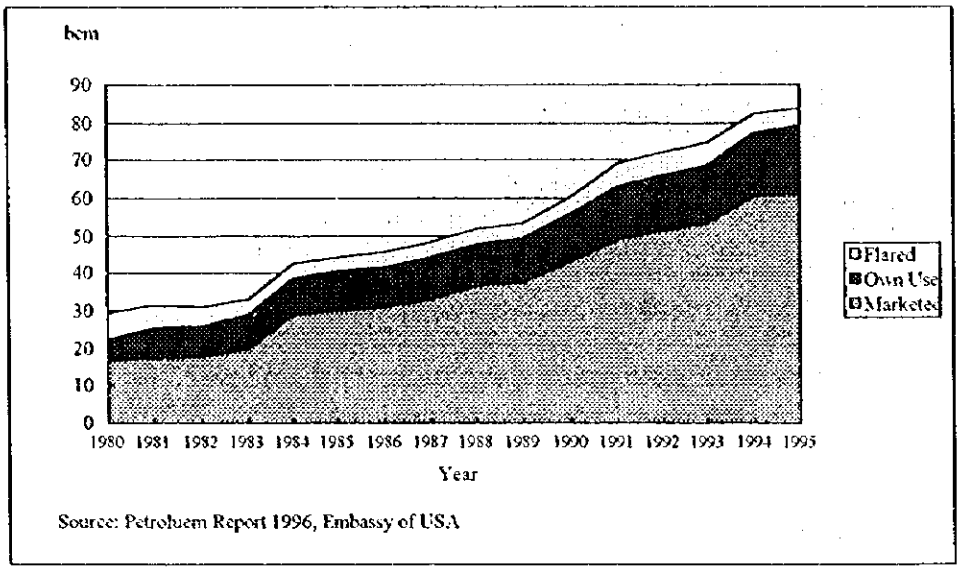
(2) Production

1) Natural Gas

There are currently nine main gas fields in Indonesia. Total production in 1995 reached 84.0 billion cubic meter (bcm), which was energy equivalent of 1.52 million barrels of oil per day, or roughly the same as the country's 1995 oil and condensate production. Of this amount, 4.5 bcm of natural gas was consumed for flared and 79.5 bcm of gas was for own use and market. Production in the Sumatra

accounted for 56% of total production, followed by 34% in the Kalimantan, 9% in Java, 1% in the Irian Jaya. Pertamina predicts that natural gas production will exceed about 90 bcm by 1999, mainly to meet the increasing demand for gas for both export and domestic use.

Figure 4-16 Natural Gas Production and Utilization



Source: Petroluem Report 1996, Embassy of USA

The development of natural gas will be promoted in order to diversify energy resources and earn export revenues. At present, the Natuna gas production and liquefaction project is proceeding. Construction of the plant will begin in 1999 and it will start producing five million MT per year of LNG around 2005. An agreement on the project has been signed between Pertamina and Exxon. Pertamina expects that Indonesia's natural gas production will grow from 75.4 bcm to 93.0 bcm during the Second 25 Year Development Plan.

2) LNG

There are two liquefied natural gas (LNG) plants in Indonesia. One of them is Bontang LNG plant located in East Kalimantan. In 1977, it commenced the operation of two trains to liquefy natural gas from the Badak area and exported the produced LNG to Japan. Later, the plant increased the number of trains to 5, mainly because the terms for LNG export levels in the contract with Japan was doubled. In 1993, one more train was added. Therefore, Bontang LNG plant now has 6 trains, with annual production capacity of 13.2 million tons.

Construction of the G train (the 7th train) began in September 1995. In June 1995, the Japanese Export and Import Bank (Jexim) signed an agreement with a consortium of Japanese banks to finance this project, to which Jexim would provide 70 % of the financing, while the rest would come from a consortium of banks. Installation of equipment would take place in September 1996, and production begins in 1997. The facility (G train) is expected to produce 2.3 million t/y of LNG.

Upon completion of the G train, construction of a 2.9 million t/y H train would start, with a targeted completion date set in the year 2000. With the operation of trains G and H, is estimated that the plant will achieve a total annual output of 18.4 million tons by 2000.

The second major LNG plant is in Arun, North Sumatra, which began operating 3 trains in October 1978. The output was also exported to Japan. Two trains were added in 1984 and another one in 1986. Currently Arun plant is operating 6 trains with 9 million tons/year of design capacity. Table 4-32 shows the status of LNG plants.

Actual sales during the 1990s have been well in excess of the originally contracted tonnages and of rated plant capacity. This over-production in relation to design capacity is fairly normal with LNG plants, since Indonesian plants have all been designed with relatively large operating margins.

Table 4-32 LNG Production Capacity

	Start up Date	Number of Trains	Design Capacity (million t/year)
Badak (Bontang)			
A/B	8/77	2	4.3
C/D	10/83	2	4.3
E	12/89	1	2.3
F	11/93	1	2.3
G	1998	1	2.3
H (Originally Planned for 1996)			
Arun			
A/B/C	10/78	3	4.5
D/E	3/84	2	3.0
F	10/86	1	1.5
G (Planned for 1997 But Now Later)		1	2.0
Total Capacity in Place in 1994 (Actual Sales in 1993: 23.7)			22.2

Note: Trains A to D at Bontang are currently undergoing debottlenecking for completion during 1994.

Source: Philip Barnes, Indonesia: The Political Economy of Energy

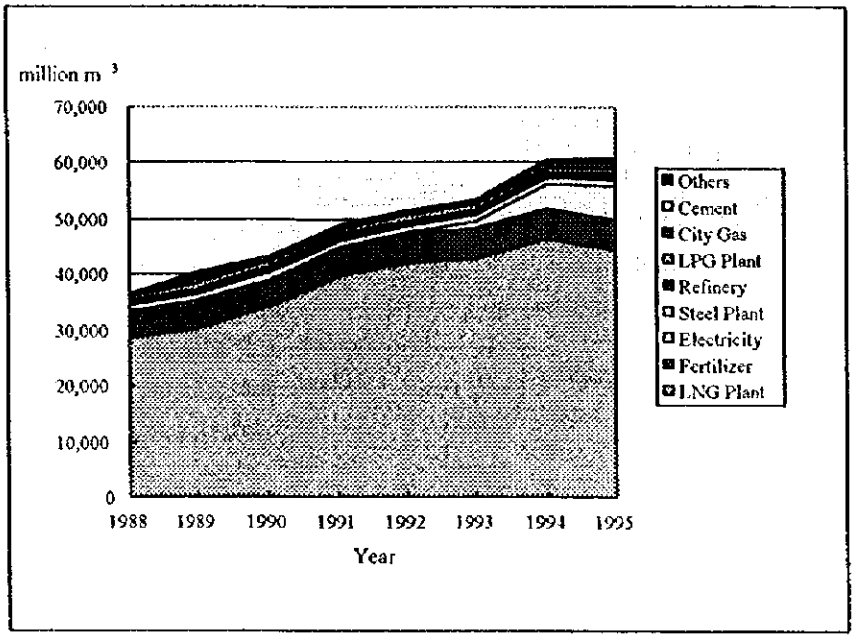
(3) Demand

1) Natural Gas

Marketed gas consumption in Indonesia rose from 36.7 bcm in 1988 to 61.1 bcm in 1995 with the annual growth rate of 7.5 %. More than a half of the gas (44.6 bcm) was liquefied in the LNG plants and exported. Non-export natural gas is used in the domestic market, at present, mainly as a feedstock for fertilizer plants and a fuel for power plants which account for about 68 % of the domestic consumption. It is also used to produce methanol in refineries by a handful of industrial users such as the Krakatau steel plant, and city gas in a few urban centers. There is a local pipeline system around Jakarta. Other

users are cement plants, LPG plants, etc. (refer to Figure 4-17) Domestic use, nonetheless, is still very modest as compared to the export. According to MIGAS, natural gas consumption in Indonesia will increase to 84.9 bcm in 1998/99, and a half of the gas will be liquefied.

Figure 4-17 Natural Gas Utilization (Marketed Gas)



2) LNG

Asia consumed about 51 million tons of LNG in 1995. Assuming its consumption continues to increase in the future, total demand is expected to reach 82 million tons by 2000. Indonesia is the largest LNG exporting country in the world, with its main customers including Japan, Korea, and Taiwan. Indonesia made an agreement with Korea in August 1995 to supply one million tons/year of LNG for 20 years from 1999 and also signed a contract with Taiwan in October 1995 to supply 1.9 million tons/year for 20 years from 1998. Table 4-33 shows the existing LNG contracts situation.

Table 4-33 LNG Contracts in Indonesia

(Unit:1,000 ton)

	1996	1997	1998	1999	2000	2001	2002	
Japan	8,180	8,180	8,180	8,180				1977-1999
Japan	3,640	3,640	3,640	3,640	3,640	3,640	3,640	1983-2003
Japan	3,640	3,640	3,640	3,640	3,640	3,640	3,640	1984-2004
Japan	2,300	2,300	2,300	2,300	2,300	2,300	2,300	1994-2013
Taiwan			1,900	1,900	1,900	1,900	1,900	1998-2017
Taiwan	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1990-2009
Korea	2,300	2,300	2,300	2,300	2,300	2,300	2,300	1987-2007
Korea	2,056	2,056	2,000	2,000	2,000	2,000	2,000	1994-2014
Korea								
Korea	1,456	1,288	1,264	1,512				
Korea				1,000	1,000	1,000	1,000	-2018

Source: IEEJ, Asia Taiheiyo-chiiki no Tennengasu Juyou Doukou

4.3.3 Coal

(1) Reserves

Indonesia has around 36 billion tons of coal and lignite deposits, of which 58.6% is lignite and 26.6% sub-bituminous coal. This figure represents three percent of the world's total coal reserves. The distribution of coal resources in Indonesia is: 51.16 % in South Sumatra, 11.37 % in Central Sumatra, 4.66 % in North Sumatra, 15.30 % in East Kalimantan, 9.91 % in South Kalimantan, and 5.79 % in West Kalimantan. Indonesian coal quality is characterized by low calorific value such as lignite and sub-bituminous coals. Coal resources are classified as: 58.63 % lignite, 26.63 % sub-bituminous, 14.38 % bituminous, and 0.36 % anthracite. The high quality reserves are already held by the state-owned coal mining company (PTBA) and its coal contractors.

(2) Production

Despite its abundant coal reserves, coal development in Indonesia was not aggressively carried out until after the early-1980's. However, it is now growing rapidly as an alternative source of energy for oil. Coal producers are the state-owned coal mining company and its coal contractors, national private companies, and co-operative units. Coal production in 1995 reached 42 million tons out of which approximately 90 % of coal produced by the state-owned coal mining company and 11 coal contractors.

Coal production in the Kalimantan in 1995 reached about 70% of the total production (31 million tons per year), while the Sumatra produced 11 million tons/year.

The location of the coal mines: those in the Kalimantan are located near the sea shore in the east and the south, and all mines are operated by contractors of domestic and foreign capital. On the other hand, many mines in the Sumatra are located in the south and the central regions. Bukit Asam coal mine, the only state-operated company, is producing 7.9 million tons/year. Other coal mines produce about one million tons/year. The present and future production plans of the coal mine companies are shown in Table 4-34. In 2002, 75 million tons of coal will be produced from the Kalimantan and 17 million tons of coal will be produced from the Sumatra.

Currently, some 51 companies are expected to receive official approvals and 46 others have filed an application with the Directorate General of Mining for coal concessions, however, many of these concessions may not start production due to low volume and lower quality of coal resources and secondly insufficient infrastructure. The production of current operations can be expanded significantly without a large additional investment. In the longer term, there will be a potential for new mines in the concession areas, providing market justifies investment. PTBA has a plan to increase production to 22 million tons by 2005. Coal production in the future is thus expected to increase to 120.0 million tons by 2008.

Figure 4-18 Change of Coal Production

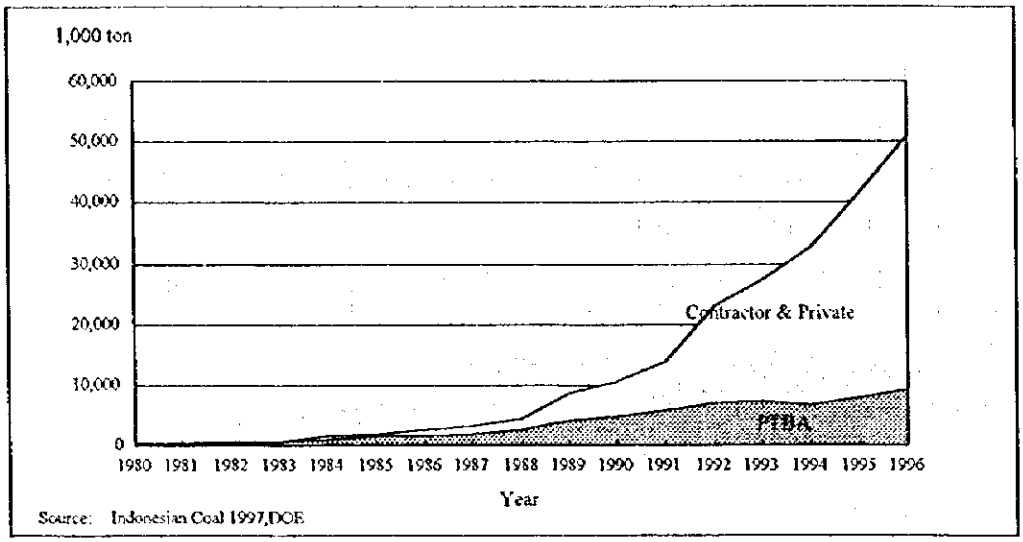


Table 4-34 Indonesian Coal Production Forecast by Company (MT)

	1995	Exports	1996(est)	1999(est)	2002(est)
PT Kaltim Prima	10.2	9.2	11.5	15.0	20.0
PT Adaro Indonesia	5.5	4.7	8.5	18.0	22.0
PT Artmin	5.4	4.7	6.0	10.0	12.0
PT Kideco	2.5	2.5	2.7	3.5	5.0
PT Multi Harapan	1.9	1.6	2.0	2.5	2.5
PT Tanito Harum	1.1	1.1	1.5	1.5	1.5
PT Kendilo	1.0	1.1	1.0	1.0	1.0
PT Bukit Baiduri	0.8	0.8	0.8	0.8	
PT Kitadin	0.7	0.0	0.8	0.7	
PT Berau Coal	0.7	0.1	1.5	3.5	6.0
PT Fajar Bumi	0.6	0.2	0.6	0.5	
PT Indominco			0.2	3.0	5.0
Total Kalimantan	30.4	26.0	37.1	60.0	75.0
PT Bukit Asam	7.9	2.4	8.7	12.0	15.0
PT Allied Indocoal	1.2	1.0	1.4	1.5	1.0
PT Bukit Sunur	0.8	0.5	0.8	1.0	1.0
PT Danau Mas Hitam	0.7	0.7	0.6	0.5	
PT Karbindo	0.4	0.2	0.4	0.4	
Total Sumatra	11.0	4.8	11.9	15.4	17.0
Others	0.6	0.2	1.0	3.0	5.0
Total	42.0	31.0	50.0	78.4	97.0

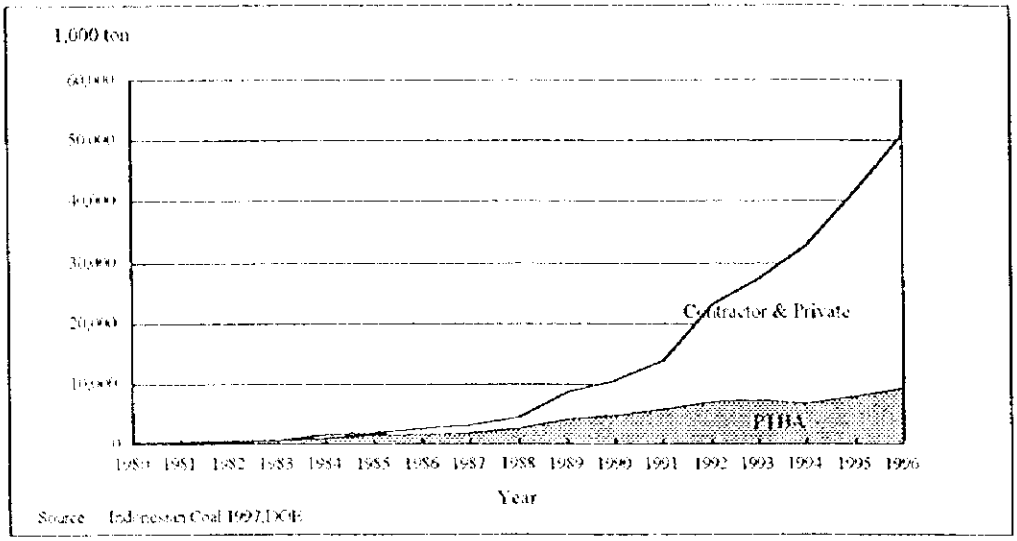
Source: Norfolk Southern, World Coal, November 1996

(3) Demand

1) Electric Utility

By far, the largest single growth area for Indonesian coal lies in the domestic electric utility sector. Total coal consumption in 1995 was 12.4 million tons, out of which 7 million tons consumed by the

Figure 4-18 Change of Coal Production



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PT Adaro Indonesia	5.5	4.7	8.5	18.0	22.0
PT Arutmin	5.4	4.7	6.0	10.0	12.0
PT Kideco	2.5	2.5	2.7	3.5	5.0
PT Multi Harapan	1.9	1.6	2.0	2.5	2.5
PT Tanito Harum	1.1	1.1	1.5	1.5	1.5
PT Kendilo	1.0	1.1	1.0	1.0	1.0
PT Bukit Baiduri	0.8	0.8	0.8	0.8	
PT Kitadin	0.7	0.0	0.8	0.7	
PT Berau Coal	0.7	0.1	1.5	3.5	6.0
PT Fajar Bumi	0.6	0.2	0.6	0.5	
PT Indominco			0.2	3.0	5.0
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PT Bukit Asam	7.9	2.4	8.7	12.0	15.0
PT Allied Indocoal	1.2	1.0	1.4	1.5	1.0
PT Bukit Sunur	0.8	0.5	0.8	1.0	1.0
PT Danau Mas Hitam	0.7	0.7	0.6	0.5	
PT Karbindo	0.4	0.2	0.4	0.4	
Total Sumatra	11.0	4.8	11.9	15.4	17.0
Others	0.6	0.2	1.0	3.0	5.0
Total	42.0	31.0	50.0	78.4	97.0

Source: Norfolk Southern, World Coal, November 1996

(3) Demand

1) Electric Utility

By far, the largest single growth area for Indonesian coal lies in the domestic electric utility sector. Total coal consumption in 1995 was 12.4 million tons, out of which 7 million tons consumed by the

electric sector. The rest was consumed as fuel for cement kiln and for the boiler of other industries. In the future, the coal consumption will increase as it becomes a substitute for petroleum, mainly in the electric sector.

The Directorate General of Mines (DGM) projects that domestic utility consumption of coal will increase from 7 million tons per year (mt/y) in 1995 to 28.2 mt/y in 1999 and 58.6 mt/y in 2004. According to the development plan toward 2002 of the coal-fired power, the consumption for power plants in 2002 will reach about 40 million tons. Of this amount, 34.2 million tons will be accounted for by the Java, followed by 3.5 million tons in the Sumatra, 1.6 million tons in the Kalimantan, and 0.3 million tons in the Sulawesi (refer to Table 4-35). Most of the coal for power plants will also be consumed in the Java.

Table 4-35 Indonesian Coal-fired Power Stations (Project/location)

Name	Location	Capacity (MW)	Status	Coal Mta
Java				
PLN Paiton	East Java	1,600	Operational/Construction	4.8
Paiton Energy	East Java	1,230	Construction/1998-9	4.0
Java Power-Paiton	East Java	1,220	Construction/1999-2000	3.7
Tanjung Jati A	Central Java	1,200	Awarded/2000-1	3.6
Tanjung Jati A	Central Java	1,320	Awarded/2001-2	4.0
Cilacap	Central Java	400	Negotiation/2000	1.2
PLN Suralaya	West Java	3,400	Operational/Construction	10.5
Cilegon	West Java	400	Awarded/2000	1.2
Serang	West Java	400	Negotiation/2001	1.2
Total Java		11,170		34.2
Sumatra				
Tarahan	South Sumatra	200	Negotiation	0.6
Bukit Asam	South Sumatra	330	Operational/Construction	1.1
Ombilin	Central Sumatra	200	Operational/Construction	0.6
Sibolga A	North Sumatra	200	Awarded/2000	0.6
Sibolga A	North Sumatra	200	Negotiation/2002	0.6
Total Sumatra		1,130		3.5
Sulawesi				
Amurang	Sulawesi	110	Awarded/2000	0.3
Total Sulawesi		110		0.3
Kalimantan				
PLN Banjarmasin	South Kalimantan	130	Construction/1999	0.4
Tanjung	South Kalimantan	200	Planned/2002	0.7
Pontianak	West Kalimantan	160	Negotiation/1999	0.5
Total Kalimantan		490		1.6
Grand total		12,900		39.6

Source: Norfolk Southern, World Coal, November 1996

2) Cement

The present leading industrial consumer of coal is the cement industry consumed 3.6 million tons in 1995. In a rapidly developing economy, cement consumption is high. In Indonesia according to the Directorate of Coal (DOC), coal consumption in the cement industry will increase to 4.6 mt/y in 1998, 6.0 mt/y in 2003, and 7.8 mt/y in 2008. Although the production capacity is quite high, some of the demand is currently met by imports due to the requirement of high quality of coal. However, as more Indonesian mines are brought into commercial production, while demand of cement industry could be met by domestic coal.

(4) Paper and Pulp

The Government encourage all domestic major manufacturers and basic industries to convert energy source to coal as much as possible. Paper and pulp, one of the leading industrial sectors, is urged for immediate conversion. The Government projects that the paper industry's fuel costs will be dramatically reduced with the conversion to coal and so Indonesian products will become more competitive in the world market. PT Tjiwi Kimia, one of the country's largest paper and pulp processing companies, with plants located throughout the Java, is completely shifting its energy source from oil to coal and estimates its coal requirement will soon reach one million tons per year. This company has ordered boilers designed specially for coal from both Bengkulu and East Kalimantan.

In addition, Barito Pacific Group plans to construct a new paper plant, the largest in Indonesia in South Sumatra in 1998. Coal for its boilers will be supplied from the Tanjun Enim coal mine in South Sumatra. Currently targeted coal consumption for the paper and pulp industry is 5-6 mpa by 2004.

4.3.4 Geothermal

There are many active volcanoes in Indonesia, so that geothermal use for electricity generation is potentially large. Total reserves are equivalent to 16,000 MW, including 7,800 MW in the Java-Bali, 4,900 MW in the Sumatra, 1,500 MW in Sulawesi, and 1,800 MW in West and East Nusa Tenggara, the Irian Jaya, the Maluku and other islands of East Indonesia. In 1993, the total geothermal power plant for electricity generation was only 144 MW. In 1994, two new plants, a 110 MW plant at Salak and a 55 MW plant at Darajat, started operation and so the total capacity rose to 309 MW. According to MIGAS, the total installed capacity will increase the output to 1,206.5 MW by the end of the Repelita VI, 2,500.75 MW by the end of the Repelita VIII, and 4,000.75 MW by the end of the Repelita X. The World Energy Council in 1995 noted that Indonesian capacity will become 2,500 MW by 2020.

4.3.5 Hydropower

Indonesia's hydropower potential is estimated at near 75,000 MW and about 400,000 GWh/year can be produced. 1,210 potential hydropower generation sites are spread over the whole country and estimated potential of power generation of major islands is respectively followings: 84,110 GWh (20.9% of the total energy potential) in the Sumatra, 18,042 GWh (4.5 %) in the Java, 107,202 GWh (26.7 %) in the Kalimantan, 52,952 GWh (13.2 %) in the Sulawesi, 133,759 GWh (33.3 %) in the Irian Jaya, 3,287 GWh (0.8 %) in Nusa Tenggara, and 2,292 GWh (0.6 %) in the Maluku.

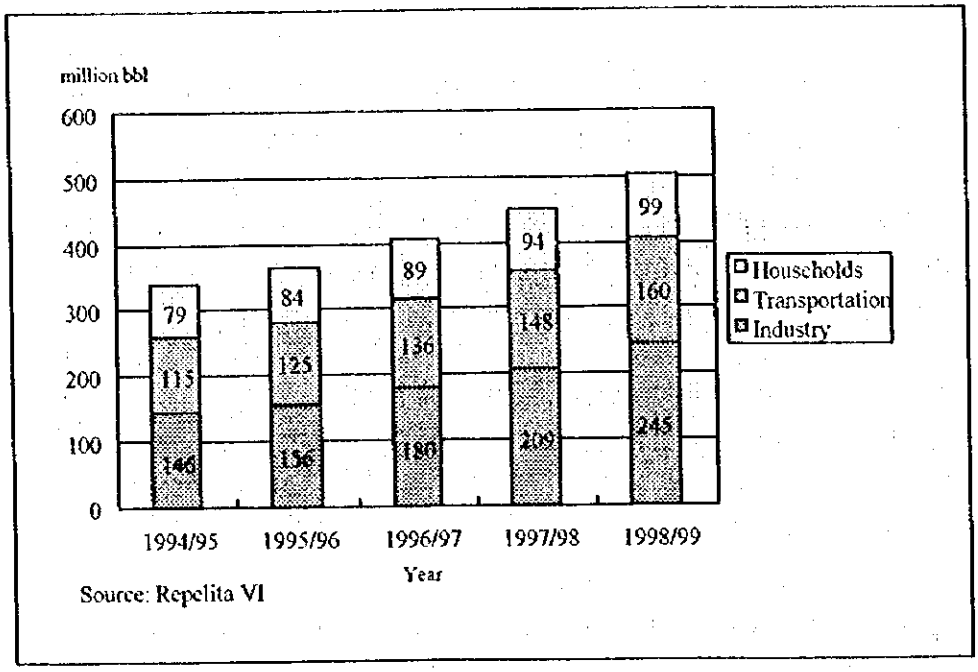
The total capacity of the hydropower plants in Indonesia in 1993 accounted for 3,046.24 MW. The capacities are 697.5 MW in the Sumatra, 30 MW in the Kalimantan, 321.98 MW in the Sulawesi, and 1,996.76 MW in the Java. At present, nine hydropower plants with total installed capacity is 1,218.2 MW are under construction and, at completion, they are expected to generate 2,847.27 GWh annually. Detailed designs for construction have been completed for 13 hydropower projects. When all of projects are completed, 1,341.9 MW will be generated with an annual energy generation of 5,209.96 GWh.

4.3.6 Energy policy

Basic energy policy is included in the five year plan (the Repelita) as well as the 25 year long term development plan (PJP). Repelita I and PJP I were simultaneously set in 1969, and subsequently Repelita VI and PJP II were set in 1994. The main development objective in the energy sector during the second long-term development plan (the PJP II) is the total domestic supply of energy. To achieve this aim, Indonesia will continue its efforts to reduce the consumption of crude oil. This means that development of non-oil energy sources such as natural gas and coal must be excavated, and so during the PJP II, coal-fired power plants should be increased rapidly to about a half of the total energy mix in electricity.

According to the Repelita VI, a total final energy consumption is estimated to increase from the 340.23 million barrels of oil equivalent in 1994/95 to 504.60 million barrels in 1998/99. In the industrial sector, the energy demand increases at an annual average rate of 13.9 %, from 145.8 million barrels to 245.2 million barrels. In the transportation sector, the energy demand rises from 114.99 million barrels to 160.35 million barrels. The energy demand in households will grow from 79.43 million barrels to 99.02 million barrels at an annual average rate of 5.7 %. (refer to Figure 4-19)

Figure 4-19 Estimated Total Final Energy Consumption



The projected total primary energy supply will increase from the equivalent of 493.7 million (actual in 1994: 457.7 million) barrels of oil in the first year of the Repelita VI to 688.13 million barrels in the final year. Natural oil will rise from 296.0 million barrels to 360.0 million barrels; however, the share of oil in the supply of primary energy will go down from 60.0 % to 52.3 %. Replacing oil the share of coal will grow from 9.5 % to 23.6 % (refer to Figure 4-20).

Figure 4-20 Projected Total Primary Energy Supply by Source

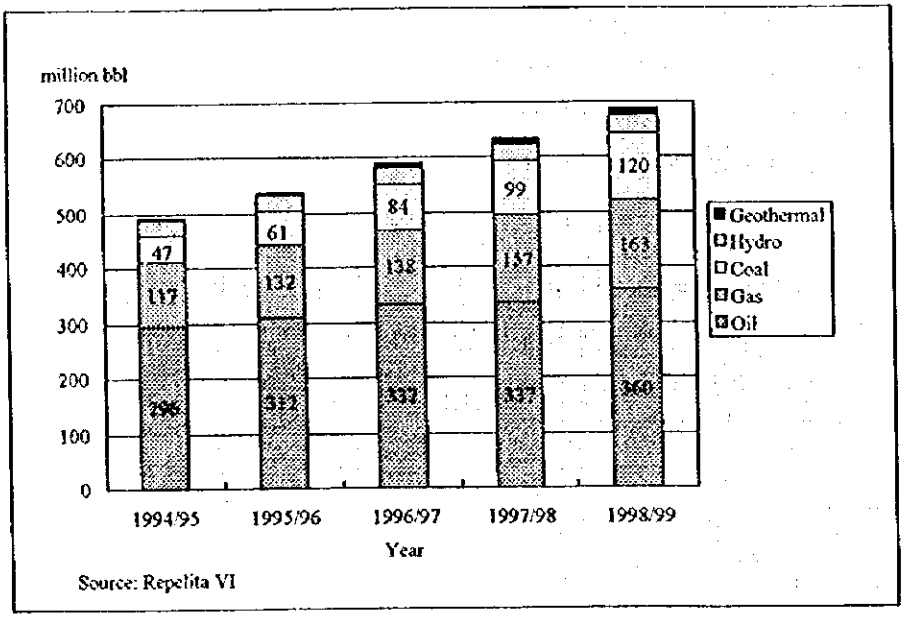
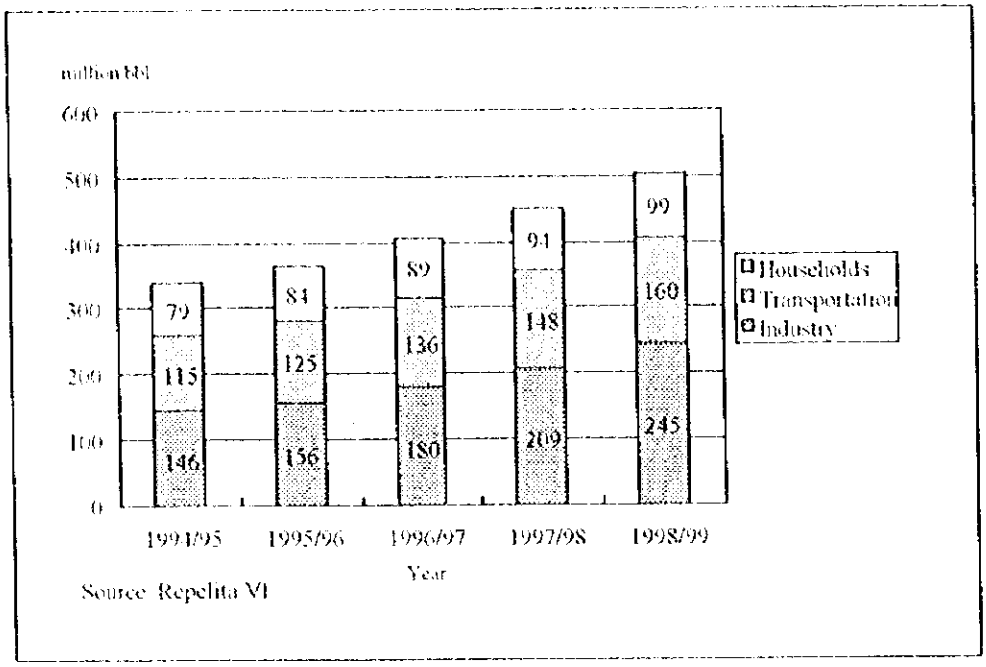


Figure 4-21 shows energy requirements projected for power plants, and the share of oil consumption will decrease and the share of coal will increase during the Repelita VI. Electric power plants are additionally build to meet electricity demand, so electricity supply is projected to rise from

Figure 4-19 Estimated Total Final Energy Consumption



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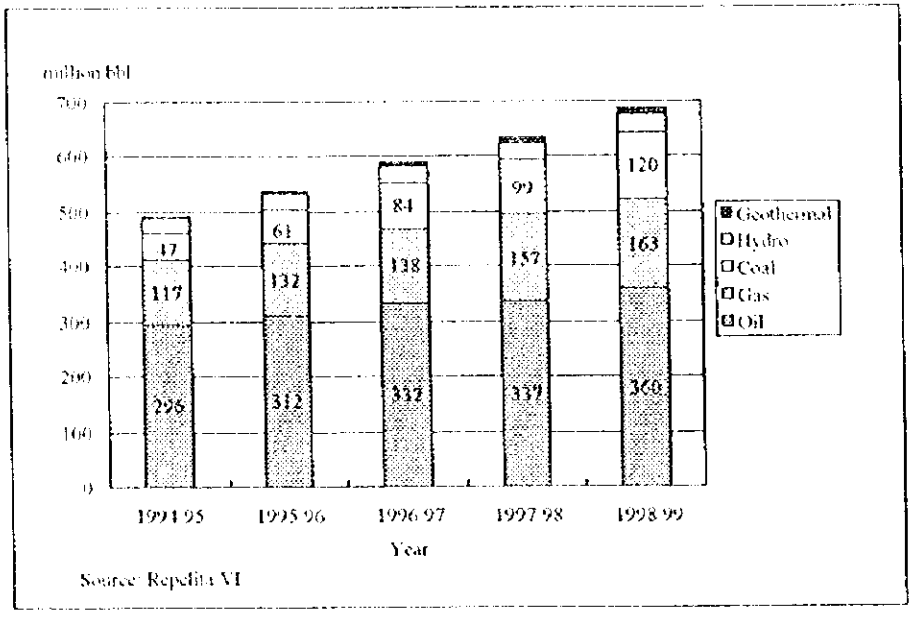
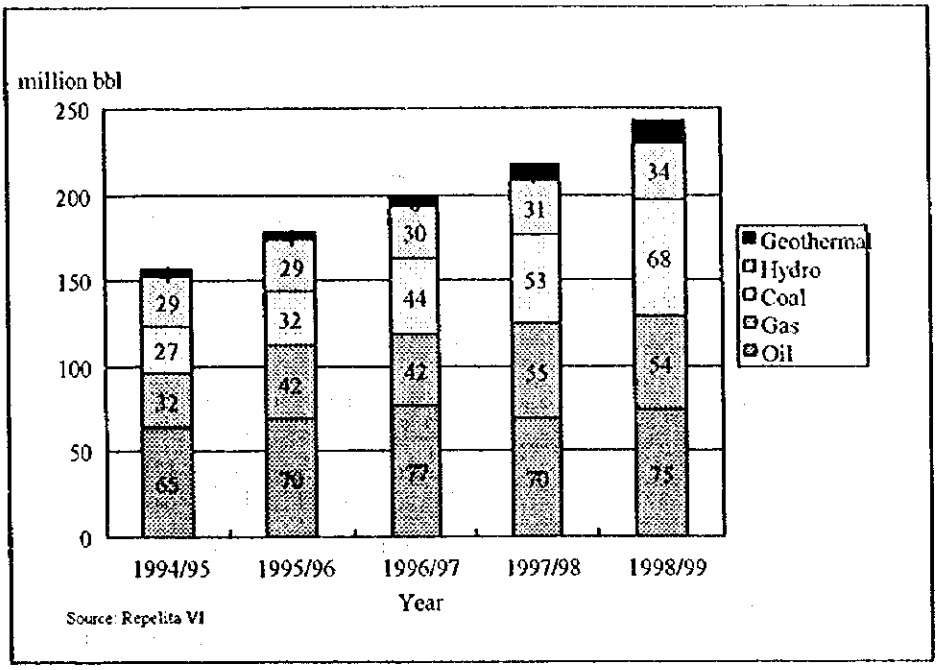


Figure 4-21 shows energy requirements projected for power plants, and the share of oil consumption will decrease and the share of coal will increase during the Repelita VI. Electric power plants are additionally build to meet electricity demand, so electricity supply is projected to rise from

71,500 GWh in the first year of the Repelita VI to 115,500 GWh in its fifth year. Meanwhile, the rate of electrification is expected to reach 60 % by the end of the Repelita VI, 70 % by the end of the Repelita VII, 80 % by the end of the Repelita VIII, 90 % by the end of the Repelita IX, 100 % by the end of the Repelita X.

Figure 4-21 Projected Requirement Energy for Power Plants



4.3.7 Comparison of the Solutions of IOPM and the MME Plan

Energy demand in the future was calculated from the solutions of IOPM. The products from the Oil & Gas sector include crude oil, natural gas, and geothermal energy. According to energy balance tables (refer to Table 4-33 to 4-35), crude oil moves only to a petroleum refinery in the chemical sector and for export. Crude oil is not directly burned in thermal power plants, while natural gas is directly consumed as fuel in power plants, in the commercial sector, and in the household sector. Also, natural gas is supplied as raw material to LNG and fertilizer plants in the Chemical sector. For export, natural gas is transported to the LNG plants through pipelines and then liquefied there for export, and there is no export of natural gas through pipelines to neighbor countries. It is assumed that geothermal energy is supplied to factories and power generation plants which are located near to the geothermal well energy source. Non Oil Gas sector includes minerals such as tin, nickel, bauxite, copper, gold, silver and coal. All these minerals except coal move to other sectors. Coal is reasonably assumed to be used for electric power generation in the Electricity Gas, Water sector.

Table 4-36 and 4-37 show the current and constant prices of crude oil for import and export, and of coal for power generation, all of which are calculated from both I-O Tables and energy balance Tables

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Figure 4-21 Projected Requirement Energy for Power Plants

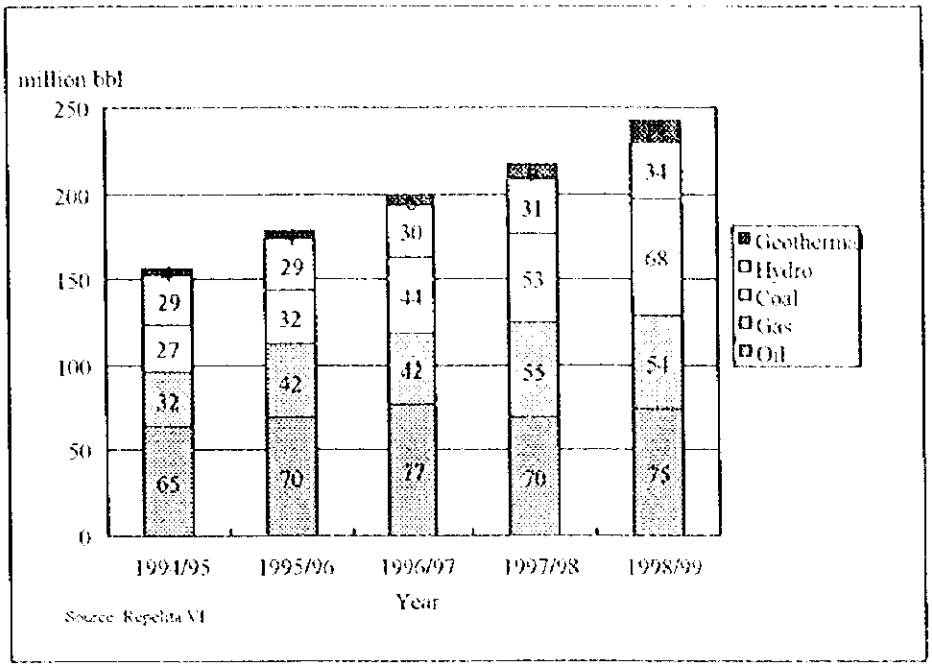

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Table 4-36 and 4-37 show the current and constant prices of crude oil for import and export, and of coal for power generation, all of which are calculated from both I-O Tables and energy balance Tables

in 1985, 1990, and 1993. All current energy prices (Table 4-36) should match with realized prices in each year (1985, 1990, 1993). However, these prices calculated from the tables were not exactly consistent with real prices, presumably caused by statistic error, and the prices of these energy source products of three years were re-examined. First, the exchange rates for calculations are Rp1,110.6/US$ in 1985, Rp1,842.8/US$ in 1990, and Rp2,087.1/US$ in 1993 respectively, and for energy conversion factors used are for crude oil 7.33 barrels/ton oil equivalent(toe) and for coal 1.66 ton coal equivalent(tce)/toe respectively.

Results:

1) In Table 4-36, the crude oil price in 1985 is shown as US$17.45-US$23.44/bbl, which is slightly lower than the realized price of US$26.5-US$28.5/bbl.
2) Crude oil price in 1990 calculated from the I-O Table is US$21.65-US$25.46/bbl while the realized price of US$17-US$21/bbl in 1990.
3) Calculated crude oil price in 1993 is US$16.1/bbl while the realized price of US$16-US$19.5/bbl, so the former price is fairly close to the latter.
4) Coal price for power generation in the Table in 1985 is US$86.33/ton, which is much higher than US$55/ton of international steaming coal price of the year. However, coal production in Indonesia then was much smaller in volume and the mining conditions were substantially different from these of today. Therefore, such price difference may not mean much for examination.
5) The coal price for power generation in 1990 is shown as US$33.11/ton, which matches with the market price of the same year.
6) Coal price in 1993 is US$62.2/ton, which is too high compared to Indonesian realized price of US$35/ton in the same year.

As a result of this examination, the estimated future demand for energy in the prices of 1990 are the most dependable ones.

For the purpose to estimate future demand for energy, simulations are exercised under the different constraints of IOPM. The result of this exercises turns out to be the best result in Case 1 and Case 4. Thus, the solutions and intermediate demand of these two Cases are used to calculate the future production of oil and gas, import and export of crude oil, and consumption of coal. Table 4-37 shows each unit cost in 1990 for the production of oil and gas, export and import of crude oil and consumption of coal for electric power generation which are listed as below:

Production of oil and gas	: Rp207,515/toe (US$99.43/toe)
Crude oil export	: Rp265,408/toe (US$17.35/bbl)
Crude oil import	: Rp303,805/toe (US$19.86/bbl)
Coal for power generation	: Rp137,708/toe (US$39.59/tce)

Figure 4-22 shows the estimated future production levels of oil and gas change lower than that of MIGAS plan till the year of 2011, however, the two figures of Case 4 and the MIGAS plan reach almost the same level in the year of 2016. The estimated future demand of coal for thermal power generation grows slightly faster than that of DOE (Directorate of Energy) plan, but the difference is very small (refer to Figure 4-23).

Figure 4-22 Oil & Gas Production

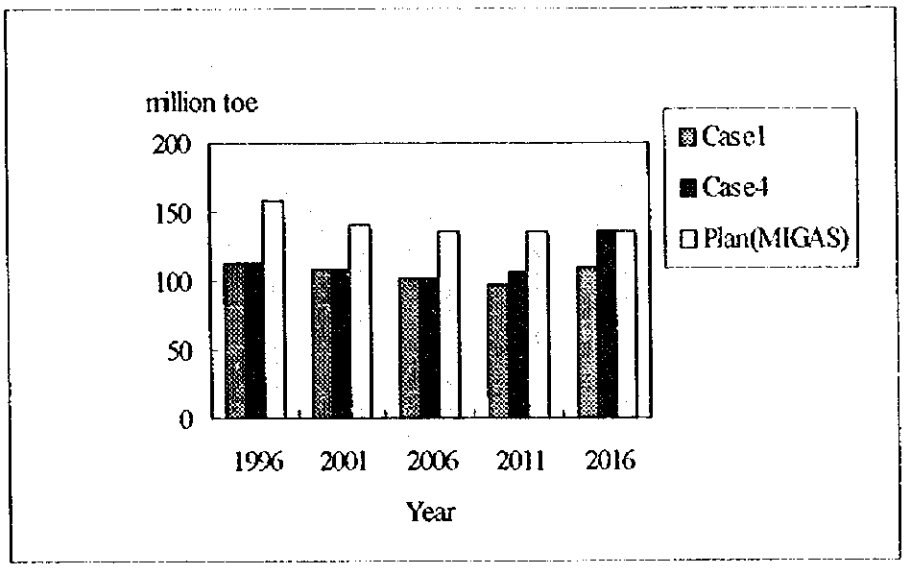
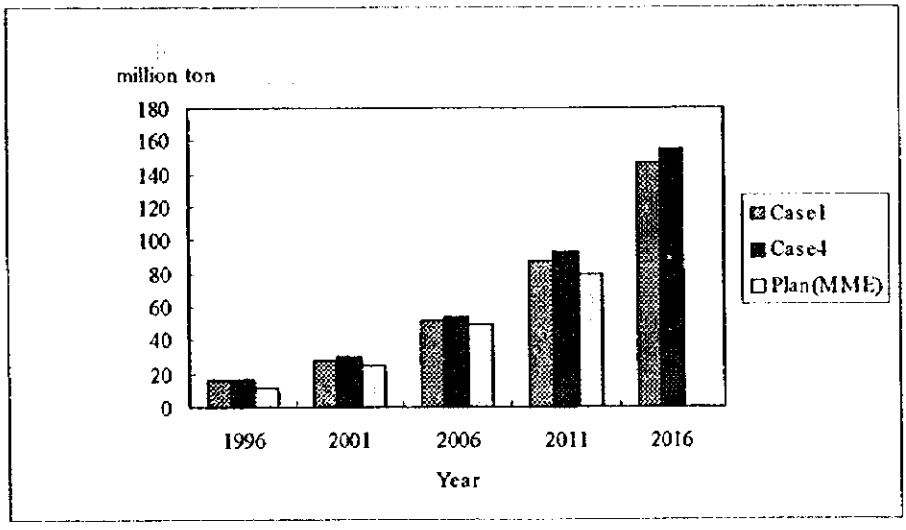


Figure 4-23 Coal Consumption for Power Plants



The narrowing gap between export and import of oil may indicate the constantly increasing domestic demand. In the IOPM both export and import of oil increase to arrive at break-even in 2016 (see Figure 4-24 and 4-25). On the other hand, MIGAS expect consumption of oil products will increase constantly, while export of oil will decrease gradually and that Indonesia may become net oil importer

between 2004 – 2008. Comparative examination of energy demand and supply in Case 1 and 4 can be concluded that the solution of IOPM produces values fairly close to the reality though there exist minor differences.

Figure 4-24 Crude Oil Export

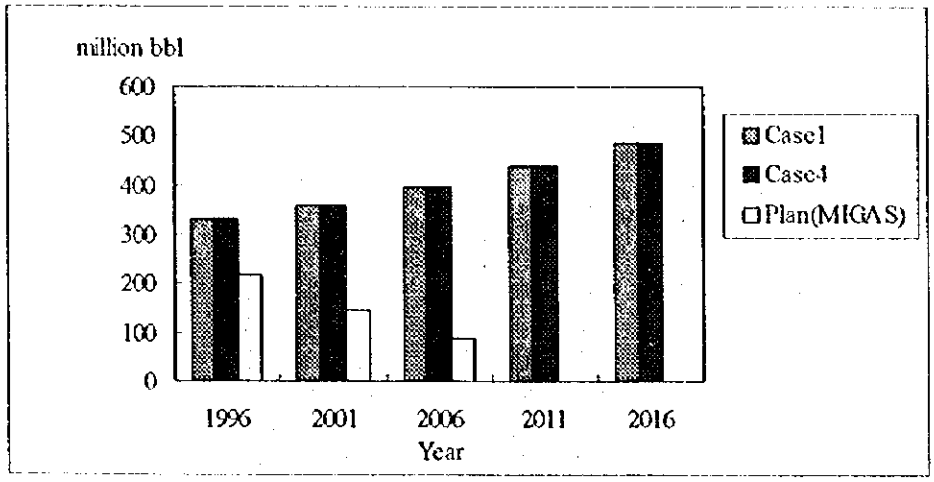


Figure 4-25 Crude Oil Import

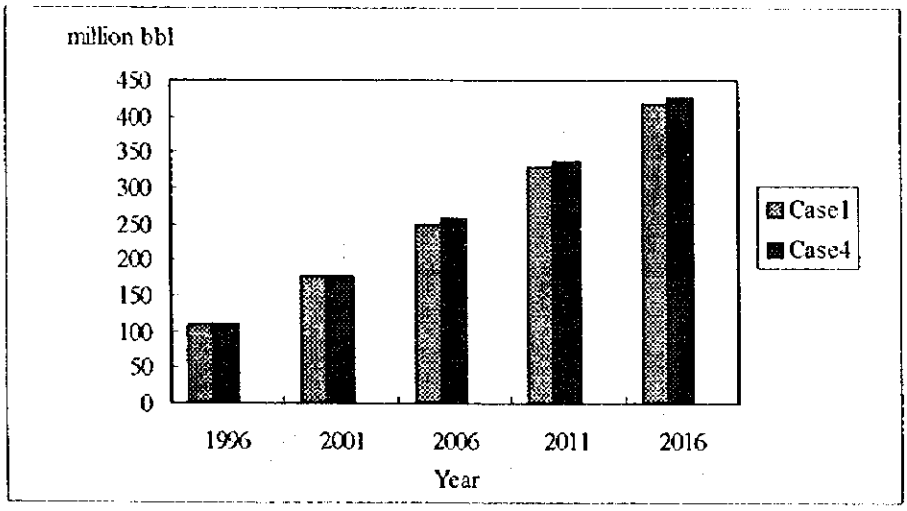


Table 4-36 Energy Balance in Indonesia 1985

(Unit 1,000toe)

	Coal	Oil	Gas	Hydro/Other	Electricity	Total
Indigenous Production	918	66,444	24,197	1,421		92,980
Import	29	6,696				6,725
Export	-665	-50,109	-17,670			-68,443
Marine Bunkers		-212				-212
Stock Changes		666				666
Total Primary Energy Supply	282	23,486	6,527	1,421	0	31,716
Petroleum Refineries		-1,534	-70			-1,604
Electricity Generation	-100	-5,742	-1	-1,421	2,629	-4,636
Other Transformation	44	-268	-1,783		-278	-2,286
Total Final Consumption	225	15,943	4,673	0	2,350	23,191
Iron and Steel	21	104	1,583		183	1,890
Chemical		877	3,022		107	4,006
Non-Metallic Minerals	148					148
Unspecified	26	2,416	37		482	2,960
						0
Road		6,508				6,508
Air		530				530
Unspecified	20	185				205
						0
Agriculture						0
Public/Commerce					130	130
Residential		5,113	31		449	5,593
Unspecified	10				1,001	1,011
						0
Non Energy Use		210				210
Total	225	15,943	4,673	0	2,350	23,191

Note: Other Transformation includes Returns, Transfers, Statistical Difference, Own Use and Losses.
Source: Energy Statistics and Balance of Non-OECD Countries, IEA

Table 4-37 Energy Balance in Indonesia 1990

(Unit 1,000toe)

	Coal	Crude Oil	Petro. Products	Gas	Hydro/Other	Electricity	Total
Indigenous Production	6,449	76,360		36,533	1,456		120,797
Import	31	6,327	2,983				9,341
Export	-2,989	-39,915	-10,863	-22,350			-76,117
Marine Bunkers			-346				-346
Stock Changes		-2,391	-33	-4,298			-6,721
Total Primary Energy Supply	3,491	40,381	-8,258	9,885	1,456	0	46,954
Returns and Transfers							0
Statistical Difference			2				2
Public Electricity	-2,812		-3,822	-273	-1,456	2,925	-5,438
Autoproducers of Electr.			-24			881	858
CHP Plants							0
District Heating							0
Gas Works			-12	-297			-309
Petroleum Refineries		-40,381	37,558	-774			-3,596
Coal Transformation							0
Liquefaction							0
Other Transformation							0
Own Use				-4,454			-4,454
Distribution Losses						-344	-344
Total Final Consumption	679	0	25,444	4,089	0	3,462	33,673
Iron and Steel	31		448				479
Chemical			954	3,933			4,887
Non-Ferrous Metals							0
Non-Metallic Minerals	648		485	156			1,289
Transport Equipment							0
Machinery			54				54
Mining and Quarrying			930				930
Food and Tobacco			518				518
Paper, Pulp and Printing							0
Wood and Wood Products							0
Construction			268				268
Textile and Leather			891				891
Non-specified Industry			1,003			1,218	2,221
							0
Air			969				969
Road			9,386				9,386
Rail							0
Internal Navigation			753				753
Non-specified Transport							0
							0
Agriculture			992				992
Public/Commerce			309			200	509
Residential			6,655			774	7,429
Non-specified Other						1,270	1,270
							0
Non Energy Use			829				829
Total	679	0	25,444	4,089	0	3,462	33,673

Source: Energy Statistics and Balance of Non-OECD Countries, IEA

Table 4-38 Energy Balance in Indonesia 1993

(Unit 1,000toe)

	Coal	Crude Oil	Petro. Products	Gas	Hydro/Other	Electricity	Total
Indigenous Production	16,964	78,483		47,171	1,642		144,260
Import	207	7,812	7,281				15,300
Export	-11,213	-39,220	-10,443	-28,468			-89,344
Marine Bunkers			-505				-505
Stock Changes	-1,061		412				-649
Total Primary Energy Supply	4,897	47,075	-3,255	18,703	1,642	0	69,062
Returns and Transfers		-2,537	2,807				270
Statistical Difference		-3,598	97	1	-29	-1	-3,530
Public Electricity	-3,806		-5,071	-846	-1,613	4,232	-7,104
Autoproducers of Electr.			-331			79	-252
CHP Plants							0
District Heating							0
Gas Works				-53			-53
Petroleum Refineries		-40,940	38,524	-656			-3,072
Coal Transformation	3						3
Liquefaction				-7,834			-7,834
Other Transformation							0
Own Use				-2,722		-211	-2,933
Distribution Losses						-524	-524
Total Final Consumption	1,094	0	32,771	6,593	0	3,575	44,033
Iron and Steel	25						25
Chemical			1,172	4,753			5,925
Non-Ferrous Metals							0
Non-Metallic Minerals	1,068			115			1,183
Transport Equipment							0
Machinery							0
Mining and Quarrying							0
Food and Tobacco							0
Paper, Pulp and Printing							0
Wood and Wood Products							0
Construction							0
Textile and Leather							0
Non-specified Industry			6,976			1,882	8,858
							0
Air			1,455				1,455
Road			11,391				11,391
Rail							0
Internal Navigation			1,016				1,016
Non-specified Transport							0
							0
Agriculture			1,421				1,421
Public/Commerce			450	238		305	993
Residential			7,522	238		1,156	8,916
Non-specified Other				1,249		232	1,481
							0
Non Energy Use			1,369				1,369
Total	1,093	0	32,772	6,593	0	3,575	44,033

Source: Energy Statistics and Balance of Non-OECD Countries, IEA

Table 4-39 Energy Price based on Energy Balance and I-O Table (current price)

		1985		
Item	million toe	million Rp	Rp/toe	
Oil & Gas Production	90.6412	15,477,361	170,754	153.75 US$/toe
Crude Oil Export	50.1089	9,562,215	190,829	23.44 US$/bbl
Crude Oil Import	6.6963	951,393	142,077	17.45 US$/bbl
Coal Consumption for Power	0.1002	16,011	159,790	86.33 US$/tce
		1990		
Item	million toe	million Rp	Rp/toe	
Oil & Gas Production	112.8927	22,945,458	203,250	110.29 US$/toe
Crude Oil Export	39.9152	11,673,931	292,468	21.65 US$/bbl
Crude Oil Import	6.327	2,175,880	343,904	25.46 US$/bbl
Coal Consumption for Power	2.8118	285,928	101,689	33.11 US$/tce
		1993		
Item	million toe	million Rp	Rp/toe	
Oil & Gas Production	125.654	24,847,684	197,747	94.75 US$/toe
Crude Oil Export	39.22	9,652,415	246,110	16.09 US$/bbl
Crude Oil Import	7.812	1,924,834	246,395	16.11 US$/bbl
Coal Consumption for Power	3.806	823,485	216,365	62.20 US$/tce

Note: Exchange rate : Rp1,110.6/US$ in 1985, Rp1,842.8/US$ in 1990, Rp2,087.1/US$ in 1993

Conversion factor : 1toe = 1.67tce, 1toe = 7.34bbl

Source: Energy Statistics and Balance of Non-OECD Countries/IEA, and I-O Balance Table

Table 4-40 Energy Price based on Energy Balance and I-O Table (current 1993 price)

		1985		
Item	million toe	million Rp	Rp/toe	
Oil & Gas Production	90.6412	20,739,328	228,807	109.63 US$/toe
Crude Oil Export	50.1089	7,239,957	144,484	9.44 US$/bbl
Crude Oil Import	6.6963	1,055,274	157,591	10.30 US$/bbl
Coal Consumption for Power	0.1002	32,612	325,469	93.57 US$/tce
		1990		
Item	million toe	million Rp	Rp/toe	
Oil & Gas Production	112.8927	23,426,909	207,515	99.43 US$/toe
Crude Oil Export	39.9152	10,593,812	265,408	17.35 US$/bbl
Crude Oil Import	6.327	1,922,177	303,805	19.86 US$/bbl
Coal Consumption for Power	2.8118	387,206	137,708	39.59 US$/tce
		1993		
Item	million toe	million Rp	Rp/toe	
Oil & Gas Production	125.654	24,847,684	197,747	94.75 US$/toe
Crude Oil Export	39.22	9,652,415	246,110	16.09 US$/bbl
Crude Oil Import	7.812	1,924,834	246,395	16.11 US$/bbl
Coal Consumption for Power	3.806	823,485	216,365	62.20 US$/tce

Note: Exchange rate = Rp2,087.1/US$, Conversion factor : 1toe = 1.67tce, 1toe = 7.33bbl

Source: Energy Statistics and Balance of Non-OECD Countries/IEA, and I-O Balance Table

4.4 Environment

4.4.1 Environmental Issues

(1) Environmental Issues in Repelita VI and PJP II

The development of Indonesia has depended considerably on its rich natural resources such as oil, natural gas, nonferrous metals, forest resources and agricultural products. However, Indonesia is now entering a phase with processing industries involving higher-technology. Due to this shift, pollution and other environmental issues have become the focus of the Government of Indonesia's development concerns.

Three major environmental issues mentioned in Repelita VI and PJP II

1) Strain on Indonesia's stock of key natural resources (land, forests, water and energy) as a critical ecosystems (including ground water aquifers in cities, and watersheds and coastal and marine ecosystems throughout Indonesia)
2) Increase of industrial pollution (including water pollution, air pollution, and toxic and hazardous waste) and urban pollution (human waste, solid waste and vehicle emissions)
3) Environmental degradation due to poverty (pollution, erosion of natural resources, unsustainable production practices, unsafe disposal of human and other wastes)

To respond-to these issues, the Government of Indonesia has introduced the policies below:

1) Natural Resources Management

- Energy resources management (energy saving and introduction of alternative energy sources)
- Forest resources management (including intervention of illegal logging, introduction of cash crops and deforestation)
- Water resource management including management of safe drinking water and industrial water, watershed management and water pollution control)
- Land management (including prevention of soil erosion by conservation of forests, setting parks, reserves and protection areas especially in watersheds, coral reefs and mangroves)

2) Pollution Control

- Industrial pollution (including "win-win-win policies" to improve efficiency, environment outcome and income distribution at the same time, PROKASIH, Langit Biru, AMDAL and reduction of toxic and hazardous waste)
- Urban pollution (sanitation and public health education, collection and disposal of municipal solid waste, improvement of two-stroke motorcycle engines, and mitigation for coastal development)

(2) Priorities

Interviews with Indonesian officers, both at national and regional related areas have revealed that Indonesia's priorities for sustainable development are 1) water pollution control, 2) toxic and hazardous waste management, 3) air pollution control and 4) natural resources management. Pollution controls are the highest priorities in Java (and Southern Sumatra), and natural resources management is the most important issue out side of Java.

1) Water Pollution

Safe water is the most important issue in Indonesia. As countermeasures for water pollution reduction of BOD (biological oxygen demand) and COD (chemical oxygen demand) have been focused on. However, some experts point out pollution by heavy metals. Yet as natural BOD is so high and domestic waste is dominant, the load of industrial waste is still rather small.

2) Solid Waste

Since a collection and processing system of household waste has not been efficiently implemented, the sight of garbage left on the streets, dumped by the rivers and burned is common. Also there is only one industrial waste treatment center in Indonesia located near Bogor, and the second is planned in the suburbs of Surabaya. Immediate actions including storage and transportation of industrial waste are necessary.

3) Air Pollution

The priorities in air pollution now is dust, lead in dust and nitrogen oxides (NOx). Sulfur oxides (SOx) have not been a serious problem yet. However, proceeding power plants are shifting from oil to coal and rapid industrialization is going on. Thus we cannot exclude SOx from our consideration an important environmental issue in the near future.

4) Forest Resources Management

Major causes of deforestation in Indonesia are illegal logging, improper farming, conversion of forest lands into farm lands by the transmigration policy and natural causes such as forest fires. For natural forest, selective logging and reforestation are mandatory. Industrial afforestation has been promoted for wastelands and less-productive forests. Social forestry has also been promoted for commons and for unproductive convertible forests.

(3) Regional Environmental Characteristics of Indonesia

With a view to collecting data on regional environmental characteristics, Indonesia is divided into five regions, i.e. Sumatra, Java, Kalimantan, Sulawesi and others, covering the provinces listed below

together with their provincial serial numbers.

1) Sumatra Region: 1. DI Aceh, 2. Sumatra Utara, 3. Riau, 4. Sumatra Barat, 5. Jambi, 6. Sumatra Selatan, 7. Bengkulu, 8. Lampung
2) Java Region: 9. DKI Jakarta, 10. Java Barat, 11. Java Tengah, 12. DI Yogyakarta, 13. Java Timur
3) Kalimantan Region: 14. Kalimantan Barat, 15. Kalimantan Tengah, 16. Kalimantan Selatan, 17. Kalimantan Timur
4) Sulawesi Region: 18. Sulawesi Utara, 19. Sulawesi Tengah, 20. Sulawesi Tenggara, 21. Sulawesi Selatan
5) Others: 22. Bali, 23. Nusa Tenggara Barat, 24.Nusa Tenggara Timur, 25. Maluku, 26. Irian Jaya, 27. Timor Timur

Table 4-41 Regional Environmental Characteristics of Indonesia

	Sumatra		Java		Kalimantan		Sulawesi		Others		Total	
Area	473,897 km²		127,721 km²		538,293 km²		191,798 km²		588,078 km²		1,919,787 km²	
(1993, BPN)	(24.7%)		(6.7%)		(28.0%)		(10.0%)		(30.6%)		(100.0%)	
Population	36,421,000		107,518,000		9,103,000		12,511,000		13,642,000		179,195,000	
(1993, DPU)	(20.3%)		(60.0%)		(5.1%)		(7.0%)		(7.6%)		(100.0%)	
Urban Population	9,292,000		38,335,000		2,507,000		2,761,000		2,494,000		55,389,000	
(1993, DPU)	(16.8%)		(69.2%)		(4.5%)		(5.0%)		(4.5%)		(100.0%)	
Population Density (1993)	76.9 /km²		841.8 /km²		16.9 /km²		65.2 /km²		23.2 /km²		93.3 /km²	
Transmigrated Households	1,055,921		0		357,725		170,213		90,251		1,674,110	
(by 1993/4, MTFSR)	(63.1%)		(0.0%)		(21.4%)		(10.2%)		(5.4%)		(100.0%)	
Estimated Transmigrated Area	11,800 km²		0 km²		4,000 km²		1,900 km²		1,000 km²		18,700 km²	
Environmental Priorities	1.Water Pollution		1.Water Pollution		1.Water Pollution		1.Deforestation		1.Deforestation			
(1995, BAPPENAS)	2.Deforestation		2.Land Use Conflict		2.Deforestation		2.Land Use Conflict		2.Land Use Conflict			
	3.Land Use Conflict		3. Urban Slum		3.Urban Slum		3.Water Pollution		3.Critical Land			
	4.Urban Slum		4. Critical Land		4.Land Use Conflict		4.Critical Land		4.Urban Slum			
Demand for Water (1993, DPU)	million ton / year		million ton / year		million ton / year		million ton / year		million ton / year		million ton / year	
Drinking Water	1,999	[6.5%]	5,623	[8.2%]	337	[4.1%]	609	[5.3%]	145	[2.6%]	8,713	[7.0%]
Industrial Water	69	[0.2%]	527	[0.8%]	16	[0.2%]	13	[0.1%]	3	[0.1%]	628	[0.5%]
Irrigation Water	25,207	[82.3%]	55,589	[81.1%]	6,355	[76.8%]	9,508	[83.4%]	5,327	[93.8%]	101,986	[81.9%]
Aquaculture Water	221	[0.7%]	2,529	[3.7%]	0	[0.0%]	1,170	[10.3%]	79	[1.4%]	3,999	[3.2%]
Other Water Use	3,141	[10.3%]	4,264	[6.2%]	1,570	[19.0%]	98	[0.9%]	126	[2.2%]	9,199	[7.4%]
Total Demand	30,637	[100.0%]	68,532	[100.0%]	8,278	[100.0%]	11,398	[100.0%]	5,680	[100.0%]	124,525	[100.0%]
Potential Supply (1993, DPU)	465,257	[1519%]	79,543	[116%]	695,754	[8405%]	114,220	[1002%]	665,183	[11711%]	2,019,957	[1622%]
Land Use (1993, BPN)	km²		km²		km²		km²		km²		km²	
Settlement Area	7,863	[1.7%]	15,543	[12.2%]	3,204	[0.6%]	2,739	[1.4%]	2,792	[0.5%]	32,141	[1.7%]
Paddy Field	20,798	[4.4%]	35,827	[28.1%]	8,692	[1.6%]	7,998	[4.2%]	4,788	[0.8%]	78,103	[4.1%]
Dry Land	15,901	[3.4%]	23,983	[18.8%]	21,136	[3.9%]	7,068	[3.7%]	32,913	[5.6%]	101,001	[5.3%]
Plantation	71,929	[15.2%]	5,270	[4.1%]	15,677	[2.9%]	11,334	[5.9%]	8,853	[1.5%]	113,063	[5.9%]
Fish Pond	4,108	[0.9%]	1,709	[1.3%]	1,828	[0.3%]	1,338	[0.7%]	388	[0.1%]	9,371	[0.5%]
Forest Area	299,696	[63.2%]	27,759	[21.7%]	419,339	[77.9%]	127,208	[66.3%]	457,427	[77.8%]	1,331,429	[69.4%]
Others	53,602	[11.3%]	17,630	[13.8%]	68,417	[12.7%]	34,113	[17.8%]	80,917	[13.8%]	254,679	[13.3%]
Total	473,897	[100.0%]	127,721	[100.0%]	538,293	[100.0%]	191,798	[100.0%]	588,078	[100.0%]	1,919,787	[100.0%]
LANDSAT Forest Area (1986-1991)	236,286	[49.9%]	29,161	[22.8%]	389,437	[72.3%]	113,787	[59.3%]	436,994	[74.3%]	1,205,665	[62.8%]
Industrial Estates	12,600 ha		38,200 ha		1,220 ha		670 ha		200 ha		52,890 ha	
(1996, BPPI)	(23.8%)		(72.2%)		(2.3%)		(1.3%)		(0.4%)		(100.0%)	
Industrial Area Increase by 2003	5,190 ha		17,440 ha		2,770 ha		1,320 ha		770 ha		27,490 ha	
(1996, BPPI)	(18.9%)		(63.4%)		(10.1%)		(4.8%)		(2.8%)		(100.0%)	
Foreign Investment	US$33,210.3 million		US$105,869.2 million		US$9,291.6 million		US$8,301.2 million		US$5,929.9 million		US$162,602.2 million	
(up to June 1996, BKPM)	(20.4%)		(65.1%)		(5.7%)		(5.1%)		(3.6%)		(100.0%)	
Number of Vehicles (Police Dept.)	Number		Number		Number		Number		Number		Number	
1989	1,752,116	[100%]	5,194,888	[100%]	411,330	[100%]	443,690	[100%]	441,958	[100%]	8,243,982	[100%]
1990	1,824,271	[104%]	5,603,117	[108%]	448,316	[109%]	462,659	[104%]	512,376	[116%]	8,850,739	[107%]
1991	1,794,407	[102%]	5,902,359	[114%]	479,263	[117%]	479,788	[108%]	574,924	[130%]	9,230,741	[112%]
1992	1,992,238	[114%]	6,326,167	[122%]	521,349	[127%]	454,891	[103%]	598,092	[135%]	9,892,737	[120%]
1993	1,760,600	[100%]	6,743,981	[130%]	569,451	[138%]	532,502	[120%]	630,535	[143%]	10,237,069	[124%]
1994	1,964,908	[112%]	6,867,460	[132%]	586,211	[143%]	521,790	[118%]	652,786	[148%]	10,593,155	[128%]
1995	2,187,836	[125%]	8,493,158	[163%]	683,919	[166%]	594,633	[134%]	790,955	[179%]	12,750,501	[155%]
1996	2,404,086	[137%]	9,717,217	[187%]	786,690	[191%]	748,837	[169%]	873,765	[198%]	14,530,595	[176%]
Amount of SOx Emission	134,098,939 t / year		274,484,768 t / year		8,840 t / year		0 t / year		321,712 t / year		408,914,259 t / year	
(1993, NKLD)	(32.8%)		(67.1%)		(0.0%)		(0.0%)		(0.1%)		(100.0%)	
Amount of NOx Emission	4,374,457 t / year		785,429,879 t / year		9,807 t / year		2,536,550 t / year		228,885 t / year		792,579,578 t / year	
(1993, NKLD)	(0.6%)		(99.1%)		(0.0%)		(0.3%)		(0.0%)		(100.0%)	

4.4.2 Environmental Policies

(1) Government Organizations

The office of Minister of State for Environment (KLH) makes policies regarding environmental issues and the Environmental Impact Management Agency (BAPEDAL) , which was established in 1990, State for Environment holds the post of Secretary of State for BAPEDAL concurrently.

Under BAPEDAL, the Environmental Management Center (EMC) was established under the co-operation of the Governments of Indonesia and Japan. Studies for environmental policies, development of environmental management techniques, analysis of environmental data and training of officers and-engineers in environmental field are undertaken at EMC.

Other ministries are also tackling the environmental problems, for example;

Ministry of Industry and Trade	:	Industrial Pollution
Ministry of Forestry	:	Forest Resources, Nature Conservation
Ministry of Public Works	:	Water Supply, Solid Waste, Sanitation
Ministry of Labor	:	Labor Environment
Ministry of Mining and Energy	:	Natural Resources

(2) Water Pollution

1) Water Quality Standards:

Water quality standards were introduced by Government Regulation No.20 of 1990 on June 5, 1990. The standards for fresh water are classified into four categories, namely, A : drinkable without water purification, B : drinkable after water purification, C : for fishery and live stock farming, D : for agriculture, industries and power generation. Except for several inorganic matters, the standards in Indonesia are almost as strict as those of Japan. (Japanese categories are; AA : Water Supply Class 1 = drinkable with simple filtration and for nature conservation, A : Water Supply Class 2 = drinkable with water purification and Fishery Class 1, B : Water Supply Class 3 = drinkable with a high degree of water purification and Fishery Class 2, C: Fishery Class 3 and Water for Industrial Use Class 1, D : Water for Industrial Use Class 2 and for Agricultural Use, E : Water for Industrial Use Class 3 and not unpleasant to daily life.)

Table 4-42 Major Criteria of fresh Water Quality in Indonesia and Japan

Parameter	Unit	Max Concentration									
		Indonesia				Japan					
		A	B	C	D	AA	A	B	C	D	E
pH		6.5-8.5	5 - 9	6 - 9	5 - 9	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.5	6.0-8.5
TDS	mg/l	1,000	1,000	1,000-	2,000-						
SS	mg/l					25	25	25	50	100	-
Organic Substances	mg/l	10	-	-	-						
BOD	mg/l					1	2	3	5	8	10
DO	mg/l	-	>6	>3		>7.5	>7.5	>5	>5	>2	>2
Cadmium	mg/l	0.005	0.01	0.01	0.01	0.01					
Cyanide	mg/l	0.1	0.1	0.02	-	0					
Lead	mg/l	0.05	0.1	0.031	1	0.01					
Arsenic	mg/l	0.05	0.05	0.002-	1	0.01					
Hg	mg/l	0.001	0.001-		0.005	0.0005					
1,2-Dichloroethane	mg/l	0.01			-	0.004					

BOD: Biological Oxygen Demand (MnO4), Organic Substances (KMnO4)
TDS: Total Dissolved solid Substances
SS: Suspended Solids
DO: Dissolved Oxygen

2) Effluent Standards

The effluent standards introduced by KEP-02/MENKLH/1/1988 were applied uniformly to all types of industry, thus being extremely strict for some types of industry but not so strict for other types. Consequently, new effluent standards were newly established for 14 types of industry by KEP-03/MENKLH/2/1991. The 14 types of industry and their parameters are as follows :

Table 4-43 The Effluent Standards of Industry

Type	Parameters
Caustic Soda	COD, TSS, Hg, Cu, Pb, Zn, pH
Electoplanting	TSS, Cd, CN, Metals, Cu, Ni, Cr, Cr^{+6}, Zn, pH
Tanned Leather	BOD_5, COD, TSS, H_2S, Cr, Oil and Grease, NH_3-N, pH
Oil Refining	BOD_5, COD, Oil and Grease, Cr^{+6}, NH_3-N, pH
Palm Oil	BOD_5, COD, TSS, Oil and Grease, NH_3-N, pH
Pulp and Paper	BOD_5, COD, TSS, pH
Rubber	BOD_5, COD, TSS, CN, pH
Sugar	BOD_5, COD, TSS, H_2S, pH
Tapioca	BOD_5, COD, TSS, CN, pH
Textile	BOD_5, COD, TSS, Phenol, Cr, Oil and Grease, pH
Urea fertilizer	BOD_5, COD, TSS, Oil and Grease, NH_3-N, pH
Ethanol	BOD_5, COD, TSS, pH
MSG	BOD_5, COD, TSS, pH
Ply Wood	BOD_5, COD, TSS, Phenol, pH

BOD: Biological Oxygen Demand (MnO4), Organic Substances (KMnO4)
TDS: Total Dissolved solid Substances
SS: Suspended Solids
DO: Dissolved Oxygen

For those industry not included in the above 14 types, the KEP-02/MENKLH/1/1988 still stands.

3) PROKASIH (Program Kali Bersih = Clean River Program):

PROKASIH is a program to improve the river water quality launched in 1989, and in the fiscal year 1995/1996 13 provinces and 32 rivers are under PROKASIH. The framework of PROKASIH activities at provincial level is as follows:

- Selection and determination of rivers and the scope of PROKASIH
- Inventory of large scale factories
- Inventory of the pollution load
- Selection and determination of factories which must reduce their water pollution loads
- Signing of the agreement
- Monitoring of the disposed water o
- Evaluation of the compliance of each factory
- Taking of supervisory / law enforcement actions
- Monitoring of river water quality
- Data processing and reporting

BAPEDAL's report (1994) showed that the liquid waste pollution load of PROKASIH industries for BOD (biochemical oxygen demand) decreased by 74% from 166,523 tons in 1992/93 to 43,543 tons in 1992/1993 in 4 years, and that of COD (chemical oxygen demand) decreased by 60% from 272,858 tons to 108,331 tons. However, the river sections which indicated an improvement in quality are 4, namely, Kali River, Central Java, Musi River, South Sumatra, Mahakam River, East Kalimantan and Siak River, Riau, and the river sections showed a tendency of decreased quality are 5, namely, Bengawan Solo River, Central and East Java, Cipinang River, DKI Jakarta, Deli River, River and Kapuas River, North Sumatra, and the river sections showed a tendency of unchanged quality are 3, namely, Brantas River, East Java, Ciliwung River and Mookervart River, DKI Jakarta. Therefore, the decrease of industrial liquid waste pollution load did not directly bring about an improvement in river water quality.

BAPEDAL has also started a 5 rank (gold, green, blue, red and black) pollution abatement rating program for major factories. By the first announcement in June, 1995, there were no golds, 5 greens, 61 blues, 115 reds and 6 blacks out of 187 factories. The 5 green factories were commended, on the other hand, the 6 black factories were named in the paper.

4) Recent Development in PROKASIH

Implementation of PROKASIH has expanded over the eight years since 1989/1990 when it started in eight provinces with 422 factories. Now Proper PROKASIH covers monthly pollution load of 300 factories and annual load of 1,000 factories. Annual survey includes items such as:

1) Company Profile: Name, Address, Status, Licenses, Employment, Production time
2) Input: Raw materials, Water use, Products, Market, Environmental certification, Environmental policies, PROKASIH, Environmental audit
3) Water pollutants: River/Lake/Ocean/Others, Volume, Type of process, Layout and flow diagram, Lab
4) Solid waste: Source, Amount, Product origin, Result of analysis, Storage, Handling methodology

In June 1995, BAPEDAL announced the results of performance evaluation and rating by the PROPER PROKASIH, an assessment program, for the first time. The program assessed 187 companies, comprising 172 PROKASIH participant companies, 11 volunteer companies and 4 companies considered necessary to take part (special participants). In December 1995, the program assessed 213 companies, comprising 181 PROKASIH participant companies, 25 volunteer companies and 7 special participants. Again in October 1996, the program assessed the same 213 companies which were assessed in December 1995.

The results show a substantial improvement. The ratio of the Red rating decreased from more than 60% to less than 40% and the Blue rating increased from about 30% to about 60%, even though the numbers of the Black rating and Green rating did not change much. Also there still are no Gold rating companies yet.

The analysis of the change of performance of the 115 Red rating and 5 Black rating companies, which had been assessed in December 1995, revealed that 70 companies or 58% stayed in the Red rating, 33 companies or 28% moved up to the Blue rating and 1 company or 1% even moved up to the Green rating in October 1996.

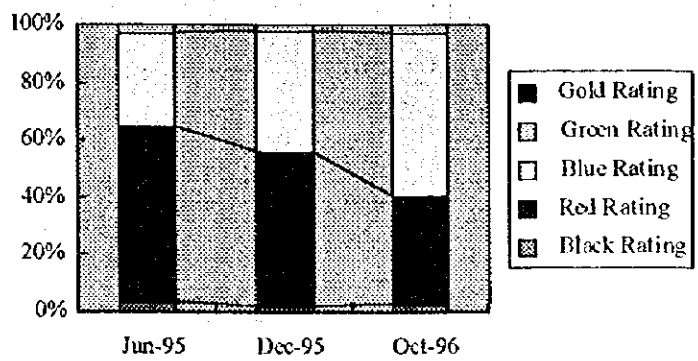
The companies in the Red rating mean that they had already started to treat their waste but did not achieve the level required due to mistakes in the design, procurement of equipment or operational weakness. These companies are relatively easy to be upgraded to the Blue rating by the application of the PROPER PROKASIH. The Black rating means the companies had not yet put any effort into managing their pollution.

The rating comparison among companies with local capital investment (PMDN) status, foreign capital investment (PMA) status and government owned enterprises (BUMN) shows that 87 local companies (65.9% of PMDN), 8 foreign companies (19.5% of PMA) and 17 government owned companies (47.2% of BUMN) were in the Red rating in December 1995. On the other hand, 40 local companies (30.3% of PMDN), 29 foreign companies (70.7% of PMA) and 18 government owned companies (50.0% of BUMN) were in the Blue rating. Thus 78.1% of PMA, 52.8% of BUMN and 38.3% of PMDN were in the Blue or above.

Table 4-44 The Rating Results of PROPER PROKASIH

Rating	No. of Companies					
	Jun-95		Dec-95		Oct-96	
Gold Rating	0	(0.0%)	0	(0.0%)	0	(0.0%)
Green Rating	5	(2.7%)	5	(2.3%)	6	(2.8%)
Blue Rating	61	(32.6%)	88	(41.3%)	121	(56.8%)
Red Rating	115	(61.5%)	115	(54.0%)	80	(37.6%)
Black Rating	6	(3.2%)	5	(2.3%)	6	(2.8%)
Total	187	(100.0%)	213	(100.0%)	213	(100.0%)

Figure 4-26 The Results of PROPER PROKASIH



Type of industry and location of the Black rating companies in December 1995 were as follows (No.6 was in Black in June 1995, but moved up to Blue in December 1995):

1.	Plywood	Siak River	Sumatra
2.	Plywood	Mahakam River	Kalimantan
3.	Pulp and paper	Citarum River	Java
4.	Paper	Belumai River	Sumatra
5.	Paint	Deli River	Sumatra
6.	Textile	Citarum River	Java

Those in October 1996 were as follows:

1.	Sugar	Java
2.	Rubber	Kalimantan
3.	Tanning	Java
4.	Tanning	Java
5.	Pulp and paper	Java

(3) Air Pollution

1) Air Quality Standards

Air quality standards were introduced by KEP-02/MENKLH/I/1988 for 9 parameters such as sulfur dioxides (SO_2), carbon monoxide (CO), nitrogen oxides (NOx), ozone, total suspended particulates (TSP), lead (Pb), hydrogen sulfide (H_2S), ammonia (NH_3) and hydrogen carbon (HC), but are now being prepared for revision. The revised air quality standards will be comparable to those in Japan.

Table 4-45 Revised Air Quality Standards in Indonesia and Air Quality Standards In Japan

Parameter	Indonesia		Japan	
	Measurement	Max Concentration	Measurement	Max Concentration
SO_2	1 hour	900 μ g/m^3 (0.34 ppm)	1 hour	0.1 ppm
	24 hours	300 μ g/m^3 (0.11 ppm)	24 hour ave.	0.04 ppm
	1 year	60 μ g/m^3 (0.02 ppm)		
CO	1 hour	30 μ g/m^3 (26 ppm)	8 hour ave.	20 ppm
	8 hours	10 μ g/m^3 (9 ppm)	24 hour ave.	10 ppm
NO_2	1 hour	400 μ g/m^3 (0.21 ppm)		
	24 hours	150 μ g/m^3 (0.08 ppm)	24 hour ave.	0.04-0.06 ppm
	1 year	100 μ g/m^3 (0.05 ppm)		
Oxydant	1 hour	160 μ g/m^3 (0.08 ppm)	1 hour	0.06 ppm
TSP/SPM	24 hours	230 μ g/m^3 (TSP)	1 hour	200 μ g/m^3 (SPM)
	1 year	90 μ g/m^3	24 hour ave.	100 μ g/m^3 (SPM)
Lead	24 hours	2.0 μ g/m^3		
	1 year	2.0 μ g/m^3		
HC	3 hours	160 μ g/m^3 (0.24 ppm)		

TSP: Total Suspended Particulates
SPM: Suspended Particulate Matter

2) Emission Standards

Emission standards for 17 parameters were also introduced by KEP-02/MENKLH /I /1988, but were revised for 4 major industries by KEP-13/MENKLH/3/1995 in March, 1995. The 4 industries and their parameters are:

Table 4-46 Emission Standard of Industries

Type	Parameters
Iron and Steel Industries	TSP, HCL, SO_2, NO_2, Opacity
Pulp and Paper Industries	TSP, TRS, Cl_2, Clo_2, SO_2, NO_2, Opacity
Coal Fired Steam Power Plants	TSP, SO_2, NO_2, Opacity
Cement Industries	TSP, SO_2, NO_2, Opacity
All Other Industries	NH_3, Cl_2, HCl, HF, Opacity, TP, SO_2, H_2S, Hg, As, Sb, Cd, Zn, Pb

TSP: Total Suspended Particulates
HCL: Hydrochrloric Acid Fumes
TRS: Total Reduced Sulfur
Cl_2: Chlirine
ClO_2: Chlorine Dioxide
HF: Hydrogen Fluoride

The emission standards for automobiles were also revised by KEP-35/MENKLH/10/ 1993. The parameters are only CO and HC for gasoline engines, and exhaust smoke for diesel engines.

3) Langit Biru = Blue Sky Program:

Lingit Biru is a program to promote countermeasures against air pollution launched in 1992, and the targets are:

For Stationary Sources :

- to reduce the total exhaust gas of cement industries from 164,000 ton / year to 42,000 ton / year, and that of iron industries from 35,000 to / year to 3,700 ton / year in 4 years
- to establish emission standards of fossil fuel fired steam power plants as soon as possible

For Mobile Sources :

- to reduce SPM exhausted from automobiles by 50 % in Jakarta, Bandung, Semarang and Surabaya (a BAPEDAL study indicates that stationary sources account for 15% of TSP, 16% of NOx and 63% of SOx in Jakarta, and 28% of TSP, 43% of NOx and 88% of SOx in Surabaya.) Though the targets are established as above, concrete plans have not been made yet.

4) JICA Study on Air Pollution

JICA Study for developing a diffusion model for Jakarta revealed several very important facts.

1) Air pollution in the Jakarta area is not so crucial as it was reported before due to incorrect method of measurement, lack of enough consideration to the tropical climate, limited use of coal and the dominant wind from the sea. The problem of particle matters is not as bad as in Japanese big cities.
2) According to the results of the diffusion model, there are few grids where the concentration of pollutants are over the air quality standards. There is only one grid over 40ppb of SO_2 around a cement factory and several others close to 40ppb around a power plant, two or three grids over 100ppb of NO_2 along major roads and no grid over 10 ppm of CO.
3) Stationary sources account for 76% of SO_X, 26% of NO_X and 57% of PM, whereas a former BAPEDAL study in Jakarta indicated that 63% of SO_X, 16% of NO_X and 15% of TSP. Automobiles were overestimated for all the pollutants, especially for PM.

4.4.3 Water Use

(1) Demand and Supply

BAPPENAS has established the target water demand in 1998 based on actual water demand data for 1993 (see Table 4-47 for the Repelita VI target figures). The basic consumption units used by BAPPENAS to decide the target water demand in 1998 are 0.6 liters/sec/ha for industrial water, 0.6 liters/sec/ha for agricultural water, 120 liters/day/person for drinking water, 1 liter/sec/ha for aquaculture water and 1 liter/sec/ha for livestock water.

Table 4-47 Repelita VI Target Figures of Water Use

Type of Water Use	Target Unit Water Use in	Estimated Volume of Unit in 1998	Target Water Use in 1998	
Industry + Tourism	0.6 liters/sec/ha	217,000 ha	110 ton/sec	(2.5%)
Agriculture	0.6 liters/sec/ha	6,100,000 ha	3,700 ton/sec	(83.7%)
Household	120 liters/sec/ha	211,000,000 x 72%	210 ton/sec	(4.8%)
Aquaculture	1 liter/sec/ha	370,000 ha	380 ton/sec	(8.6%)
Livestock	0.4 liters/sec/ha	50,000 ha	20 ton/sec	(0.5%)
Total	N.A.	N.A.	4,420 ton/sec	(100.0%)

Source: Bureau for Water Resources and Irrigation, BAPPENAS, 1993
Note: 2% annual population growth rate is used for population forecast.

The Water demand estimated by the DPU in 1993 is compared with the target water demand in 1998 of BAPPENAS in Table 4-48. While little difference is seen between the units of industrial water use of the two estimates, those for agricultural water, aquaculture water and livestock water are reduced from 1 liter/sec/ha to 0.6 liters/sec/ha, from 1-2 liters/sec/ha to 1 liter/sec/ha and from 1 liter/sec/ha to 0.4 liters/sec/ha respectively, indicating the need for a fairly large water consumption saving.

Comparison between the estimated water demand of the DPU in 1993 and the target water demand in 1998 of BAPPENAS finds that while the target total consumption figure for 1998 shows a 12% increase on the 1993 estimate, the target industrial water and aquaculture water demands in 1998 are more than five times and approximately three times higher respectively than the 1993 estimates. The shares of industrial water and domestic water in the overall water consumption in 1998 are still as low as less than 2.5% and less than 5% respectively with agricultural water commanding an overwhelming share of more than 80%. Compared to the current situation in Japan where the consumption shares of industrial water, domestic water and agricultural water are approximately 15%, 20% and 65% respectively, the water demands for industrial and domestic purposes in Indonesia in 1998 are expected to be still relatively low.

Meanwhile, the Revised Study on Jakarta Water Supply Development adopted a unit of water use of 156 liters/day/person for domestic water. Based on the assumption that the total water demand, consisting of the demand for domestic water as well as for industrial and commercial water, in the

Jakarta area is likely to increase in proportion to the population increase due to the almost inconceivable rapid industrialization in this already highly urbanized area, the same study estimated the basic unit for total water consumption in 1995 to be 209 liters/day/person and 222 liters/day/person in 2019. Other units of industrial water use are 0.55-0.75 liters/sec/ha including domestic water for employees of the BPPIP (Ministry of Industry and Trade) and 0.70 liters/sec/ha of the BAKOSURTANAL (National Coordination of Survey and National Charting Development Board).

Table 4-48 Comparison of DPU Estimates and BAPPENAS Targets

Type of Water Use	Unit Water Use in 1993 by DPU	Target Unit Water Use in 1998 by PAPPENAS	Estimated Water Use in 1993 by DPU	Target Water Use in 1998 by BAPPENAS	1998/ 1993
Industry + Tourism	0.5-1 liter/sec/ha	0.6 liters/sec/ha	628 million ton/year	3,469 million ton/year	5.52
Agriculture	1 liter/sec/ha	0.6 liters/sec/ha	101,984 million ton/year	116,683 million ton/year	1.14
Household	110 liters/sec/ha	120 liters/sec/ha	8,713 million ton/year	6,623 million ton/year	0.76
Aquaculture	1-2 liters/sec/ha	1 liter/sec/ha	3,999 million ton/year	11,984 million ton/year	3.00
Livestock	N.A.	0.4 liters/sec/ha	N.A.	631 million ton/year	N.A.
Others	1 litter/sec/ha	N.A.	9,199 million ton/year	N.A.	N.A.
Total	N.A.	N.A.	124,523 million ton/year	139,390 million ton/year	1.12

Source: Bureau for Water Resources and Irrigation, BAPPENAS, 1993; DPU, 1996

(2) Water Supply at Industrial Parks

The BKPM (Investment Coordination Board) provides data on the supply of industrial water at 11 major industrial parks in Indonesia. Each of these parks appears to have a guaranteed water supply rate of 0.50-0.95 liters/sec/ha. The exceptions to this general picture are the Batamindo Industrial Park where the core industrial operation using rented SFBs (standard factory buildings) requires a low water supply level and the Pasuruan Industrial Estate Rembang where the unit of water supply per ha is exaggerated because only those sites for Phase I sale are accounted for.

Table 4-49 Unit Water Supply at Major Industrial Parks

Name	Unit Water Supply per sec	Unit Water Supply per day
MM2100 Industrial Town	0.50 liters/sec/ha	42.9 ton/day/ha
East Jakarta Industrial Park	0.70 liters/sec/ha	60.3 ton/day/ha
Cikarang Industrial Park]	0.54 liters/sec/ha	47.0 ton/day/ha
Karawang International Industrial City	0.95 liters/sec/ha	82.0 ton/day/ha
Suryacipta City of Industry	0.71 liters/sec/ha	61.6 ton/day/ha
Bukit Indah Industrial Park	0.81 liters/sec/ha	70.0 ton/day/ha
Tanjung Emas Export Processing Zone	N.A	N.A (Deep Well)
Pasuruan Industrial Estate Rembang	3.41 liters/sec/ha	295.0 ton/day/ha
Batamindo Industrial Park	0.12 liters/sec/ha	10.4 ton/day/ha
Bintan Industrial Estate	0.55 liters/sec/ha	47.6 ton/day/ha
Kabil Industrial Estate	0.40 liters/sec/ha	34.2 ton/day/ha

Source: BKPM

(3) Water Use of Pulp & Paper, Cement and Iron & Steel Industries

An interview was conducted at the competent section of the BPPIP to confirm the unit of industrial water use by industrial sector in Indonesia. As the Japanese industrial statistics suggest that three sectors, i.e. iron and steel, pulp and paper and chemical and rubber, account for three-quarters of the total industrial water use, efforts were made to collect concrete data on large factories in these three sectors. In the case of the chemical and rubber sector, only data on a cement factory were obtained.

Table 4-50 Examples of Unit of Water Use in Pulp & Paper, Cement and Iron & Steel Industries

	Type of Industry	Area	Annual Production	Amount of Water Use	Unit Water Use per Production	Unit Water Use per Area
Factory A	Pulp and paper	Total: 26,628 m2 Factory: 15,270 m2	24,100 ton	1,728 ton/day	21.51 ton/ton	Total: 7.51 liters/sec/ha Factory: 13.10 liters/sec/ha
Factory B	Pulp and paper	Factory: 179,020 m2	84,000 ton	4,320 ton/day	15.43 ton/ton	2.79 liters/sec/ha
Factory C	Cement	Total: 1,830,000 m2 Factory: 1,180,000 m2	Wet Process: 500,000 ton Dry Process: 1,300,000 ton	Production: 6,636 ton/day Total: 11,094 ton/day	1.11 ton/ton Dry: 0.60 ton/ton	Production: 0.65 liters/sec/ha Total: 0.70 liters/sec/ha
Factory D	Iron and Steel	Total: 120,900 m2 Factory: 29,000 m2	45,000 ton (Concrete Bar=C.B.)	266 ton/day	1.77 ton/ton	Total: 0.25 liters/sec/ha Factory: 1.06 liters/sec/ha
Factory E	Iron and Steel	Total: 28,430 m2 Factory: 9,603 m2	150,000 ton (Billet/C.B./Profile)	216 ton/day	0.43 ton/ton	Total: 0.88 liters/sec/ha Factory: 2.60 liters/sec/ha
Factory F	Iron and Steel	Total: 6,050 m2 Factory: 2,400 m2	7,500 ton (Profile/C.B.)	144 ton/day	5.76 ton/ton	Total: 2.76 liters/sec/ha Factory: 6.96 liters/sec/ha
Factory G	Iron and Steel	Total: 50,960 m2 Factory: 8,891 m2	120,000 ton (C.B.)	67 ton/day	0.17 ton/ton	Total: 0.18 liters/sec/ha Factory: 0.72 liters/sec/ha
Factory H	Iron and Steel	Total: 85,315 m2 Factory: 43,069 m2	144,000 ton (C.B./Profile)	130 ton/day	0.27 ton/ton	Total: 0.17 liters/sec/ha Factory: 0.35 liters/sec/ha

Source: BPPIP
Note: One operational year = 300 days

The interview survey found that the water use level in the paper industry in Indonesia is more than five times higher than the commonly used unit of 0.55-1.0 liters/sec/ha. The water use level in the cement industry is similar to the average level for all industries. While the three factories surveyed in the iron and steel industry consume the average level of industrial water, the remaining two factories use three to five times more than the average.

(4) A Sampling Study by BPPIP

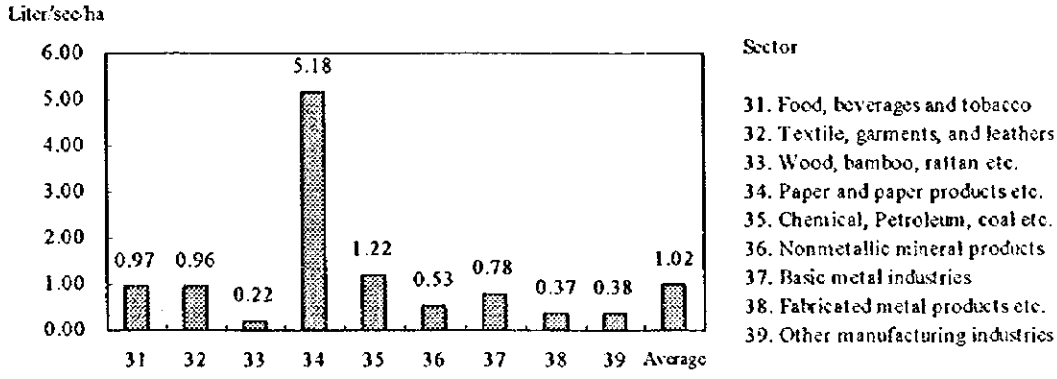
A sampling study by BPPIP (Studi Penyusunan Karakteristik Prasarana Dan Sarana Tiap Jenis Industri, Maret 1996) was conducted of more than 600 factories in the Jakarta area on water use, energy use, BOD load, COD load, heavy metals, SO_X, NO_X etc.

According to the study, the average unit water use for industrial water is 1.02 liters/sec/ha and 34, paper and paper products, printing and publishing industry, is the most water consuming industry with 5.18 liters/sec/ha. The next water consuming industry is 35, chemical, petroleum, coal, rubber, and plastic products, but the unit is only 1.22 liters/sec/ha which is much lower than 5.18 liters/sec/ha of 34, paper and paper products, printing and publishing.

Table 4-51 Unit Water Use by Sector

Industrial Sub-sector	Unit Water Use		# of
	(liter/sec/ha)	(ton/day/ha)	Firms
31. Food, beverages and tobacco	0.97	83.6	56
32. Textile, garments, and leathers	0.96	83.0	150
33. Wood, bamboo, rattan willow and the like	0.22	18.9	41
34. Paper and paper products, printing and publishing	5.18	447.7	34
35. Chemical, petroleum, coal, rubber, and plastic products	1.22	105.0	166
36. Nonmetallic mineral products, except petroleum and coal	0.53	45.7	45
37. Basic metal industries	0.78	67.3	17
38. Fabricated metal products, machinery and equipment	0.37	32.3	149
39. Other manufacturing industries	0.38	33.0	6
Average / Total	1.02	88.5	664

Figure 4-27 Unit Water Use by Sector



A little more detailed analysis of the data by industrial sub-sector has revealed that 34111, pulp, and 34114, tissues paper, are using more than 10 liters/sec/ha, and 35117, basic organic chemicals from crude oil, natural gas and coal, 36212 Glass products for laboratory, pharmacy and medical equipment, 35609 Plastic products n.e.c., 31153 Cooking oil made of coconut oil, 34113 Industrial papers and 34112 Cultural papers are using more than 5 liters/sec/ha. Twenty industrial sub-sectors which are consuming more than 2.5 liters/sec/ha are shown in Table 4-52. In the eight sub-sectors consuming more than 5 liters/sec/ha, there are four 34s, two 35s and one 36 and 31 each. Of the twenty sub-sectors consuming more than 2.5 liters/sec/ha, there are seven 35s (Chemical, petroleum, coal, rubber, and plastic products), four 34s (Paper and paper products, printing and publishing) and 32s (Textile, garments, and leathers) each, three 31s (Food, beverages and tobacco), one 36 (Nonmetallic mineral products, except petroleum and coal) and 37 (Basic metal industries) each.

Table 4-52 Water Consuming Industrial Sub-sectors

Industrial Sub-sector	Unit Water Use (liter/sec/ha)	Unit Water Use (ton/day/ha)	# of Firms
34111 Pulp	13.41	1159.0	2
34114 Tissues paper	10.02	866.0	4
35117 Basic organic chemicals from crude oil, natural gas and coal	9.76	843.0	3
36212 Glass products for laboratory, pharmacy and medical equipment	6.82	589.3	1
35609 Plastic products n.e.c	5.93	512.0	2
31153 Cooking oil made of coconut oil	5.75	496.9	2
34113 Industrial papers	5.67	490.0	11
34112 Cultural papers	5.19	448.0	7
35410 Products of petroleum refineries	4.71	406.7	1
32130 Knitting mills	4.19	362.0	4
32116 Printed textiles	4.07	352.0	8
35523 Crumb rubber	3.60	311.0	3
31149 Other manufacturing and preserving of fish	3.39	292.7	1
35131 Synthetic resins	3.36	290.0	12
31111 Slaughtering	3.27	282.5	2
35113 Basic inorganic chemicals pigment	3.06	264.0	2
37202 Non ferrous metal smelting industry	2.89	250.0	2
35111 Basic inorganic chemicals chloride and alkali	2.84	245.0	8
32115 Finished textiles	2.77	239.0	5
32113 Finished yarn	2.55	220.0	8

(5) Recommendations

Table 4-54 shows the details of 664 samples. A shaded grid means the unit water use of the (sub-) sector is over 2.5 liters/sec/ha. From the analysis of the samples, the Study Team proposes to use the following figures as unit water use of each (sub-) sector.

Table 4-53 Proposed Unit Water Use by Sub-sector

31	Food, beverages and tobacco			1.0 liters/sec/ha
	except for	31111	Slaughtering	3.5 liters/sec/ha
		31149	Other manufacturing and preserving of fish	3.5 liters/sec/ha
		31153	Cooking oil made of coconut oil	6.0 liters/sec/ha
32	Textile, garments, and leathers			0.5 liters/sec/ha
	except for	32113	Finished yarn	2.5 liters/sec/ha
		32115	Finished textiles	3.0 liters/sec/ha
		32116	Printed textiles	4.0 liters/sec/ha
		32130	Knitting mills	4.0 liters/sec/ha
33	Wood, bamboo, rattan, willow and the like			0.2 liters/sec/ha
34	Paper and paper products, printing and publishing			5.0 liters/sec/ha
	except for	34111	Pulp	13.0 liters/sec/ha
		34114	Tissues paper	10.0 liters/sec/ha
		342	Printing, publishing and allied industries	1.5 liters/sec/ha
35	Chemical, petroleum, coal, rubber, and plastic products			1.0 liters/sec/ha
	except for	35111	Basic inorganic chemicals chloride and alkali	3.0 liters/sec/ha
		35113	Basic inorganic chemicals pigment	3.0 liters/sec/ha
		35117	Basic organic chemicals from crude oil, natural gas and coal	10.0 liters/sec/ha
		35131	Synthetic resins	3.5 liters/sec/ha
		35523	Crumb rubber	3.5 liters/sec/ha
		35609	Plastic products n.e.c.	6.0 liters/sec/ha
36	Nonmetallic mineral products, except petroleum and coal			0.5 liters/sec/ha
	except for	36212	Glass products for laboratory, pharmacy and medical equipment	7.0 liters/sec/ha
37	Basic metal industries			1.0 liters/sec/ha
	except for	37202	Non ferrous metal smelting industry	3.0 liters/sec/ha
38	Fabricated metal products, machinery and equipment			0.4 liters/sec/ha
39	Other manufacturing industries			0.4 liters/sec/ha

Table 4-54 Unit Water Use by Sub-sector (1)

No.	KKI	Industrial Sub-sector	Unit Water Use		# of
			(ton/day/ha)	(l/sec/ha)	Firms
	31	**Food, beverages and tobacco**	83.6	0.97	56
	311	**Food**	114.4	1.32	31
1	31111	Slaughtering	282.5	3.27	2
2	31112	Processing and preserving of meat	126.3	1.46	1
3	31121	Powdered, condensed and preserved milk	77.8	0.90	1
4	31123	Ice cream	77.8	0.90	1
5	31131	Canned fruits and vegetables	78.6	0.91	1
6	31141	Canned fish and other similar products	124.4	1.44	1
7	31149	Other manufacturing and preserving of fish	292.7	3.39	1
8	31153	Cooking oil made of coconut oil	496.9	5.75	2
9	31154	Cooking oil made of palm oil	148.9	1.72	5
10	31162	Other grain mill products	5.9	0.07	1
11	31165	Peeling and cleaning of nuts	3.0	0.03	1
12	31168	Wheat flour	28.2	0.33	1
13	31171	Macaroni, spaghetti, noodle and the like	107.3	1.24	4
14	31179	Bakery products	37.0	0.43	3
15	31184	Syrup	57.3	0.66	1
16	31191	Chocolate powder	12.2	0.14	2
17	31192	Food made of chocolate and sugar confectionery	15.4	0.18	3
	312	**Food**	32.0	0.37	15
18	31211	Tapioca	52.0	0.60	3
19	31221	Processed tea	6.0	0.07	1
20	31222	Processed coffee	38.8	0.45	3
21	31231	Ice cube	32.0	0.37	1
22	31243	Tempe	95.5	1.11	1
23	31271	Shrimp paste and the like	4.5	0.05	1
24	31281	Prepared animal feeds	11.0	0.13	3
25	31282	Concentrate animal feeds	18.0	0.21	2
	313	**Beverages**	76.1	0.88	8
26	31320	Wines and its similar products	9.0	0.10	1
27	31330	Malt liquors and malt	160.0	1.85	3
28	31340	Soft drinks	30.0	0.35	4
	314	**Processed tobacco and cigarette flavors**	23.0	0.27	2
29	31410	Dried tobacco and processed tobacco	15.0	0.17	1
30	31420	Clove cigarettes	31.0	0.36	1

Table 4-54 Unit Water Use by Sub-sector (2)

No.	KKI	Industrial Sub-sector	Unit Water Use (ton/day/ha)	Unit Water Use (l/sec/ha)	# of Firms
	32	**Textile, garments, and leathers**	83.0	0.96	150
	321	**Textile**	163.9	1.90	70
1	32111	Spinning mills	47.6	0.55	7
2	32112	Threads	103.0	1.19	3
3	32113	Finished yarn	220.0	2.55	8
4	32114	Weaving mills except gunny and other sacks	120.0	1.39	23
5	32115	Finished textiles	239.0	2.77	5
6	32116	Printed textiles	352.0	4.07	8
7	32117	Batik	21.0	0.24	1
8	32121	Made-up textile article except wearing apparels	124.0	1.44	6
9	32129	Other sacks	2.0	0.02	2
10	32130	Knitting mills	362.0	4.19	4
11	32151	Rope, twine	9.0	0.10	1
12	32190	Textile n.e.c.	36.0	0.42	2
	322	**Clothes except footwear**	25.7	0.30	18
13	32210	Wearing apparel made of textile (garments)	27.0	0.31	14
14	32220	Wearing apparel made of leather and the like	21.0	0.24	3
15	32290	Other wearing apparel made of textile and leather n.e.c	22.0	0.25	1
	323	**Tanneries and leather finishing, product of leather except footwear**	26.4	0.31	8
16	32312	Leather tanneries	26.0	0.30	5
17	32331	Products of leather and substitutes for technical / industrial purposes	27.0	0.31	3
	324	**Footwear**	22.2	0.26	14
18	32411	Footwear for daily use	1.0	0.01	3
19	32412	Sport shoes	28.0	0.32	11
	33	**Wood, bamboo, rattan, willow and the like**	18.9	0.22	41
	331	**Wood, bamboo, rattan, willow and the like**	10.1	0.12	33
1	33111	Sawmills	9.2	0.11	8
2	33112	Molding and building components	5.2	0.06	11
3	33113	Plywood	34.0	0.39	4
4	33114	Laminated board including decorative plywood	9.0	0.10	6
5	33115	Block board, particle board and the like	2.0	0.02	3
6	33116	Veneer	7.0	0.08	1
	332	**Furniture and fixtures; kitchen utensils of wood etc.**	55.0	0.64	8
7	33211	Furniture and fixtures mainly made of wood	23.0	0.27	4
8	33212	Furniture and fixtures made of bamboo and / or rattan	87.0	1.01	4
	34	**Paper and paper products, printing and publishing**	447.7	5.18	34
	341	**Paper, paper products and the like**	532.4	6.16	27
1	34111	Pulp	1159.0	13.41	2
2	34112	Cultural papers	448.0	5.19	7
3	34113	Industrial papers	490.0	5.67	11
4	34114	Tissues paper	866.0	10.02	4
5	34120	Boxes made of paper and cardboard	12.0	0.14	2
6	34190	Products of paper and cardboard n.e.c	44.0	0.51	1
	342	**Printing, publishing and allied industries**	121.0	1.40	7
7	34200	Printing, publishing and allied industries	121.0	1.40	7

Table 4-54 Unit Water Use by Sub-sector (3)

No.	KKI	Industrial Sub-sector	Unit Water Use		# of
			(ton/day/ha)	(l/sec/ha)	Firms
	35	**Chemical, petroleum, coal, rubber, and plastic products**	105.0	1.22	166
	351	**Industrial chemical**	118.7	1.37	94
1	35111	Basic inorganic chemicals chloride and alkali	245.0	2.84	8
2	35112	Basic inorganic chemicals industrial gas	60.0	0.69	6
3	35113	Basic inorganic chemicals pigment	264.0	3.06	2
4	35114	Basic inorganic chemicals n.e.c	73.0	0.84	10
5	35116	Basic organic chemicals intermediate cyclic, dyes and pigment	30.0	0.35	24
6	35117	Basic organic chemicals from crude oil, natural gas and coal	843.0	9.76	3
7	35118	Basic organic chemicals resulting special chemicals	69.0	0.80	8
8	35131	Synthetic resins	290.0	3.36	12
9	35132	Synthetic rubber	12.0	0.14	8
10	35133	Synthetic fibers	45.0	0.52	3
11	35142	Pesticides	7.0	0.08	10
	352	**Other chemical industries**	92.2	1.07	37
12	35210	Paints, varnishes and lacquers	10.0	0.12	3
13	35221	Pharmaceutical preparation	160.0	1.85	6
14	35222	Drugs and medicines	63.0	0.73	1
15	35231	Soap and cleaning preparations, including tooth paste	47.0	0.54	4
16	35232	Cosmetics	209.0	2.42	4
17	35291	Adhesive	83.0	0.96	15
18	35293	Ink	13.0	0.15	2
19	35295	Matches	31.0	0.36	2
	354	**Product of petroleum refineries and coal**	406.7	4.71	1
*	35410	Products of petroleum refineries	406.7	4.71	1
	355	**Rubber and rubber products**	70.8	0.82	17
*	35506		7.2	0.08	1
20	35511	Tire and inner tubes	24.0	0.28	2
21	35522	Remold rubber	54.0	0.63	2
22	35523	Crumb rubber	311.0	3.60	3
23	35592	Products of rubber for industrial purposes	12.0	0.14	9
	356	**Plastic products**	73.6	0.85	17
24	35601	Pipes and hose made of plastics	11.0	0.13	3
25	35603	Plastic sheets	14.0	0.16	2
26	35604	Plastic records	3.0	0.03	1
27	35606	Plastic bags, containers	11.0	0.13	7
28	35607	Products of plastics for technical / industrial purposes	43.0	0.50	2
29	35609	Plastic products n.e.c	512.0	5.93	2

Table 4-54 Unit Water Use by Sub-sector (4)

No.	KKI	Industrial Sub-sector	Unit Water Use		# of
			(ton/day/ha)	(l/sec/ha)	Firms
	36	**Nonmetallic mineral products, except petroleum and coal**	45.7	0.53	45
	361	**Porcelain**	68.5	0.79	3
1	36111	Household wares made of porcelain	12.4	0.14	1
2	36112	Structural materials made of porcelain	187.5	2.17	1
3	36113	Laboratory, electricity / technical wares made of porcelain	5.6	0.06	1
	362	**Glass and glass products**	142.4	1.65	5
4	36212	Glass products for laboratory, pharmacy and medical equipment	589.3	6.82	1
5	36214	Glass containers	89.3	1.03	1
6	36219	glass n.e.c	16.3	0.19	2
7	36221	Sheet glass	0.8	0.01	1
	363	**Cement, lime and products of cement and lime**	25.9	0.30	16
8	36310	Cement	7.0	0.08	4
9	36321	Structural cement products	38.0	0.44	9
10	36331	Lime plaster	15.0	0.17	3
	364	**Clay products**	16.1	0.19	10
11	36421	Clay bricks	23.0	0.27	2
12	36422	Clay tiles	10.0	0.12	1
13	36423	Clay refractory bricks and the like	5.0	0.06	2
14	36429	Other structural clay products	19.0	0.22	5
	369	**Other nonmetallic mineral products**	51.1	0.59	11
15	36911	Household wares, made of stone	7.0	0.08	1
16	36919	Products of stone n.e.c	6.0	0.07	4
17	36922	Structural marble products	52.0	0.60	3
18	36932	Asbestos products for industry	107.0	1.24	1
19	36990	Non metallic mineral products n.e.c	134.0	1.55	2
	37	**Basic metal industries**	67.3	0.78	17
	371	**Iron and steel basic industries**	27.2	0.32	9
1	37102	Iron and steel smelting industry	13.0	0.15	7
2	37104	Steel forging industry	77.0	0.89	2
	372	**Non ferrous metal basic industries**	112.4	1.30	8
3	37202	Non ferrous metal smelting industry	250.0	2.89	2
4	37203	Non ferrous metal rolling industry	17.0	0.20	3
5	37205	Non ferrous metal forging industry	116.0	1.34	3

Table 4-54 Unit Water Use by Sub-sector (5)

No.	KKI	Industrial Sub-sector	Unit Water Use (ton/day/ha)	Unit Water Use (l/sec/ha)	# of Firms
	38	**Fabricated metal products, machinery and equipment**	32.3	0.37	149
	381	**Fabricated metal product, except machinery and equipment**	35.5	0.41	52
1	38112	Hand tools and cutlery	9.0	0.10	2
2	38114	Kitchen ware made of aluminum	18.0	0.21	2
3	38119	Agricultural tools, hand tools, cutlery and kitchen wares n.e.c	139.0	1.61	2
4	38120	Furniture and fixtures primarily made of metal	8.0	0.09	2
5	38132	Fabricated structural aluminum products	152.0	1.76	1
6	38133	Fabricated structural steel products	12.0	0.14	4
7	38134	Plate working, pressure vessel, steel tank, for industry	26.0	0.30	7
8	38139	Fabricated metal products n.e.c	53.0	0.61	4
9	38191	Nail, screw and bolts	49.0	0.57	8
10	38192	Hinge and locks	28.0	0.32	4
11	38193	All kind of metal containers	3.0	0.03	3
12	38194	Wire	9.0	0.10	3
13	38195	Metal pipe and pipe fitting	23.0	0.27	7
14	38199	Products of metal n.e.c	68.0	0.79	3
	382	**Machinery except electrical**	50.1	0.58	17
15	38213	Components and parts of prime movers	15.0	0.17	1
16	38246	Components and parts of special industrial machinery	7.0	0.08	2
17	38247	Alteration and repair of special industrial machinery	5.0	0.06	1
18	38292	Lifting and hoisting machinery, tractor, bulldozer and the like	131.0	1.52	4
19	38294	Air conditioning, refrigerator and the like	30.0	0.35	3
20	38295	Machinery and equipment n.e.c	16.0	0.19	2
21	38296	Components and parts of machinery and equipment n.e.c	43.0	0.50	4
	383	**Electrical machinery, apparatus, appliances and supplies**	24.3	0.28	43
22	38311	Electric generators	4.0	0.05	2
23	38312	Electric motors	43.0	0.50	2
24	38313	Transformer, rectifier and voltage stabilizers	4.0	0.05	4
25	38314	Electric panel and switch gear	3.0	0.03	3
26	38316	Other electrical machinery	5.0	0.06	1
27	38321	Radio, television and consumer electronics	10.0	0.12	5
28	38324	Electronic components	17.0	0.20	5
29	38330	Household electronic appliances	40.0	0.46	3
30	38391	Electrical accumulator	17.0	0.20	3
31	38392	Dry cell batteries	37.0	0.43	1
32	38393	Bulb, spot light and ultra violet lamps	116.0	1.34	3
33	38395	Electric lamp components	50.0	0.58	1
34	38396	Electric and telephone cables	10.0	0.12	7
35	38399	Other electrical apparatus and components	37.0	0.43	3
	384	**Transport equipment**	25.1	0.29	33
36	38411	Ships / boats	2.0	0.02	2
*	38413	Shop parts and equipment	58.2	0.67	1
37	38414	Alteration and repair of ships	19.0	0.22	1
38	38431	Motor vehicles	31.0	0.36	3
39	38432	Motor vehicle bodies	19.0	0.22	6
40	38433	Motor vehicle component and apparatus	22.0	0.25	14
41	38441	Motor cycle and motorized tricycles	150.0	1.74	1
42	38442	Motor cycle, motorized tricycles component and apparatus	15.0	0.17	3
43	38443	Bicycle and tricycle	6.0	0.07	1
44	38444	Bicycle and tricycle components	31.0	0.36	1
	385	**Professional, scientific, measuring and controlling equipment**	59.0	0.68	4
45	38521	Eyeglass lens and frames	11.0	0.13	1
46	38522	Binoculars and optical goods for scientific purposes	111.0	1.28	2
47	38524	Cinematographer camera, projector and equipment	3.0	0.03	1

Table 4-54 Unit Water Use by Sub-sector (6)

No.	KKI	Industrial Sub-sector	Unit Water Use		# of
			(ton/day/ha)	(l/sec/ha)	Firms
	39	**Other manufacturing industries**	33.0	0.38	6
	390	**Other manufacturing industries**	33.0	0.38	6
1	39012	Personal adornment made of precious metal	17.0	0.20	1
2	39022	Non traditional musical instruments	26.0	0.30	1
3	39030	Sporting and athletics goods	24.0	0.28	1
4	39040	Toys	7.0	0.08	1
5	39051	Writing and drawing articles	62.0	0.72	2

Source: BPPI, Studi Penyusunan Karakteristik Prasarana Dan Sarana Tiap Jenis Industri, Maret 1996

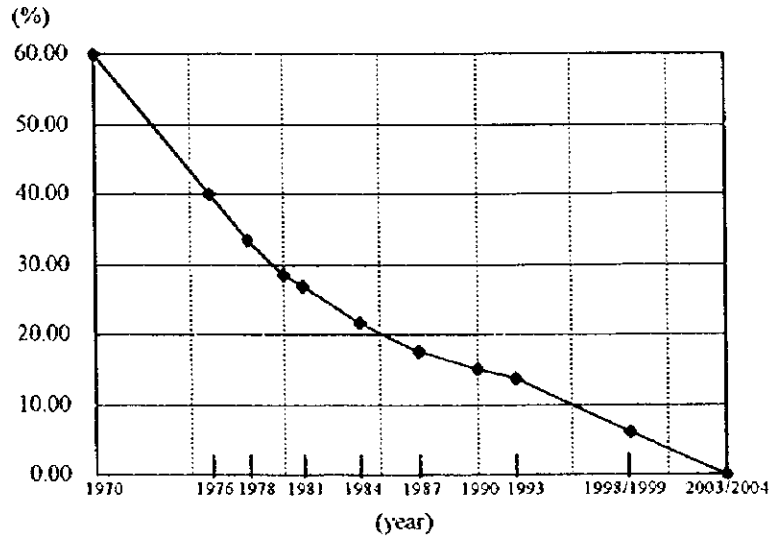
4.5 Poverty Issue and Income Distribution

The major objectives of this chapter are to review the performance of poverty reduction by the Government of Indonesia since 1970, to analyze the present situation of poverty and income distribution in Indonesia and to formulate a basic framework of comprehensive approach toward further poverty reduction and equitable distribution.

4.5.1 A Review of the Performance of Poverty Reduction

The incidence of absolute poverty in Indonesia has decreased from 60% in 1970 to 11.3% of the population in 1996. The number of the poor decreased from about 70 million in 1970 to 22.5 million in 1996 during the same period. This achievement has been widely noted by international organizations like the World Bank and UNDP. The Government of Indonesia has targeted reducing poverty to 6 % by the end of the Repelita VI (1994/95-1998/99) and to zero during the Repelita VII (1999/2000-2003/04). (Figure 4-28)

Figure 4-28 Trend of Poverty Incidence in Indonesia



Source: Welfare Indicators 1995/Repelita VI: BPS
Statistik Indonesia 1996: BPS

The Government of Indonesia successfully decreased the incidence of absolute poverty due to the performance of macro economic policy and management: the high rate of economic growth, inflation control, population control, transmigration, etc.

During the past 25 years (the first long-term development plan = PJP I 1969/70~1993/94), the Indonesian economy grew at an average annual rate of 6.8 percent. This economic growth was accompanied by declines in population growth. Thus, on the average, the people's standard of living was improved. The nation recorded an annual per capita income of US$70 in 1969; it rose to around US$700

by the end of the first long-term development plan (Repelita VI).

Both agricultural and industrial sectors contributed to the high rate of economic growth.

The agricultural sector was given high priority in economic development during the first long-term development plan. The main target was self-sufficiency in rice. Between 1971 and 1983, the average annual production of rice increased by 5.3 % or three times as fast as population growth. Self-sufficiency in rice was first achieved in 1984, as stated in the World Bank's report (Indonesia: Strategy for a Sustained Reduction in Poverty, 1990): "The agriculture sector has made a major contribution to Indonesia's economic development and the reduction in poverty."

Most of the absolute poor live in rural areas. The agricultural success contributed significantly to alleviating poverty, especially in rural areas, ensuring an equitable distribution of economic growth and increasing farm income.

The share of the industrial sector in the national product continued to rise. Since 1991 the industrial sector's contribution to the national product exceeded the share contributed by agriculture. Indonesia's dependence on oil and gas fell since the early 1980s. In 1981, the contribution of oil and gas to the national product reached 24 percent, while by 1992 it dropped to only 13 percent as a result of growth in the non-oil sectors.

Inflation contributes to diminishing purchasing power of the people. The higher the rate of inflation, the more serious the damage affecting the poor or the low income group. In Indonesia, during the first long-term development plan, inflation was well controlled, enabling the establishment of a stable economy. The average annual rate of inflation was 6.8 percent during the first long-term development plan.

The rate of population growth and the rate of economic growth are key indicators linked with the increase of per capita income. In Indonesia a population control policy was successful during the first long-term plan, resulting in a decrease in the growth rate of the population from 2.23 percent in 1970 to 1.66 percent in 1993.

Transmigration also contributed to poverty alleviation in Indonesia. According to the Repelita VI (refer to Chapter 2), during the first long-term plan, a total of 1.5 million households, or 8 million people, relocated to new areas under the transmigration program or on their own will. They established 1,931 new villages outside Java and Bali. Transmigration helped promote a more balanced distribution of the population. In 1971, 65.6 percent of the population lived in Java; the percentage declined to 59.3 percent in 1993.

These performance led to the successful reduction in poverty incidence with synergistic effects among policies and measures taken by the Government.

However, it should be noted that the speed of a decrease of poverty incidence gradually slowed down (Figure 4-28 and Table 4-55). The trend suggests that the above mentioned policies and measures at the Central Government level which may be defined as 'macro economic policy and management approach' had a limited effect on poverty reduction, or a limit of trickle-down effect.

Table 4-55 Poverty Line, Number and Percentage of Poor Population 1970 - 1996

Year	Poverty Line (Rp/Capita/Month)		Number of Poor Population (Million)			Percentage of Poor Population		
	Urban	Rural	Urban	Rural	Total	Urban	Rural	Total
1970					70.0			60.0
1976	4,522	2,849	10.0	44.2	54.2	38.79	40.37	40.08
1978	4,969	2,981	8.3	38.9	47.2	30.84	33.38	33.31
1980	6,831	4,449	9.5	32.8	42.3	29.04	28.42	28.56
1981	9,777	5,877	9.3	31.3	40.6	28.06	26.49	26.85
1984	13,731	7,746	9.3	25.7	35.0	23.14	21.18	21.64
1987	17,381	10,294	9.7	20.3	30.0	20.14	16.44	17.42
1990	20,614	13,295	9.4	17.8	27.2	16.75	14.33	15.08
1993	27,905	18,244	8.7	17.2	25.9	13.45	13.79	13.67
1996	38,246	27,413	7.2	15.3	22.5	9.71	12.30	11.34

Source: Welfare Indicators 1995: BPS, Statistik Indonesia 1996: BPS

4.5.2 Remaining Problems: A Limit to Macro Economic Approach

As mentioned in the previous section the incidence of poverty was reduced from 60% in 1970 to 11.34% in 1996 during PJP I. However, in spite of a number of progress there are still more than 20 million of the absolute poor in Indonesia. In addition to poverty issue, economic inequality is becoming serious among regions, especially between Java and non-Java, between Eastern and Western Indonesia, and between urban and rural areas.

As stated in the Repelita VI (refer to Chapter 3), reducing these inequalities are major challenges that must be resolved in the second long term development plan (PJP II 1994/95-2018/19).

(1) Absolute Poverty

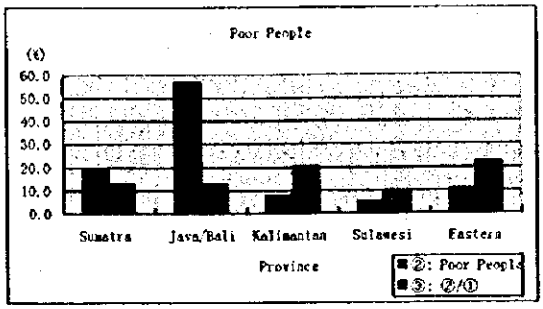
Table 4-56 indicates that a member of the absolute poor is still very large in Java and Sumatra. More than half of the people under the poverty line in Indonesia live in Java, and about 20% in Sumatra.

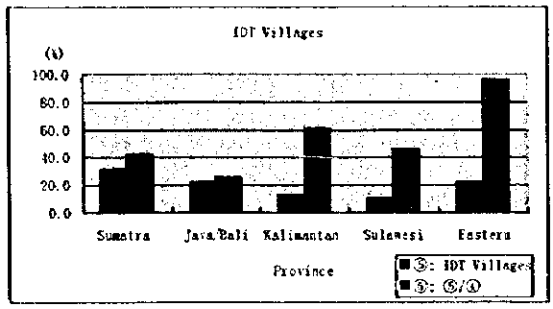
As for geographical distribution of the least developed villages (Inpres Desa Tertinggal = IDT), 31.9% of the total IDT villages exist in Sumatra, 22.8% in Java/Bali, 22.4% in eastern parts of Indonesia. It is noted that 96.0% of villages in eastern Indonesia (East Nusa Tenggara, West Nusa Tenggara, East Timor, Maluku, Irian Jaya except Bali) are IDT villages (Table 4-56).

Table 4-56 Poor People and IDT Villages

Province	① Population 1993 ('000)		② Poor People 1993 ('000)		③ ②/① (%)	④ All Villages 1996		⑤ IDT Villages 1996		⑥ ⑤/① (%)
Sumatra	39,232.8	20.7	5,053	19.6	12.9	21,332	32.9	8,999	31.9	42.2
Java/Bali	* 115,015.2	60.8	14,766	57.2	12.8	25,370	38.8	6,440	22.8	25.4
Kalimantan	9,958.5	5.3	2,009	7.8	20.2	5,884	9.0	3,564	12.6	60.6
Sulawesi	13,279.0	7.0	1,320	5.1	9.9	6,267	9.6	2,911	10.3	46.4
Eastern	11,649.8	6.2	2,662	10.3	22.9	6,571	10.0	6,309	22.4	96.0
Total	189,135.6	100.0	25,810	100.0	13.6	65,424	100.0	28,223	100.0	43.1

* Java only 112,159.2 (59.3%).





Source: Repelita VI/Sebaran Desa IDT Menurut Propins: Dan Kabupaten/Kotamadya
(Tahun Anggaran 1994/95-1996/97)

Table 4-57 is concerning a number of poor population by province in 1993 and 1996. According to this table, a national average of poverty incidence in 1996 is 11.34 percent.

As for poverty incidence in 1996, the highest province is East Timor: 31.15 percent. The other high provinces are West Kalimantan (21.99%), Irian Jaya (21.17%) and East Nusa Tenggara (20.57%). The lowest province is DKI Jakarta (2.48%) and the next lowest is Bali (4.30%).

Table 4-57 also shows percentages of decreased number of the poor by province. It should be noted that the region where the number of the poor was most decreased is Kalimantan: 17.43 percent. Kalimantan is the second highest region in the number of the poor. The second lowest is Sulawesi: 8.75 percent. The lowest region is the Eastern regions: 5.55 percent.

There are two provinces where the number of the poor drastically decreased: Jakarta(53.47%) and Bali(53.52%). Both are the lowest provinces in terms of the poverty incidence. Another two provinces which follow Jakarta and Bali are Central Kalimantan(41.10%) and West Sumatra(32.07%). On the other hand, the least decreased number of the poor is with East Nusa Tenggara(0.99%), Irian Jaya(3.17%) and Lampung(3.59%).

Table 4-57 suggests that the province with the lower incidence of poverty can easily decrease the number of the poor in the province, and the province with the higher incidence of poverty can hardly reduce poverty incidence. The less poverty incidence, the easier poverty reduction, and the more poverty

incidence, the more difficult poverty reduction. It suggests that the gap of income distribution is expanding among provinces in Indonesia.

(2) Regional Inequality

Table 4-58 indicates per capita gross regional domestic product (GRDP) at current market price and at constant 1993 market price by province (1994 and 1995). According to this table the regional gaps among provinces are shown very clearly. Taking the year 1995 (at constant 1993 market price), the highest per capita GRDP is Rp. 8,058,000 in Kalimantan Timur, on the other hand the lowest per capita GRDP is Rp. 697,000 in Nusa Tenggara Timur. The former is 12 times more than the latter. The former figure in Kalimantan Timur is one including oil and its products. Even if per capita GRDP excluding oil and its products being taken for comparison, the highest is Rp. 6,654,000 in Jakarta, and the figure is about 10 times more than that of Timor Timur.

In 1995 the average per capita GRDP in Indonesia is Rp. 1,981,000 excluding oil and its products. The Table 4-58 indicates that two thirds of 27 provinces are below the average of per capita GRDP.

As stated in the previous section, more than half of the poor people in Indonesia live in Java. Per capita GRDP in the areas in Java except Jakarta (Java Barat, Java Tengah, Java Timur, and D.I.Yogyakarta) are below the average. The per capita GRDP in these areas is between one fifth or a quarter of that of Jakarta. Regional inequality will become more serious in the future.

Table 4-57 Poor Population in Indonesia 1993-1996

No.	Province	1993 Total		1996 Total		Decreased Total	
		(thousand)	%	(thousand)	%	(thousand)	%
1	D.I.Aceh	496.7	13.46	425.6	10.78	71.1	14.32
2	North Sumatera	1,311.6	12.32	1,234.2	10.91	97.5	7.32
3	West Sumatera	566.1	13.47	384.6	8.76	181.6	32.07
4	Riau	410.9	11.20	322.0	7.94	88.8	21.62
5	Jambi	299.4	13.38	222.8	9.06	76.5	25.57
6	South Sumatera	1,023.9	14.89	794.9	10.72	229.0	22.37
7	Bengkulu	173.1	13.11	137.2	9.37	35.9	20.72
8	Lampung	751.8	11.64	724.9	10.65	27.0	3.59
	Sumatera	5,053.6	12.87	4,246.1	10.15	807.4	15.98
9	DKI Jakarta	497.1	5.65	231.3	2.48	265.8	53.47
10	West Java	4,612.4	12.20	3,962.1	9.87	650.2	14.10
11	Central Java	4,618.7	15.78	4,157.3	13.91	461.4	9.99
12	D.I.Yogyakarta	343.5	11.77	303.8	10.42	39.7	11.56
13	East Java	4,423.7	13.25	4,046.5	11.86	377.2	8.53
14	Bali	270.2	9.46	125.6	4.30	144.6	53.52
	Java-Bali	14,765.6	12.84	12,826.6	10.75	1,939.0	13.13
15	West Kalimantan	874.5	25.05	820.5	21.99	54.0	6.18
16	Central Kalimantan	321.6	20.85	189.4	11.24	132.2	41.10
17	South Kalimantan	517.8	18.62	424.3	14.33	93.5	18.05
18	East Kalimantan	294.9	13.75	224.4	9.24	70.4	23.86
	Kalimantan	2,008.8	20.17	1,658.7	15.35	350.1	17.43
19	North Sulawesi	304.7	11.79	284.6	10.60	20.1	6.59
20	Central Sulawesi	193.9	10.48	163.4	8.18	30.5	15.74
21	South Sulawesi	659.2	8.97	617.1	8.02	42.0	6.38
22	South East Sulawesi	162.3	10.84	139.4	8.49	22.9	14.10
	Sulawesi	1,320.1	9.94	1,204.5	8.59	115.5	8.75
23	West Nusa Tenggara	692.4	19.52	653.0	17.62	39.4	5.69
24	East Nusa Tenggara	756.4	21.84	749.0	20.57	7.5	0.99
25	East Timor	293.0	36.24	267.8	31.15	25.2	8.59
26	Maluku	478.9	23.93	417.0	19.47	61.8	12.91
27	Irian Jaya	441.9	24.16	427.8	21.17	14.0	3.17
	Nusa Tenggara, Maluku Irian Jaya	2,662.6	22.86	2,514.7	20.33	147.8	5.55
	Indonesia	25,900.0	13.67	22,493.7	11.34	3,406.3	13.15

Source: BPS 1997 *Poverty alignment (rupiahs/person/month)
1993 Kota : Rp. 27,905
Desa : Rp. 18,244
1996 Kota : Rp. 38,246
Desa : Rp. 27,413

Table 4-58 Per Capita Gross Regional Domestic Product by Province

Province	At Current Market Price		At Constant 1993 Market Price	
	1994	1995	1994	1995
Daerah Istimewa Aceh	3075	3330	3015	2921
Daerah Istimewa Aceh*	1583	1777	1448	1499
Sumatera Utara	1989	2232	1830	1971
Sumatera Utara*	1952	2191	1792	1930
Sumatera Barat	1702	1888	1529	1633
Riau	4884	5518	4818	4875
Riau*	1898	2194	1773	1877
Jambi	1280	1472	1172	1229
Jambi*	1248	1438	1140	1197
Sumatera Selatan	1738	2057	1665	1765
Sumatera Selatan*	1488	1767	1402	1501
Bengkulu	1334	1500	1099	1154
Lampung	1007	1212	893	967
D.K.I. Jakarta	6617	7508	6097	6654
Java Barat	1635	1883	1477	1562
Java Barat*	1561	1804	1401	1492
Java Tengah	1340	1555	1239	1322
Java Tengah*	1271	1486	1170	1255
D.I. Yogyakarta	1673	1926	1503	1625
Java Timur	1705	1961	1574	1690
Java Timur*	1705	1961	1573	1689
Bali	2263	2563	2133	2284
Nusa Tenggara Barat	828	955	767	816
Nusa Tenggara Timur	704	809	651	697
Timor Timur	739	849	694	743
Kalimantan Barat	1713	1977	1568	1679
Kalimantan Tengah	2336	2697	2114	2237
Kalimantan Selatan	1933	2233	1791	1911
Kalimantan Selatan*	1923	2221	1781	1900
Kalimantan Timur	8756	9531	8081	8058
Kalimantan Timur*	4383	4939	4046	4305
Sulawesi Utara	1236	1371	1169	1245
Sulawesi Tengah	1129	1331	986	1040
Sulawesi Selatan	1180	1369	1092	1162
Sulawesi Tenggara	993	1160	903	938
Maluku	1377	1499	1291	1331
Maluku*	1371	1492	1284	1324
Irian Jaya	2886	3645	2743	3182
Irian Jaya*	2726	3503	2578	3051
Jumlah 27 provinsi	1967	2255	1817	1935
Jumlah 27 provinsi*	1791	2172	1642	1769
Indonesia	2005	2335	1860	1981
Indonesia *	1829	2149	1682	1808

Source: BPS: Statistik Indonesia 1995. * excluding oil and its products

(3) Inequality between Urban and Rural Areas

Inequality between urban and rural areas did not improved. According to the 'Welfare Indicators 1995 (BPS)'the average per capita monthly expenditure between the urban and rural areas is the ratio of 100 to 52~59 for more than ten years from 1980 to1993.

As far as Gini Ratio is concerned, some improvement can be seen in since 1976 in rural areas (Table 4-59). However, Gini Ratio increased to 0.36 in 1996, which is the same ratio in 1976 and 1980.

Income distribution is actually improving at a relatively faster rate in rural areas than urban areas. Table 4-59 indicates that a percentage share of the lowest 40% group in rural areas increased from 21.2 percent in 1976 to 23.2 percent in 1996, and that of the highest 20% group in the rural areas decreased from 40.5 percent in 1976 to 37.8 percent in 1996. It suggests that inequality in rural areas improved slightly. However, percentage shares of any groups changed little in the urban areas between 1976 and 1996.

According to the World Bank Criteria (Asian Development Bank's report: Rural Poverty in Developing Asia, vol.2, 1996), if the percentage of the national income attributed to 40 percent of the lowest income population is less than 12 percent, the level of inequality is categorized as "high", if that group receives between 12~17 percent of the total income, the level of inequality is categorized as "medium", but if that group receives over 17 percent or more, the level of inequality is categorized as "low" or relatively equal distribution of income. Table 4-59 shows that the share of the poorest 40 percent is in excess of 17 percent. Therefore, it follows that Indonesia as a whole belongs to the category of income distribution with low income inequality.

Per capita expenditure is not equal to per capita income. Table 4-59 is based on "expenditure" instead of "income". Strictly speaking, income distribution analysis should be made on the basis of "income". Savings, direct tax, net transfer income, etc. are excluded in "expenditure". Generally speaking, since saving ratio increases as income increases, inequality of expenditure distribution is lower than that of income distribution. Accordingly, it may well be presumed that, taking "income" instead of "expenditure", inequality gap is larger especially in urban areas in Indonesia.

Table 4-59 Per Capita Income Distribution and Gini Ratios,1976-1996

Year	Percentage Share of Expenditure Group in Total Expenditure			
	Lowest 40%	Medium 40%	Highest 40%	Gini Ratio
Urban				
1976	19.6	37.5	50.0	0.36
1980	18.7	37.8	43.5	0.36
1981	20.8	37.2	41.9	0.33
1984	20.6	38.2	41.1	0.32
1987	21.5	38.0	40.5	0.32
1990	19.7	37.7	42.7	0.34
1993	20.5	37.3	42.2	0.33
1996	19.0	36.9	44.0	0.36
Rural				
1976	21.2	38.8	40.5	0.31
1980	21.2	39.0	39.8	0.31
1981	22.8	39.4	37.8	0.29
1984	22.3	39.8	37.8	0.28
1987	24.3	39.3	36.4	0.26
1990	24.4	39.2	36.4	0.25
1993	25.1	38.4	36.5	0.26
1996	23.2	39.0	37.8	0.27
Indonesia				
1976	19.6	38.0	42.5	0.34
1980	19.5	38.2	42.3	0.34
1981	20.4	37.5	42.1	0.33
1984	20.7	37.3	42.0	0.33
1987	20.9	37.5	41.6	0.32
1990	21.3	36.8	41.9	0.32
1993	20.3	35.9	43.8	0.34
1996	20.1	35.1	44.7	0.36

Source: National Social-Economic Surveys (1976, 1980, 1981, 1984, 1987, 1990 and 1993); Statistical Yearbook of Indonesia, 1993 and 1996: BPS

Table 4-60, which is prepared with data from the World Bank Report 1997, shows distribution of income and consumption in four ASEAN countries (Indonesia, the Philippines, Thailand and Malaysia). Although the year surveyed is different among four countries, the statistics is comparable because there seems to be not too much change during a few years as far as Gini Index is concerned. Table 4-60 indicates income distribution in Indonesia(31.7-1993) is more equitable than other three ASEAN countries: the Philippines(40.7-1988), Thailand(46.2-1992) and Malaysia(48.9-1989).

Table 4-60 Distribution of Income and Consumption in 4 ASEAN Countries

Country	Year	Gini Index	Lowest 10%	Lowest 20%	Second Quintile	Third Quintile	Fourth Quintile	Highest 20%	Highest 10%
Indonesia	1993	31.7	3.9	8.7	12.3	16.3	22.1	40.7	25.6
Philippines	1988	40.7	2.8	6.5	10.1	14.4	21.2	47.8	32.1
Thailand	1992	46.2	2.5	5.6	8.7	13.0	20.0	52.7	37.1
Malaysia	1989	48.4	1.9	4.6	8.3	13.0	20.4	53.7	37.9

Table 4-61 shows that a portion of income spent on food, that is, Engel's coefficient, decreased both in urban and rural areas since 1980, but the gap between urban and rural areas changed little.

Table 4-61 Average Per Capita Monthly Expenditure for Food and Non-Food Items by Urban - Rural Classification, 1980 - 1993

Place of Residence	Food		Non-Food		Total	
	Rupiahs	%	Rupiahs	%	Rupiahs	%
Urban						
1980	7,305	59.80	4,903	40.20	12,208	100.0
1981	8,898	52.90	7,917	47.10	16,815	100.0
1984	13,632	54.10	11,565	45.90	25,197	100.0
1987	17,494	52.40	15,919	47.60	33,413	100.0
1990	22,633	51.40	21,396	48.60	44,029	100.0
1993	31,908	49.81	32,155	50.19	64,063	100.0
Rural						
1980	5,336	74.00	1,876	26.00	7,212	100.0
1981	6,210	61.50	3,188	33.90	9,398	100.0
1984	9,146	68.50	4,197	31.50	13,343	100.0
1987	12,147	67.20	5,926	32.80	18,073	100.0
1990	16,379	67.40	7,917	32.60	24,296	100.0
1993	21,228	63.59	12,157	36.41	33,385	100.0
Urban + Rural						
1980	5,780	69.30	2,561	30.70	8,341	100.0
1981	6,823	61.50	4,265	38.50	11,088	100.0
1984	10,199	63.20	5,928	36.80	16,127	100.0
1987	13,559	61.30	8,566	38.70	22,125	100.0
1990	18,272	60.40	11,999	39.60	30,271	100.0
1993	24,772	56.86	18,793	43.14	43,565	100.0

Source: Welfare Indicators 1995; BPS

Table 4-62 shows inequality between urban and rural areas. According to this table, 63 percent rural people falls in the classes with a monthly per capita expenditure of less than Rp. 20,000. On the other hand, 24.6 percent of urban people belongs to the same classes. As for the classes with the

expenditure less than Rp. 60,000, 88.5 percent of the rural people and 54.2 percent of the urban people belong to the classes. It is noted that 45.8 percent of urban people belongs to the classes over Rp. 60,000, while only 11.5 percent of the rural people falls in the same classes.

Table 4-62 Percentage of Population in Urban/Rural and Monthly per Capita Expenditure Class (1995)

(Percentage)

	Rp. less than 19,999	20,000~ 39,999	40,000~ 59,999	60,000~ 79,999	80,000~ 99,999	100,000 and over	Total
Urban	1.08	23.55	29.57	18.55	10.34	16.91	100.0
Rural	7.77	55.50	25.24	7.12	2.44	1.93	100.0
Urban + Rural	5.43	44.26	26.76	11.14	5.22	7.2	100.01

Source: Statistic Kesejahterann Rakyat 1995: BPS

There is another data concerning the inequality between urban and rural areas. Table 4-63 shows disparity in the availability of housing facilities. As far as housing facilities are concerned, urban areas are much better than rural areas in terms of availability of electricity, piped drinking water, private bathing facilities and private septic tank toilet except land size. It is important to note the percentage of villages and households with access to drinking water. In urban areas, 36.5% of the households have access to drinking water, and on the other hand in rural areas only 5.9% in 1994. As for electricity, 90.4% in urban areas and 40.7% in rural areas; as for private bathing facility, 64.9% in urban areas and 38.3% in rural areas; as for private septic tank toilet, 46.5% in urban areas and 9.6% in rural areas.

Table 4-63 Percentage of Households by Various Housing Facilities and Urban-Rural Classification

(%)

Housing Facilities	Urban			Rural			Urban + Rural		
	1980	1990	1994	1980	1990	1994	1980	1990	1994
Electricity	48.8	85.2	90.4	5.4	30.7	40.7	14.2	46.8	60.9
Piped Drinking Water	26.5	33.4	36.5	2.1	4.4	5.9	7.0	12.9	16.2
Private Bathing Facility	51.1	69.1	64.9	19.9	30.3	38.3	26.2	41.7	46.5
Private Septic Tank Toilet	29.0	43.7	46.5	3.8	7.1	9.6	9.0	17.9	22.0
Area > $30m^2$	72.8	79.4	81.4	77.2	83.1	86.5	76.3	82.0	85.0

Source: Welfare Indicators 1995: BPS

(4) Urban Poverty

Although a majority of the poor live in rural areas, urban poverty issue is increasingly important. The rural population at or below the poverty line decreased from 44.2 million in 1976 to 15.3 million in 1996, but the absolute number of the urban poor declined from 10 million to only 7.2 million for the last 26 years (Table 4-64). A share of the poor in rural areas out of the total poor population decreased from 81.5% in 1976 to 68.0% in 1996. On the other hand, it increased from 18.5% in 1976 to 32.0% in 1996 in urban areas. One reason why the number of the urban poor decreased little is that although the number of the poor in urban areas decreased, the more number of people in rural areas moved to urban areas to seek for employment or income opportunity.

Table 4-64 Indonesia: Poor Population, 1970-1993

(million)

Year	Urban	(%)	Rural	(%)	Urban + Rural	(%)
1970	-		-		70.0	100.0
1976	10.0	18.5	44.2	81.5	54.2	100.0
1978	8.3	17.6	38.9	82.4	47.2	100.0
1980	9.5	22.5	32.8	77.5	42.3	100.0
1981	9.3	22.9	31.3	77.1	40.6	100.0
1984	9.3	26.6	25.7	73.4	35.0	100.0
1987	9.7	32.3	20.3	67.7	30.0	100.0
1990	9.4	34.6	17.8	65.4	27.2	100.0
1993	8.7	33.6	17.2	66.4	25.9	100.0
1996	7.2	32.0	15.3	68.0	22.5	100.0

Source: Welfare Indicators 1995: BPS
Statistic Indonesia 1996: BPS

In conclusion of this section, although poverty incidence reduced successfully from 60% in 1970 to 11.3% in 1996, the inequality of income distribution is becoming serious among regions, between urban and rural areas, and within urban areas.

More than 20 million, that is, one tenths of Indonesian people still live under the official poverty line. Three quarters of the poor live in Java and Sumatra, and higher incidence of the absolute poverty is in eastern part of Indonesia, especially in Nusa Tenggara and Kalimantan.

It suggests that fruits of national economic development did not reach remote areas or the poorest people. This problem is especially true in a number of eastern islands, isolated rural areas even in Java, and slums in major urban areas.

This means that the macro economic policy and management alone can not eradicate absolute poverty. There is a limit to the macro economic policy and management approach. Therefore, a micro socio-economic approach is needed to reduce the absolute poverty, in the areas or villages where the macro approach is difficult to attain. It became harder to reach the poor left behind by the government level policy and management. Therefore, more efforts should be made on a village level toward poverty reduction during the second long-term development plan. This does not always mean that during the second long-term plan (PJP II), the government level approach is less important than the village level approach. Both are needed and complement each other.

The micro socio-economic approach at the village level is also important for promotion of equity in income distribution.

4.5.3 A Micro Socio-Economic Approach at Village Level: the IDT Program and the P3DT Program

(1) A Concept for a Micro Socio-Economic Approach

A micro socio-economic approach at the village level is defined here as an approach in which village people can participate and be involved, whether the programs or projects are funded by the Government or not, for their improvement of living conditions. During the first long-term development plan (PJP I), many village level programs and projects for poverty reduction were implemented in Indonesia. Major programs and projects were;

1) The Special Presidential Instruction (INPRES) program: to provide facilities for basic education and health, rural roads, sanitation, etc.
2) PKMD scheme (village health development): to provide primary health care
3) P3D program for the UPGF (Family Nutrition Improvement Program): to provide integrated health and social services
4) Social welfare Initiatives: a program for ethnic minority (estimated 1.5 million people distributed over 20 provinces)
5) Forestry Programs: for shifting cultivators (There are some 1.5 million households dependent on shifting cultivation in forested areas in Indonesia.)
6) Integrated Area Development Program (PKT): designed to assist villages or group of villages which have specific programs, mainly infrastructure related
7) The Kampung Improvement Program: significant urban development program for the poor
8) Transmigration Program: for "official" transmigration of people from over-populated areas (mainly in Java) to underpopulated areas (outside Java), and for "voluntary" transmigration
9) The P4K Program for Marginal Farmers and Landless: to increase incomes of Small Farmer Self-Help Groups (KPKs) and to organize them to have access to formal credit
10) Non-Formal Education: to improve adult literacy rates among millions of people and to promote income generating activities and vocational training
11) The IDT (Program Inpres Desa Tertinggal) and the P3DT (Pembangunan Prasarana Pendukung Desa Tertinggal) as new INPRES programs, were launched at the beginning of the Repelita VI. The former is to support the economic activities of rural people under the poverty line, and the latter is to construct basic rural infrastructure in the less developed villages, i.e., the IDT villages.

These programs and projects at the village level can be divided into three categories as follows;

(i) Provision of Basic Social Services (BSS)

This is to provide the villages with the opportunity for basic education and primary public health and medical care. These form the basis for human development as education allows innate abilities to

develop, while public health and medical care ensure a sound body for better access to employment opportunities as well as improved work efficiency to earn a better income. From the long-term viewpoint, education and public health are the key to the success of poverty eradication.

(ii) Development of Basic Rural Infrastructure (BRI)

Typical BRI at the village level is an access road from a village to a city or town. Even if the economic activities of poor individuals become vigorous with improved productivity and an improved production volume, income improvement or a better living standard will not result without surplus products being transported to consumer markets. Other important BRI elements are a water supply system and public toilets.

The P3DT program belongs to this category, whose program provides poor villages with basic infrastructure; rural access road to the nearest market and towns/cities, bridges, piers, water supply and sanitary facilities.

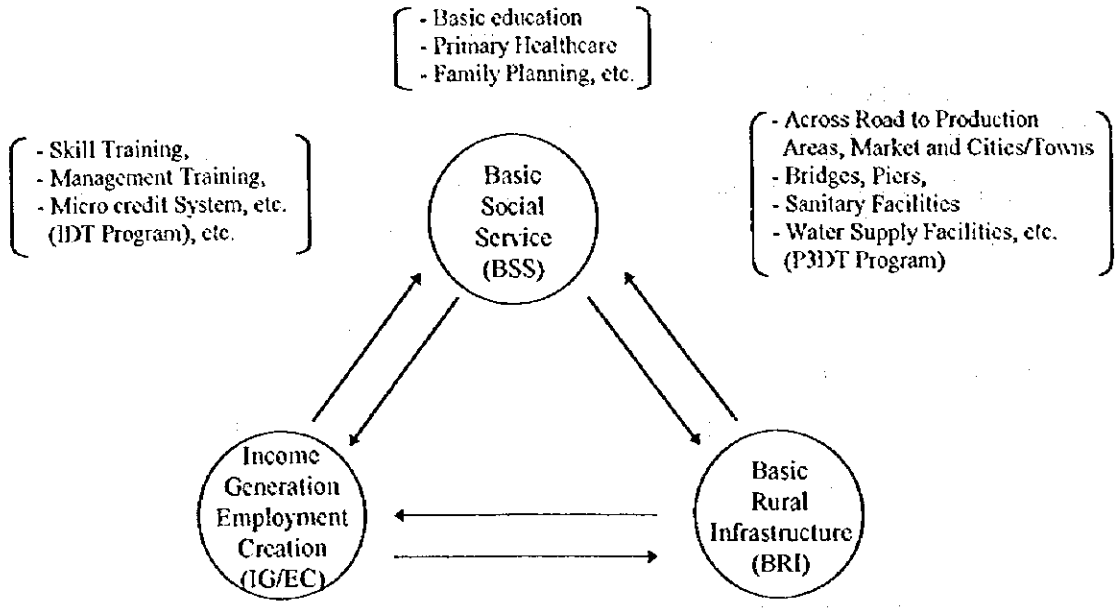
(iii) Income Generation/Employment Creation (IG/EC)

The implementation of BSS and BRI do not necessarily alleviate poverty unless the poor earn an adequate income. It is essential to provide employment and income opportunities for the poor through the creation of a system under which the poor receive technical and/or managerial training and have access to micro credit required to start small business.

The IDT Program belongs to this category, which promotes income generation and employment generation with a grant as seed money for the poor.

Basic social services (such as basic education, primary health care, etc.) are essential for human development. Unless people are sound in mind and body it is difficult for them to participate in economic and social activities for income generation. Even if basic infrastructure is well established or prepared, it is hardly useful unless economic and social activities are encouraged. Access road or transportation is very important for the young people to attend schools for further education. These three elements should be interrelated and coordinated in order to make the micro approach effective in strengthening the impact.

Figure 4-29 A Framework of Micro-Economic and Social Approach for Poverty Reduction at Village Level



(2) IDT Program

The IDT Program is a new INPRES grant targeted to poor villages at the beginning of Repelita VI (1994/95-1998/99). The IDT Program is budgeted at around Rp. 400 billion per year, allowing an annual allocation of Rp. 20 million for each of some 20,000 poor villages. This amount will be paid for three successive years to the targeted villages, giving a cumulative allocation of Rp. 60 million per poor village.

The IDT budget for three years and a number of IDT villages are as follows.

Table 4-65 IDT Budget and IDT Villages

	1994/95	1995/96	1996/97
IDT villages	20,633	22,094	22,054
Total IDT budget (Rp. Million)	412,660	441,880	479,001

Source: BAPPENAS

Research activities on the IDT program are carried out by local universities under the supervision of BAPPENAS. "Ekonomi Rakyat dan Program IDT" by Prof. Mubyarto deals with the research activities in eleven IDT provinces. Table 4-66 indicates an average allocation of IDT funds per member of community groups in the first year (1994/95) of the IDT Program.

The amount of IDT funds provided varies from province to province, because it is determined by consensus by the villages involved in the program (Table 4-66).

According to the table, in the first year of the IDT Program the villages participating in the program received Rp. 191,900 on the average.

Looking at the different provinces where the villages are located, as shown in Table 4-66 each IDT village in Central Sulawesi received Rp. 137,500 which is low compared to the Rp. 474,200 that is allocated to each IDT village in East Kalimantan. On the average each member of IDT community groups in Sumatra receives Rp. 270,000 which differs not much with the average amount (Rp. 260,000) received in Kalimantan. However, the average amount of Rp. 148,000 per member is rather low compared to what is received in Sumatra and Kalimantan.

Table 4-66 Average Allocation of IDT Funds per Member of Community Groups 1994/1995

No.	Province	Funds Received (in 1000 Rp.)	Average / member	Growth of funds in community Groups
1	Aceh	399.5	A.Sumatra	
2	Riau	249.3	(Rp. 270,000)	27%
3	Jambi	160.5		
4	South Sumatera	194.8		
5	Bengkulu	291.7		
6	West Kalimantan	139.7	B.Kalimantan	11%
7	C. Kalimantan	369.7	(Rp. 260,000)	
8	East Kalimantan	474.2		
9	Central Sulawesi	137.5	C.Sulawesi	17%
10	S.E.Sulawesi	210.5	(Rp 148,000)	
11	Irian Jaya	305.9	D.Irja/Maluku	no data
			(Rp. 225,000)	
	Indonesia	191.9	(Rp. 192,000)	-
	Java/Bali	-	(Rp. 101,000)	99%

Source: Mubyrto Ekonomi Rakyat dan Program IDT (The Economy of the People and the IDT Program), 1996.

After a member has the received funds in the form of a loan to engage in a business, the question is how far a member has the chance to repay the loan to the community group. It is the community group which will attempt to develop the repayments by its members to become a collective capital as well as a source of funds to be revolved among the people in the village.

Table 4-67 shows types of business of IDT community group members in the first year of implementation of the IDT program. According to this table, 54.9% of the business selected by members of community groups is in the field of agriculture, of which cattle feeding business is the most frequent selection. The same holds true for ten of the 11 provinces where business in the field of agriculture is the most frequently selected by community groups members, ranging from 32.2% of the members of community groups in South East Sulawesi to 81.4% in Jambi.

Table 4-67 Types of Business of IDT Community Group Members 1994/1995

No.	Province	CFFI	Type of Business
1	Aceh	56.1	Cattle (30.5%), Food Crop (25.6%), Trade (22.0%)
2	Riau	73	Cattle (34.3%), F. Crop (33.4%), Fisheries (15.3%), Trade (12.4%)
3	Jambi	81.4	Food Crop (56.4%) Cattle (19.1%)
4	South Sumatera	68.9	Cattle (42.2%), Food Crop (20.2%), Trade (14.3%)
5	Bengkulu	73.7	Cattle (36.6%), Food Crop (27.5%), Others*(18.8%)
6	West Kalimantan	85.3	Cattle (49.8%), Food Crop (24.0%), Fisheries (11.8%)
7	C. Kalimantan	65.8	Cattle (49.8%), Trade (17.9%), Fisheries (11.8%), F.Crop (12.0%)
8	East Kalimantan	59.9	Cattle (28.9%), Food Crop (23.1%), Trade (14.8%), Others (16.4%)
9	Central Sulawesi	60.2	F. Crop (29.9%), Others*(28.8%), Cattle (16.3%), Fisheries (14.0%), Trade (23.9%)
10	S.E.Sulawesi	32.2	Industry (18.2%), Cattle (16.2%), Fisheries (16.0%)
11	Irian Jaya	76.1	F. Crop (36.3%), Cattle (29.2%), Fisheries (10.6%), Trade (10.5%)
	Indonesia	54.9	Cattle (36.3%), Trade (25.7%), Food Crop (13.3%), Industry (11.8%)

CFFI = Cattle, Food Crop, Fisheries (= Agruculture)
* "Others" include "building construction and services"
Source: Directorate General of Village Community Development, Department of Internal Affairs
Source: Mubyarto, Ekonomi Rakyat dan Program IDT, 1997.

Table 4-67 also shows that in six of the 11 provinces business in cattle is ranked first, followed by business in food crops as the second in rank. Fisheries as the third choice is prominent in six provinces, i.e. the three provinces in Eastern Indonesia (Central Sulawesi, South East Sulawesi, and Irian Jaya), Central Kalimantan, West Kalimantan, and Riau. Although not frequent, trade is selected in six provinces by more than 10% of the community group members.

The IDT program is now in its third year. In each province, there are success stories as well as failures.

In general, the better the skills of group members, the more successful. The IDT fund is used as working capital for income-generating activities, often with a success. This was illustrated during the field visits in Kalimantan in examples of investments in kitchen appliances, cake making, and fire wood collection from saw mills.

Conversely, if the group members had no technical skills in a new economic activity, and the product had no market prospect, the use of the IDT fund would not be effective. For example, pig raising in the island of North Sumatra failed since the group members and facilitators did not know how to solve pig disease problem. Similar cases also happened in Maluku, where the group members were not accustomed to fishing. Fishing as economic activity for the groups in the two villages was proposed by officials at the sub-district level. Marketing was an essential factor in poverty reduction programs, and roads to reduce transportation costs and improve the access of the villages to market places have at times proven supportive of the objectives of P3DT.

(3) P3DT Program

In Fiscal Year 1994/95 the Government initiated the P3DT Program (Pembangunan Prasana Pendukung Desa Tertinggal) with funding from the World Bank and the Government of Japan through the Overseas Economic Cooperation Fund (OECF). Although the two programs vary somewhat in their approach and coverage, they both have the same basic objectives and employ a similar approach.

P3DT is designed to construct basic rural infrastructure at IDT villages for the rural people to increase incomes, improve living conditions and better manage development activities.

Key operational dimensions include:

(i) provision of funding directly to villages for construction or upgrading of basic rural infrastructure (roads, bridges, piers, water supply systems and public sanitary facilities),
(ii) local level planning and sub-project identification at the regency or Kabupaten levels,
(iii) construction through cooperative agreements between village councils (LKMDS), and
(iv) managerial and technical assistance to strengthen village capacities to manage development activities.

Overall managerial responsibility for the P3DT Program rests with BAPPENAS with implementation responsibilities shared with the Ministries of Home Affairs and Public Works.

A total of Rp. 462 billion funded by OECF has been spent on infrastructure development during Fiscal Years 1995/96 and 1996/97. Of this, the largest portion, 84%, has been spent on transport infrastructure (roads 69%, bridges 12% and piers 3%) with water systems 11% and sanitary facilities 5%, according to an evaluation study paper (May 1997) prepared by local consultants.

A total of 1,635 villages received funds during Fiscal Year 1995/96 with 66% of these on Sumatra and the remainder in Eastern Indonesia. In Fiscal Year 1996/97, 80% of the 1,815 villages supported were in Eastern Indonesia and the remainder on Sumatra.

The budget for the P3DT was allocated in the two years as follows;

Table 4-68 P3DT Budget

	1994/95	1996/97	Total
P3DT villages	2,050	2,630	4,680
Total P3DT budget* (Rp. million)	258,450	328,550	587,000

* 21 billion yen funded by OECF
Source: BAPPENAS

Although it is too early to comprehensively evaluate the impact of P3DT Program, economic and social activities were reported during the field survey. In many rural areas, P3DT-funded road has had

a positive impact on economic or social activities. They can carry their products more efficiently to markets or cities using P3DT road, resulting in a reduction of transport costs, and an increase in volume of products for market. A new bridge at one poor village in South Sumatra has made it easier to transport farm products to market (in a neighboring town). At another village in Kalimantan, a new vehicle road has cut the transportation time by two-thirds compared to the previous maritime transportation. At a village in Lombok, one middleman used to monopolize the market but the construction of a new vehicle road has resulted in competition among many middlemen, with the of higher selling prices for local producers. The secondary school and the secondary education enrollment rate have improved. In short, infrastructure development at the village level has not only had positive economic effects, but also positive educational effects.

Since economic activities are often encouraged with construction of road and bridges linking production areas and markets, the IDT Program and the P3DT Program should be coordinated in the planning stage.

In Maluku, IDT village people were eager to get boats to market. Such boats cost more than Rp. 20 million, nearly the equal to the total budget allocation per village. And, boats are not a component of the P3DT Program.

As stated in "IDT Program Implementation Guidance, March 1994", the program is an integral part of a national movement for the alleviation of poverty. The most important thing for the national movement is that IDT village people should be involved in the Program, or positively participate in the Program.

The IDT Program provides village people with special assistance fund as a grant. In the future village people should share the cost of their economic activities to encourage independence from the Government. The Government should establish or expand such a special credit scheme for the poor like P4K scheme in which Bank Rakyat Indonesia operates together with the Ministry of Agriculture.

The P3DT should be also considered cost sharing. The fund for P3DT should be accompanied by the district budget. LKMD (the Village Community Residence Institution) should provide the Program with labor and local materials.

(4) A Role of Micro Socio-Economic Approach

In addition to the other INPRES Programs covering primary education, basic health services, the IDT Program and the P3DT Program are major programs in the micro socio-economic approach by the Government. Such programs aim at poverty reduction as well as encourage the equitable distribution of socio-economic development. It is expected to eradicate poverty with the micro socio-economic approach, especially in eastern parts (except Bali) of the country. As already mentioned, the macro economic policy and management approach alone can not fully reduce the incidence of poverty to zero. The micro socio-

economic approach is needed to supplement what the macro economic management approach can not do well. Although many micro social and economic approaches have been implemented by the Government so far, more stress should be put on it not only to further reduce poverty but also to reduce the inequality or gap of income distribution.

4.5.4 Non-Government Approach: NGOs/POs and Private Enterprises

In the previous sections, the government approach consisting of two sub-approaches: the policy and macro economic management approach at the Central Government and the micro socio-economic approach at village level were introduced to eradicate poverty in Indonesia. It is noted that each approach has its own limits on the effect for poverty reduction. We have also recognized that the governmental approach can not eradicate all poverty in the country. An approach with non-government organization is needed to supplement what the government approach is not able to do. The non-government approach can be divided into two sub-approaches: an approach by NGOs, POs, etc. and an approach by private enterprises. NGOs and POs handle projects similar to ones covered by the micro socio-economic approach, for instance, basic social services and income generation projects.

(1) An Approach by NGOs and POs

According to "Ekonomi Rakyat dan Program IDT by Prof.Mubyarto" there are some cases that NGOs play an important role to reduce poverty together with IDT community groups. The distinct role of NGOs was played in the implementation of the IDT Program in Aceh, Central Sulawesi, South East Sulawesi, and Irian Jaya.

The community groups in the model villages of the four provinces are recorded as the best because, prior to the implementation of the IDT Program, local NGOs actively organized various activities to strengthen communities, so that at the initiation of the IDT program the community groups were prepared well to implement the program.

The community groups can be actively involved in implementing the program through developing harmonious relationships among the group members, thus developing willingness to accept the program inputs for the sake of economic and social progress.

Observing the attitude of IDT community groups, the regional government attempted to integrate government activities into various community activities, such as the allocation of funds from the provincial budget of Aceh to support programs of local NGOs, for instance, while the provincial government of Central Sulawesi reported that they are in the process of preparing a cooperation with local NGOs to develop integrated agriculture. In Irian Jaya the provincial government is attempting to institutionalize cooperation between the provincial governments.

Apart from IDT program, many NGOs are carrying our poverty reduction projects at poor

villages in Indonesia.

Due to limitation of the Governmental approach at village level, the role of NGOs and POs will become more important for further poverty reduction in the future.

(2) Approach by Private Enterprises

Needless to say, the major purpose of private enterprises is not to eradicate poverty but to make a profit. However, they can contribute to poverty reduction through their business activities. It is expected that the industrial sector should be responsible for 25.3 percent of the additional employment created during Repelita VI". In Indonesia, in addition to the above contribution, private enterprises have been contributing to poverty reduction at village level.

There are two cases that large private companies are contributing to poverty reduction through their own business activities: Caltex Pacific Indonesia (CPI) in Riau and Dwima Jaya Utama Company in Kalimantan.

According to BAPPENAS report which Prof. Dr. Mubyarto edited in cooperation with Pusat P3R YAE(Pusat Pengkajian Pengembangan Perekonomian Rakyat Yayasan Ekonomika) for a study using the cooperative inquiry approach to the IDT program in eleven provinces, CPI, since a long time ago, has specific interest to reduce poverty. This interest is shown by the establishment of a Community Development (CD) Division, which is a management unit integrated in the CPI management.

The participation in regional development by CPI is especially in the construction of physical infrastructure (roads, bridges, markets, education and health facilities, places of worship, etc.) for its own exclusive (internal) use, as well as construction of physical infrastructure to be used together with the people (external use). The impact of the community development program of CPI proved to be significant. Aside from increasing the market value of land for investors, the program also broke the isolation of many villages. In response to the government funded IDT Program, CPI introduced its own IDT Program under the name CPI Version IDT Program, which is considered a new and exclusive IDT Program. It is considered exclusive because of the direct involvement of a private enterprise to design and implement a program to reduce poverty, something which hardly has happened in the past. It is considered new because it is oriented to the generation of income of the poor and the introduction of a strategy of partnership between CPI and community groups. The target of the CPI Version IDT Program is the poor people living in poverty areas outside the villages.

Dwima Jaya Utama Company is one of the companies which operates all over Kalimantan as forest concessionaires (Hak Pengusahaan Hutan - HPH)

Aside from operational activities, Dwima Jaya Utama Company is also engaged in the development of village human resources, not only of the village where the base camp of company is

located, but also that of surrounding villages in the concession area of the company.

In the framework of village human resource development, the company established an education complex where education facilities for a kindergarten, primary school, junior high school, senior high school, technical high school and even an open university are located. Previously the education facilities were primarily for the use of the children of the employees of the companies. Presently, the presence of this education complex is already publicly known in Central Kalimantan.

Aside from being involved in the field of education, Dwima Jaya Utama Company is actively participating in the program to raise the welfare of the people living in or around forests and to improve the quality of human resources. It should be stressed here that to raise the welfare of the people and to improve the quality of human resources are integrated attempt to the development of the communities.

4.5.5 A Framework of Poverty Reduction in Indonesia

The nature of poverty varies from country to country. The causes and background of poverty are complicated and multidimensional in any country. There is no panacea to poverty reduction. In Indonesia, many policies and programs have been undertaken to reduce poverty over the last three decades. A framework of poverty reduction can be formulated on the basis of the lessons.

A basic framework of the comprehensive approach toward poverty reduction consists of following.

(1) Government Approach

1) Macro Economic Policy and Management Approach
   - high economic growth rate
   - inflation control
   - population control
   - transmigration policy, etc.

2) Micro Socio-Economic Approach
   - basic social service (BSS):
     basic education, primary health care, family planning, etc.
   - basic rural infrastructure (BRI):
     access road to production areas, market and towns/cities, bridges, piers, sanitary facilities, water supply, etc. (P3DT Program)
   - income generation/employment creation (IG/EC)
     skill training, management training, credit-system, subsidy/grant like the IDT program, etc.

(2) Non-Government Approach

1) Approach by NGOs and POs.

NGOs and Pos activities are similar to the Governmental approach at village level.

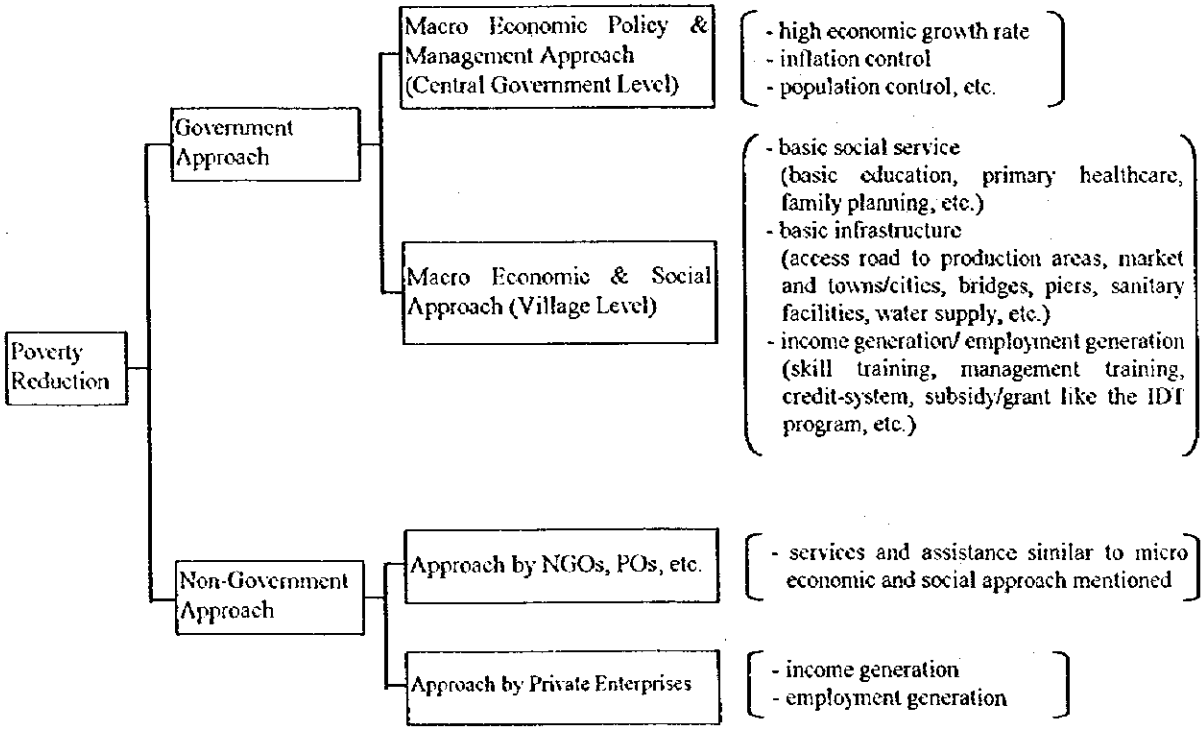
- basic social services
- income generation
- basic infrastructure

2) Approach by Private Enterprises

- income generation
- employment generation

Private enterprises also contribute to poverty reduction through BSS and BRI in addition IG/EG. A visual concept is shown in the Figure 4-30.

Figure 4-30 A Basic Framework of Poverty Reduction in Indonesia



4.5.6 Conclusion

The prerequisite to successful poverty reduction is sustainable economic growth, as mentioned in the World Bank report (Indonesia: Poverty Assessment and Strategy Report 1990). The report says " The first thrust of a poverty reduction strategy is the achievement of sustained economic growth. A review of evidence across developing countries suggests that economic growth is a major factor in the reduction of poverty. Without economic growth, it is not possible to alleviate poverty over the long term."

A remarkable performance on poverty reduction in Indonesia during the last decades was mainly attributable to continuing positive economic growth through sound management of macro economic policy by the Government.

The targets of economic growth rate for five Repelitas in the PJP II are 6.2% for Repelita VI, 6.6% for VII, 7.1% for VIII, 7.8% for IX and 8.7% for X. The IOPM model, which has been built by the JICA study team, estimates the average rate of economic growth for the PJP II 8.0 percent (Case 1) and 8.5 percent (Case 4). Both the target for the PJP II and the rates estimated by the IOPM model are higher than the average economic growth rate in the PJP I (6.8%). Even if such high rate of economic growth is attained, it seems difficult to estimate whether or not the targets of poverty reduction will be attained at 6 percent for Repelita VI and zero during Repelita VII, because the absolute poor in Indonesia live at remote islands, at landlocked areas and at slum areas, where the macro economic approach has little or limited impact, and because economic environment in PJP II may be different from that in PJP I.

At present, the country is being faced with serious monetary and economic crisis. It is reported that economic growth rate for coming years has to be decreased, basic consumer goods prices are increasing and a number of unemployment is going up. This situation easily creates poverty as well as inequality of income distribution in Indonesia.

There is no panacea to reduce poverty. A multi-dimensional or comprehensive approach is essential to poverty reduction. Although Indonesia is facing the economic crisis, the Government should make an effort to create such environment that both the Governmental approach and the Non-Government approach can work effectively to overcome poverty and inequality issues.