

Chapter III

Promoting Technology and Business Partnership for Sustainable Development through Environmental Industry: Indonesia Case

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Summary and Recommendations

Indonesia is an island country with abundance of natural resources, include rivers, mountains, hardwood forest, flourishing, as well as significant reserve of minerals, natural gas and oil. Also Indonesia is no 4 populated area in the world after China, India and US. Population in 2000 is 206,2 millions and it is projected that Indonesia population will exceed 300 million in 2030. Urban areas have been growing very rapidly in Indonesia. The highest urbanization is in Java island where nearly two - third of Indonesia population live.

Because of increasing in economic and social development e. g : population, industrial, urban development and natural resources extraction and exploitation have resulting in decreasing or depleting natural resources and decreasing the environmental quality event environmental pollution.

Accesses to clean water is a problem in Indonesia because many of the rivers are highly polluted only 42 % of Indonesia population have access to clean water. A fall many region in groundwater level, that use for industrial purpose, is found in Jakarta , Medan, Cilegon, Bandung, Semarang and Bali. The regional water utility company (PDAM) can provide top water to only 20 % of the population. The poor performance of PDAM is due to high level of debt and lack of investment as well as inefficient management. Sustainable water management in Indonesia is partly hampered by the lack of data on hydrology, including freshwater source demand and supply in many regions.

Land resources management is an important issue in Indonesia. The large scale conversion of fertile agricultural land into industrial states and the large scale conversion of forested are, wetlands and pet swamps for agricultural purpose are main problem land degradation is mainly caused by the fact that national an regional spatial plans have not been fully implemented. The impact of urban development is another factor which be taken into consideration.

Present low waste service standard have cause the level pollution for water., land and air. Household liquid waste and human waste is a major source of water pollution. Industries polluted rivers is in the range of 25 - 50 % . Program that target reduction of industrial discharge have not achieved their stated goals because of major shortcoming in the governments capacity monitor actual industrial effluents and to enforce the standard and also because of short comings in the private sectors capacity to design and operate pollution abatement system.

The available information indicates that Indonesia faces serious and growing problems related to air pollution its major urban centers. With the expansion of economic activities, air pollutant emissions are expected to grow rapidly.

Some consideration should be put forward to understand the policy and measure for environmental management such as major barriers to sustainable development include : lack of awareness and common flat form, centralized and fragmented approach to development; inadequate political will, institutional capacity and law enforcement; inadequate provision for the involvement of major group; inadequate financial for the technological and human and resources. The other are Public sector investment, protecting the urban environment, and controlling industrial pollution. Public sector investment in infrastructure include power, transport, communications, irrigation, municipal water supply and sanitation are important thing to support the rapid growth of private sector investment. The main challenge to protecting the urban environment is to define a strategy for the management of urban areas that accommodates the need for growth while protecting the quality of the environment. At stake is not only for overall economic growth but also the health and welfare of Indonesia's urban citizens. The issues of industrial pollutions control facing Indonesia today are : (a) what to do about pollution from existing firm and (b) how to “delink” future pollution loads and the damage they cause from the expansions of industrial output.

As in most developing countries, the institution responsible for environmental management face a variety of constraints in carrying our their mandate. As a result environmental issues and concerns are not yet effectively integrated in development planning and implementation. The importance of institutional strengthening should be considered seriously. There are a large number of institution in Indonesia that have an important role to play in environmental protection and the sustainable management of natural resources, at both the national and provincial levels. Most are in the public sector, but non-governmental institutions, including universities and NGOs, will be increasingly important in the coming years. At the national level, the key agencies include the State Ministry for Environment, central agencies responsible for the management and use of natural resources (forestry, agriculture, industry, etc.) and others responsible for key aspects of development planning and coordination (e.g. the State Planning Agency – BAPPENAS, and the Ministry of Home Affairs – responsible for administration of provincial and local governments).

To prevent at least reduce the level of environmental pollution, the government with the approval of the House of Representatives issued Law Number 23/1997 on Environment Management. The law stipulates among others that the development activities especially in the field of economy must take into account their impacts on the conservation of the environment. These are the basic needs that for participation of the business World and Non Governmental Organization (NGO) in Environmental Management are necessary. A pro-active move by the industrialists to find a positive incentive to change and to improve environment performance, makes possible the reduction of the level of pollution problem in accordance with the existing regulation. The move can also improve the communication with the society, enhance the industrial development and finally materialize the social sustainable future for all people and generations in the world. It is becoming increasingly clear that the members of business world should be concerned about environmental issues. They are called upon to take responsibility for lowering the amount of waste produced, protecting environmental quality and human health, as well as increasing efficiency of resource use.

Slow recognition by the public and the government of the substantial health and economic damage afflicted upon the population has resulted in lack of required standards, regulatory frameworks, minimal monitoring and enforcement, and inadequate human and financial resources to meet the environmental challenges of the country. Three environmental submarket segments are : air water, and soil pollution, including industrial waste processing and disposal. Those subsegment market should be handled through the development of environment of environmental industry. (EI). EI refers to : Environmental management systems and reporting at corporate level. Environmental technology and processes (software), and Environmental product, equipment and instrument (hardware). Effective and rational management and use of natural resources, growing economies fueled by expanding export and high quality of life for the people, are directly linked to a dynamic and technologically advanced EI. Likewise, constantly large domestic and foreign investments, combined with R&D and transfer of technology, are essential requirements for a dynamic market-driven EI.

A multiplicity of agencies and institutions responsible for environmental management, combined with incompatible and conflicting laws, as well as lack of required data and information, has further aggravated the county's ability to generate effective real demand for environmental products, technology and services. More recently, with increased domestic (including NGOs) and external, political and market-based pressure, Indonesia has embarked on a process to "green" the economy and to improve health and overall quality of life for the population.

In Indonesia, the international agencies and financial institutions along with the major donors are contributed significantly beside the MNCs, including the national corporations, to the development of EI and more generally to sustainable management of

natural resources. Overall, Japan, the US and Germany are the major donors active in the country. They are also the major exporters of pollution control products and technology.

Environment Industry future development, would benefit from the creation of conditions for converting potential demand for environmental products, technology and management services into effective, and real demand, and market based incentives, combined with effective management of streamlined and strengthened regulatory and monitoring frameworks and standards, will also contribute to the above endeavor. It will also facilitate participation by MNCs and national companies, to discover that investment in environmental protection and control is good business nowadays and in the future.

1. Introduction

Indonesia, which located in the tropical belt, that stretch along the equator from a latitude $06^{\circ}08'N$ to $11^{\circ}15'S$, and longitude of $94^{\circ}45'$ to $141^{\circ}05'E$, is the largest and widest archipelago country in the world and know as a tropical maritime continent country with a coast line length of 81,000 km. It consists of 17,846 island. It includes 3.1 million km^2 of territorial waters, and 2 million km^2 of land. When the Economic Exclusive Zone (EEZ) of 2.7 million km^2 is include, the total territorial area of Indonesia becomes 7.8 million km^2 .

More than 56 per cent of the island are nameless and only 7 per cent are permanently inhabited. Main islands are Sumatra with a total area of 47,606 km^2 ; Java with a total area of 132,107 km^2 ; Kalimantan, comprises two-third of the island of Borneo, with a total area of 539,460 km^2 ; Sulawesi with a total area of 189,216 km^2 ; and Irian Jaya with a total area of 421,981 km^2 .

The country is predominantly mountainous with approximately 400 volcanoes, of which 100 are active. The three most famous volcanoes, Merapi, Galunggung, and Krakatau, located in Java, are considered among the most active volcanoes in the world. Mountains higher than 3,000 meters are found on the Islands of Sumatra, Java, Sulawesi, Bali, Lombok, and Sumatra. The highest mountain of all is the perpetually snowcapped Mount Jayawijaya at 5,030 meters in Irian Jaya.

Indonesia's natural resources are among the world richest that include hardwood forest, flourishing, as well as significant reserves of minerals, natural gas and oil. Although Indonesia covers only 1.3 per cent of the earth's surface, it includes 10 per cent of the world's plant species, 12 per cent of mammal species, 16 per cent of reptile and amphibian species, 17 per cent of bird species, and 25 per cent or more of the world's fish species.

Indonesia is currently the fourth most populous nation in the world after China, India and the United States. The total population was 183 million in 1990 increased to 191 million in 1994. Population in 2000 is 206,2 million. The growth rate of the population was 2.3 per cent during the period of 1871-1980, decreased to 1.98 per cent during the period of 1980-1990, and 1.66 per cent in the period 1990-1995. It is projected that Indonesian population will exceed 300 million by the year 2030.

Indonesia was considered very successful economically in its national development program, including in alleviating poverty. In 1970's around 60 per cent of its population (or some 70 million people) were in absolute poverty. By 1990, the number of the poor had dropped to about 27 million, or only 15 per cent of the population. In 1994 the figure dropped further to 25 million or 13 per cent of the population.

Life expectancy in 1971 was 45.7 years and approaching 63.5 years in 1995, while adult illiteracy rate dropped from 39 per cent in 1971 to 16 per cent in 1980 and to 13 per cent in 1994.

Urban areas have been growing very rapidly during the last two decades. Urbanizations is highest in Java island where nearly two-thirds of Indonesia population live. In 1970, urban population was still less than 15 per cent and subsequently increased to 22.4 per cent in 1980 and reached 34.3 per cent in 1994. It is estimated that the figure may reach 50 per cent by 2020.

Indonesia has made significant progress in advancing education as indicated by increasing adult literacy rate from 39% in 1960 to 88% in 1999 (BPS 2000). This percentage varies according to age. Of the population above 50 year old, 66% are literate while among the population below 50 year old, 93.4 are literate. Another indicator is the increase in the percentage of the population above 10 years old who passed junior high school, i.e. from 32.2% in 1999 to 33.6% in 2000. School attendance of 7-12 year old children in 2000 was 95.5%, 13-15 years 79.6% and 16-18 year 51.2%. This is an increase of 0.1 – 0.6% compared to 1999.

Because of increasing in economic and social development e.g: population, industrial, urban development, and natural resources extraction and exploitation have resulting in decreasing or depleting natural resources, and decreasing the environmental quality event environmental pollution as described in following.

2. Present and Future Conditions

1) Water Resources

Water is one of the most important elements of the environmental for life. Without water, the various processes of life would not be possible. A large proportion of the bodies of living things consist of water. Plain water makes up only 3% of all water resources on earth, and of this percentage only percent or point percentage is available in a form which can be directly utilized. The rest is frozen in the poles.

In Indonesia, access to clean water is often a problem. The quality of water is rising as a problem. A study published in 1991 shows that many of Indonesia's rivers are highly polluted.

The pollution of surface water (rivers) and the groundwater means that the water quality is no longer sufficient for some purposes, including drinking. Water contamination is generally caused by human waste, household waste such as detergents and industrial waste which is dumped without first being treated. This waste poses great health risks, not only for the people who have to use river and reservoir water for drinking, bathing and washing, but also for those who are customers of PAM, the state water company. Which takes its water from these same sources. Water pollution from this waste also decreases the river and reservoir capacity to support water organisms, resulting in a decrease in oxygen in the water.

In addition to domestic, irrigation and industrial demand, the demand for water for electric power generation is also projected to increase as a result of the village electrification policy, industrialization, increased standards of living and urban expansion. Meanwhile a comparison of available water and demand shows that in Java demand will reach a critical level. In the year 2000 demand for water in Java is projected to be 153% of the supply.

The increasing use of groundwater for industrial purposes results in a drop in the aquifer levels in places such as Jakarta between Cengkareng and Grogol, and between Cempaka Putih and Cakung, where it is 17 meters below sea level.

A fall in groundwater level is also found in Medan, Cilegon, along the north coast lowlands of West and Central Java, Bandung, Semarang, and Bali. In addition, there has been land subsidence in large cities such as Jakarta and Bandung which endangers buildings.

Falling levels of groundwater in an aquifer also result in the intrusion of salt water into the aquifer, contaminating the fresh water. This intrusion of salt water is also caused by increased cutting of mangrove forests without concern for their function as a buffer in keeping the coastal land from being eroded or abraded by the salt water and to prevent salt water intrusion.

Indonesia is facing increasing freshwater supply problems, particularly on the islands of Java and Sumatra where the demand for freshwater is the highest. Issues associated with freshwater are population growth, industrialization, urbanization, overuse, and inadequate supply of freshwater in some regions. The demand for water for domestic use only is projected to be about 81 billion meter³ in 2015, which means an annual increase of 6,7% between 2000 and 2015. This figure has not included freshwater consumption by agricultural sector that account 98% of Indonesia's water resources and is growing by 6,67 % annually until 2015 (MoE, 1997).

On the other hand, only 42% of the Indonesian population have access to clean water. The Regional Water Utility Company (PDAM) can provide tap water to only 20% of the population, of which 90,2% is used by the domestic sector. The poor performance of PDAM is due to high level of debt and lack of investment as well as inefficient management. Limited supply has forced people to increasingly utilize groundwater, leading to over utilization by household and industries, resulting in reducing groundwater level. This problem is exacerbated by pollution both from industrial and domestic wastes, causing a decline in the annual per capita availability of water. Indeed, some causes of water use conflict has been reported from some densely populated areas with intense development activities (MoE, 1997).

The National Agenda 21 calls for the need to formulate and integrated water resource management, focusing on the provision of adequate and safe drinking water, enhancement of efficiency in water utilization and improvement in the quality of water resources.

To date there is no integrated water resources management as yet, but some efforts have been conducted as a part of water resources conservation program. For instance, in order to protect water resources from pollution the MoE launched the Clean River Program (Prokasih) which by 1999 involved 37 watershed areas in 17 provinces. The project encourage water pollution reduction from industries, voluntarily. However, the success of this program is debatable, since law enforcement is weak. It is hoped that government regulation no. 82/2001 on Water Quality Management and Water Pollution Control might serve as another policy tool to manage and prevent further water pollution.

Another important issues is the privatization of water supply through partnership between the regional water utility company (PDAM) with the private sector. This was attempted to improve the performance of PDAM. It has to be notice, however, that the cooperation between PDAM and the private sector created some problem related to public services. The profit orientation of the private sector often undermines the need to provide public services, particularly for the poor. There is a tendency that services to the poor community will deteriorate, on the other hand they have to play higher prices for water.

Sustainable water management in Indonesia is partly hampered by the lack of data on hydrology, including freshwater source, demand and supply in many regions.

2) Land Resource Management

Land resources management is an important issue in Indonesia since a large part of the nation's production depends on land. The large-scale conversion of forested areas, wetlands and peat swamps for agricultural purposes is one of major problem in land resources management. This results in land degradation, the size of which is currently 30 million hectare and is expected to increase by 1 – 2 per cent (about 300.000 to 600.000 hectare) per year. Another problem is the large – scale conversion of fertile agricultural land in Java which will expand by almost 15,000 hectare per year. An additional expansion is also anticipated for roads and industrial development amounting to about 40.000 hectare per year (World Bank, 1989).

The World Bank (1992), quoted , further estimates that until 2010, about 390.000 hectares (13 percent) of the 3,4 million hectares of rice fields in Java may be converted into non agricultural land. Another problem is the large-scale conversion of fertile agricultural land into industrial estates and urban settlements; in 2000 such conversion reached almost 250.000 ha in many cases, land conversion also occurs in conservation areas which, according to spatial planning regulations, must not intensively developed.

Land degradation is mainly caused by the fact that national and regional spatial plans have not been fully implemented. The impact of urban development is another factor which must be taken into consideration. The conversion of agricultural into non agricultural land in Java for purposes such as housing, industrial uses, fall role roads etcetera appears to be more pronounced and faster than anticipated in World Bank Projection. The mythical picture of Java turning into a “City Island” is be common more and more a reality. This development further reinforces the need for effective innovations in the development of agriculture, energy and water supply, urban development and sustainable land use.

Development planning efforts have already reclaimed coastal areas in Northern Jakarta, up to 2.700 hectares. Similar plans have been developed for Kapuk Naga (7.000 hectares) East Surabaya. The approach being taken in Jakarta and East Sumatra will be used as a model for the development of other Coastal cities in Java.

Unfortunately, no standard procedure exists yet for the land reclamation process, this is a cause of some concern due to the prospect of floods. Furthermore; the destruction of mangrove forest causes problems of foreshore erosion, salutation of beaches and inshore reefs, depletion of fish tocks, habitat loss and resource depletion. The growing interest

in land reclamation may also be interpreted as a symptom of the inability to balance socio-economic activities with land use planning.

In many cases, this is associated with conflict of interest among parties involved in the management of land resources.

The problem is exacerbated by the lack of coordination among government agencies and development sectors, complex regulations and mechanisms related to land resources and by the limited participation of major groups, especially local and indigenous people in land-use planning. Such problems have led to both horizontal and vertical conflicts. An example is the failure of the national project to develop one million hectares of peat swamps into rice fields in Kalimantan, which damaged the tropical peat swamp ecosystem as well as created social problems.

Another important issue associated with land management is the marginalization of customary land laws, even though formally it is recognized by the National Agrarian Law (Law No 5/1960). The government, in many cases, undermines traditional law on the grounds of national interest. Disregard for the customary land laws have often led to social conflicts sometimes leading to violence. The Spatial Planning Law No. 24/1992 was issued as a policy basis to achieve an interacted and environmentally sound spatial use. It was followed by Regulation No. 47/1997 on Regional Spatial Planning. However, the implementation and enforcement of these laws are weak and therefore the above problems are yet to be resolved.

As stated before, the MPR Decree No. IX/MPR/2001 on Agrarian Reform and Natural Resources management may be able to address some of the above problems as well. However, differences of opinions on the effectiveness of this decree need to be resolved, and the decree itself will need implementing regulations in order to be effective.

3) Liquid and Solid Waste Management

Liquid and solid waste as defined in this chapter, includes both domestic waste (human waste/sanitation and solid waste), which is often known as “brown waste”, or industrial waste. It is useful to differentiate domestic waste from industrial waste not only because of the different nature of the waste and the consequently different technological approaches, but also because different sectors carry the responsibility of managing different waste.

Present low waste service standards have caused the level of pollution for water, and in some instances, land and air to exceed environmental standards. Sanitation coverage, for example, has remained static since 1980 and is barely able to keep pace with population increase. In 1993, only 52% of families had access to adequate sanitation, including 39%

rural areas and 78% in urban areas (UNDP, 1995). Household liquid waste is a major source of water pollution and is estimated to contribute 50-75% of the organic loading in rivers in urban areas. Human waste is also polluting water supplies from shallow wells. A survey of shallow wells in Jakarta, where 84% of the samples were contaminated by fecal coli forms, illustrates that groundwater is contaminated on a large scale. Water pollution causes adverse effects for human health, particularly increases in diarrhea, increases in the cost of treatment for drinking water sources, and increases in the cost of transporting water from distant sources. Estimated the implied cost of water pollution in Jabotabek at Rp. 187.7 billion/annum and by the year 2005 it will be almost double unless control measures are introduced.

The service level for solid waste is not much better. On a national level only 40% of the urban population has its waste collected, the rest burn it and dispose of it in streams or on open land. In Jabotabek, for example, solid waste burning is estimated to contribute to 20% of particulate and 11% of hydrocarbons in air pollution. The disposal of solid waste in water bodies not only degrades water quality but also causes clogging of drains which in return causes flooding.

In the case of industrial pollution, it is estimated that the typical contribution of organic loading from large industries to polluted rivers is in the range of 25-50%. Programs that target reduction of industrial discharge have not achieved their stated goals because of major shortcomings in the government's capacity to monitor actual industrial effluents and to enforce the standards, and also because of shortcomings in the private sector's capacity to design and operate pollution abatement systems. The existence of numerous cottage industries that are intermixed with housing poses additional problems in enforcement and monitoring of treatment and discharge. Furthermore, these small-scale industries do not have the funds or the technical resources to build wastewater treatment plants.

In addition to population growth and urbanization, future problems in liquid solid waste management will be exacerbated by waste originating from increased industrialization.

Three trends are important to note ;

1. The first is the pace of industrial growth itself. With increased reliance of the Indonesia economy on industrialization, the manufacturing sector by 2020 is likely to expand 13-fold (World Bank, 1994) with a ten-fold waste increase.
2. The second trend is the spatial distribution. More industries will be concentrated in provinces with high population densities, particularly in Java. As a result, traditional water pollutions (BOD and suspended solids) will expand eight-fold from the current high levels.
3. The third trend is the shift of manufacturing from material processing to assembly.

Indonesia has started to realize the importance of this approach and in 1995 made a national commitment to minimize waste generated during the production process by implementing cleaner production principles. Some pilot projects have been tried under the Clean Production Program coordinated by National, Development Planning Agency in paint, textile, food, plastics, and pulp and paper industries with relatively good results; waste, water consumption and often energy and raw material use was reduced with additional investment being paid back in one to five years. Minimization potential as expressed in terms of a “minimization factor” has not been determined yet for Indonesia, however studies done in other countries could give some indication of the potential. Studies in developed countries have estimated a minimization factor (a factor that measures the reduction of waste generation because of minimization efforts) of 50-60% in the next 10-15 years as a possibility. With the assumption that there is much to be achieved through improving housekeeping practices and upgrading dirty technology, a minimization factor of 50% over a period of 20 years does not seem overly ambitious and can be used to estimate the potential reduction in levels of waste generation.

4) Air Resource Management

As with water and land, air is important requirement for every living thing. The air we breathe is part of the atmosphere which is particularly sensitive to environmental influences, including those of man. Air pollution affects the climate and lowers the air quality. Air pollution can be caused by gas or dust. Pollution from gas comes from moving objects, such as motor vehicles, ships and aircraft, as well as from fixed objects such as factories. Meanwhile, pollution from dust comes from industrial activities and dryness.

Recently a number of climate parameters have indicated that change is taking place. Deviations in atmospheric conditions are thought to be a cause of unstable weather conditions. Climate changes in Indonesia are predicted to have a clear impact on the agricultural sector in general and on the rise in sea levels coasts. Calculations by the Bandung Institute of Technology (ITB) indicate that over the past 60 years the sea level has risen by 0.5 cm/year along the coasts of Jakarta, Semarang and Surabaya. Increases in concentrations of manmade gases, such as chlorofluorocarbons (CFCs) and halon have caused the ozone layer in the stratosphere to thin, which may be hazardous to human life. These gases contribute to global warming which causes rising sea levels.

Inventarization and monitoring of the Blue Sky Program activities in metropolitan cities shows a correlation between decreasing air quality and traffic density. In large cities, particularly in business and transportation centers, there is air pollution from dust and aerosol in the lower atmosphere. Industrial activities have great potential to pollute the air because of emissions of SO₂, NO₂ and CO. Without active effort SO₂ and NO₂ pollution

will increase from the 1994 levels of 200,000 tons and 600,000 tons respectively per year to 2,4 million tons and 1.5 million tons in the year 2010. And with an estimated growth in the transportation sector of 6-8% per year air pollution by motor vehicles in the year 2000 is estimated to be double that of 1990 rising to 10 times that by 2020. Other studies have shown that air conditions in several large cities already surpass the established maximum allowable standards for air quality.

These high levels of pollution appear to cause a high incidence of respiratory ailments. For example, in Jakarta, 12.6% of all deaths are from respiratory tract infections. According to a report of the Health Ecology Research Center of the Ministry of Health in 1991, this total is twice the national average. If preventive measures are not taken immediately the same conditions will be found in six other provinces by 2010. In that year, the total suspended particulate (TSP) in the air in Central Java, East Java, Yogyakarta, Bali, North Sumatra and South Kalimantan will equal the 1990 levels in Jakarta and West Java. This means that 85% of those whose health is affected by this type of pollution live in Java.

With the remaining 15% living in Bali, North Sumatra and South Kalimantan. Complaints will be of respiratory problems, frequent asthma attacks, eye irritation and possibly cancer. Table 1.5 in the Appendices shows some sources of pollution and their effects.

The available information indicates that Indonesia faces serious and growing problems related to air pollution in its major urban centers. Moreover, with the expansion of economic activities, air pollutant emissions are expected to grow rapidly. This condition, coupled with the population growth pattern, will mean that at least half of Indonesia's population will be exposed to serious urban air pollution by 2020. The seriousness of urban pollution can be shown by the projected situation in Jakarta, where, air pollutant emissions will grow to more than double the 1990 levels by 2000 and six times the 1990 levels by 2018. These factors will seriously risk continuing social and economic development in Indonesia, as result of the high social and economic costs from air pollution.

Information from the year 1990 shows that efficiency in energy usage in Indonesia is still very low This can be seen by the high rate of energy consumption per unit of the Gross National Product (GNP). In 1990 energy intensity in Indonesia reached 366 Ton Oil Equivalent (TOE) per million US\$, compared to 251 and 258 for the Philippines and Singapore respectively, and 210 for the developed countries.

Therefore in 1991, the government issued Presidential Decree No.43, concerning the implementation of energy conservation programs in all energy sectors with the Minister and the head of the government institution having the responsibility for implementing and supervising conservation activities.

**Table 1. Projected Energy Demand
(Peta Joule)**

Sector	1991	2001	2011	2021
<i>Industry</i>	538.50	1,039.36	1,911.74	3,674.26
<i>Transportation</i>	536.80	1,040.31	1,841.72	3,246.74
<i>Residential</i>	1,124.42	1,367.58	1,574.10	1,792.49
<i>Commercial</i>	29.08	66.35	143.22	319.42
<i>Others</i>	251.05	584.90	1,085.85	2,030.18
Total	2,479.85	4,098.50	6,556.63	11,063.09

Source : BPPT-KFA, Markal Study 1992.

**Table 2. Projected Domestic Energy Supply
(Peta Joule)**

Sector	1991	2001	2011	2021
<i>Oil</i>	1,291.63	1,671.11	2,334.67	4,719.71
<i>Natural Gas</i>	710.97	1,565.98	2,300.41	2,977.35
<i>Coal</i>	193.96	790.24	2,660.18	6,512.26
<i>Geothermal & Hydropower</i>	141.75	419.07	544.17	534.68
<i>Biomass</i>	1,003.39	1,238.59	1,436.84	1,712.14
Total	3,341.70	5,684.99	9,276.27	16,465.14

Source : BPPT-KFA, Markal Study 1992.

**Table 3. Projected Oil Consumption In Indonesia
(Kilo Liter)**

No.	Product	1998/99	2003/04	2008/09	2013/14	2018/19
1.	Avgas	9,189	9,149	9,141	9,139	9,139
2.	Avtur	1,875,092	2,399,543	2,921,361	3,358,376	3,839,529
3.	Premium	11,016,790	15,072,014	18,977,991	22,146,115	26,486,719
4.	Kerosene	10,884,523	11,108,211	10,965,596	12,892,088	15,046,057
5.	ADO	22,423,379	29,832,931	39,256,424	49,062,911	63,030,325
6.	IDO	2,642,754	3,461,640	4,572,515	6,081,763	8,133,625
7.	Fuel Oil	4,672,208	5,656,924	7,260,102	9,972,543	13,679,036
Total		53,523,935	67,540,422	83,963,130	103,522,935	130,224,430
Growth Rate (%/year)		(1994 – 98)	(1999 – 03)	(2004 – 08)	(2009-13)	(2014 – 18)
		4.77	4.56	4.49	3.78	4.78

Source : Direktorat Pengolahan, Pertamina, 1995

Electricity consumption in Indonesia has grown rapidly. During the first 25 year Long-term Development Plan, 1969-1994, the demand for electricity has grown at an average rate of 15% per year. In 1968/69, total electricity consumption was merely 1,4 TWh, but in 1993/94 it increased to 63.4 TWh and it will reach 188 TWh in 2003/2004. This rapid growth is expected to continue at average of 8.2% year from 51.2 TWh in 1990 to 555 TWh in 2021 (see Table 7.4.), in which the share of consumption from the industrial sector will increase from 68% in 1990 to 73% in 2021 (Zuhail, 1995).

This annual growth rate is higher than the Asian average of 7.9% and much higher than the world's average of 3.6% (1980-1987). The electrification ratio (ratio of number of households with electricity to total households) increased from 3.4% in 1969 to 38.7% in 1994 and expected to be 60.0% in 1998/99 and 74.0% in 2003/2004 (Zuhail, 1995). Although Indonesia's total electricity consumption is the highest in ASEAN countries, the consumption per capita is the lowest among the ASEAN (246 GWh compare to 1,075 and 5,218 for Malaysia and Singapore). This condition will likely lead to the rapid growth of this sector in Indonesia.

**Table 4. Electric Power Demand
(TWh)**

<i>Sector</i>	<i>1990</i>	<i>2001</i>	<i>2011</i>	<i>2021</i>
<i>Residential</i>	<i>10.0</i>	<i>22.2</i>	<i>40.8</i>	<i>70.0</i>
<i>Commercial & General Services</i>	<i>6.4</i>	<i>15.3</i>	<i>33.9</i>	<i>78.7</i>
<i>Industry</i>	<i>35.4</i>	<i>84.8</i>	<i>183.4</i>	<i>405.1</i>
<i>Transportation</i>	<i>0.1</i>	<i>0.3</i>	<i>0.7</i>	<i>1.2</i>
<i>Total</i>	<i>51.9</i>	<i>122.6</i>	<i>258.8</i>	<i>555.0</i>

Source : BPPT-KFA, Markal Study 1992. (Agenda 21-Indonesia).

Thermoelectric plants are considered major emission sources which can effect local and regional air quality. In terms of total energy-related emissions at the national level, the greatest concern from the power sector activity is SO_x emissions. The power sector is however less of a contributor to these emissions in urban areas, as most power plants are located in rural areas. The shift to coal as primary energy source will increase concerns regarding the environmental implication of power plants, since coal combustion will produce more pollution than many other energy sources, if emissions are not properly controlled.

In the future, the emission loads corresponding to the above expansion of the power plant sector, assuming unchanged environmental control practices, are projected to expand by 20 times for the case of SPM, 17 times for the case of NO_x, 12 times for Sox and 16 times for CO₂ emissions (World Bank, 1993).

The Government of Indonesia has taken some steps to reduce emissions from power plant activity. These measures include the requirement for an environmental impact analysis for power projects, the establishment and implementation of the ambient air quality and emission standards for coal fire power plants, the use of low sulfur coals, the increased use of natural gas in combined cycle power plants, the reduction of transmission and distribution losses from a high of about 21% in 1983 to 12.38% in 1990 (11.81% in Java and 13.82% outside Java) and a target of 10% by 2000 (World Bank, 1993)

Table 5. Power Generation Forecast: Unchanged Practices Scenario (TWh)

<i>Primary fuel</i>	1990	1998	2008	2018
PLN				
<i>Oil</i>	15.4	7.1	16.4	24.4
<i>Coal</i>	9.8	27.7	117.9	336.8
<i>Natural Gas</i>	1.4	34.6	34.6	34.6
<i>Hydropower</i>	7.6	11.8	24.4	27.4
<i>Geothermal</i>	0.8	4.0	4.5	5.5
<i>Sub Total</i>	34.9	85.3	197.8	428.7
Captive				
<i>Oil</i>	12.6	33.8	68.4	174
<i>Coal</i>	1.0	8.8	13.8	31.8
<i>Natural Gas</i>	2.0	4.9	10.4	17.4
<i>Hydropower</i>	1.7	1.7	2.2	4.2
<i>Geothermal</i>	-	-	1.0	4.5
<i>Sub Total</i>	17.3	49.3	95.8	232.3
TOTAL		134.5	293.6	661.0

Source : World Bank, 1993.

Table 6. Emission From Power Plant * (Without Control)

<i>Year</i>	<i>Power Generation (TWh)</i>	<i>NOx (1000 tons)</i>	<i>SOx (1000 tons)</i>	<i>Particulate (1000 tons)</i>	<i>CO2 (million tons)</i>
1990	52.2	182.2	229.8	11.1	35.3
1998	134.6	455.0	368.1	26.6	87.3
2008	293.6	1212.5	1036.1	83.3	221.0
2018	660.9	3086.8	2648.1	224.7	553.2

Source : World Bank, 1993* PLN and Captive

Climate change is caused by increased concentration of greenhouse gases, notably carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) due to combustion of fossil fuel, deforestation, and agricultural practices. As an archipelago developing country, Indonesia stands to lose much from climate change. Its agriculture and fishery sectors, which are vital for food security and income generation will be threatened. Some models predict that if the concentration of CO₂ double, regional temperature in Indonesia will change by between 1.6° Celsius and 4.3° Celsius, which might disrupt hydrological cycle and reduce food productivity. For instance, productivity of soy bean, corn and rice will be reduced by 20%, 40%, and 2.5% respectively, with a loss of Rp 23 billion per year (MoE, 1998).

Public health will also be threatened by climate change. It is predicted that the incidence of malaria, dengue fever, and diarrhea will increase. In case the concentration of CO₂ doubles, the incidence of malaria will increase from about 2,700 cases in 1989 to about 3,200, while dengue fever will increase more than four-fold from 6 to 26 cases per 10,000 people (Asian Development Bank, 1994)

A rise in sea level will affect the islands and coastlines, making much of the low-lying lands practically inhabitable. A sea-level rise of 60 cm will inundate about 800,000 houses will be inundated, and make 1,000 km of low-lying roads and five seaports vulnerable to floods, costing Indonesia about Rp. 30 billion per year. Meanwhile tourism industry will lose about Rp. 4 billion per year due to devastated beaches. The economic toll from climate change may run as high as 10% of Indonesia's income by 2070 (Asian Development Bank, 1994).

Meanwhile, despite the efforts to mitigate them, Indonesia's greenhouse gas emissions are projected to increase rapidly. Indonesia's emissions of major greenhouse gases in 1994, the last year for which an emission inventory is available, amounted to approximately 343 million tons (megatons, MT) of CO₂ equivalent. A further 156 MT of net CO₂ emissions were caused by changes in land use, primarily deforestation. Between 1990 and 1994 Indonesia's emission of carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) grew at a rate of 1.8% per year. CO₂ accounted for approximately 70% of the total emissions (MoE, 1998).

Economic sectors with high-energy consumption (such as energy, industry, transport), accounted for approximately 35 to 60% of the total emission between 1990 and 1994. The forestry sector was the second largest contributor, responsible for between 20 and 50% of emission while the agriculture sector contributed between 15 and 25%. Fluctuations in emission during this period were caused primarily by changes in the rate of forest harvesting. As economic growth is projected to pick up again after the 1997 crisis, so too will the emissions, *albeit* at a lower rate. Carbon dioxide emission from the sectors with high energy demand is projected to triple between 2000 and 2020 as the share of coal in the energy supply is expected to increase by a factor of ten (MoE, 2001).

Nevertheless, Indonesia contributes to only about 2% of the billion tons (Gigatons, GT) of global total emission, therefore the mitigation measures should be undertaken collectively with the international climate negotiations since the early 1990s. It has ratified the United Nations Framework Convention on Climate Change (UNFCCC) through Law No.6/1994, and signed the Kyoto Protocol with a plan to ratify it soon. The Ministry of Environment has coordinated various studies related to climate change, ranging from the socio –economic impact of climate change to possible actions to be taken Indonesia to mitigate climate change. The latest is the national strategy study on the clean development mechanism under the Kyoto Protocol. A National Action Plan has been formulated by the government, with the assistance of non-governmental organizations and academic institutions.

Both the UNFCCC and the Kyoto Protocol allows developing countries such as Indonesia to increase their emission due to their development needs, but in cases where choices of low emission technologies. Taking the path of a more efficient and environmentally friendly development is a precautionary approach that will be beneficial for Indonesia in mitigating climate change.

In Indonesia, policy development on climate change is the responsibility of the Ministry of Environment who also chairs the National Committee on Climate Change, which has been in operation since 1993. The National Committee functions as a coordinating forum for relevant agencies, academics, and non governmental organizations on climate change issues. However, weak coordination remains the main obstacle to better policy development.

3. Policy and Measure for Environmental Management

1) Major Barriers to Sustainable Development

The main national constraint in implementation of the sustainable development in Indonesia is the lack of accountable representation and democratic governance, or good governance. Not enough effort has been taken to raise the awareness of the general public, including corporations, about the significance of Agenda 21. As a result, the National Agenda 21, which provides a guideline for planning of sustainable development at various levels has not been fully implemented. In addition, the term sustainable development is used as jargon denoting environmental consideration only, rather than a holistic concept for development. For the past thirty years, the development planning and implementation has been conducted in a centralized and fragmented manner. These conditions were exacerbated by inadequate political will and lack of a strong and effective system to implement sustainable development and Agenda 21.

Indonesia has limited financial, technological and human resources capacity to support its efforts in implementing Agenda 21. Funding for sustainable development is limited due to inappropriate budget allocation and a relatively high rate of debt service. Meanwhile, Indonesia has limited knowledge and capacity to make maximum use of the new institutional and financial opportunities that are emerging, such as debt swap for sustainable development and clean development mechanism. Low budget allocation for education and poverty are factors leading to inadequate human resources for development. This was exacerbated by the under utilization of existing qualified human resources as well as inappropriate placement of highly qualified people. Furthermore, budget allocation for research and development in public and private sector is also low. In term of International constrains, the declining trends of ODA flows from developed countries has raise the concern of less financial availability for sustainable development in the future for countries like Indonesia, particularly given the current economic crisis. Similarly, developed countries have not fulfilled their commitment to provide, including Information and Communication Technology (ICT). This is very important tool for the development an archipelago country like Indonesia.

On the other hand, Indonesia often receives international transfer of obsolete technology which are environmentally and socially harmful.

Finally, the international sustainable development discourse has somewhat undermined by economic liberalization agenda, particularly the trade liberalization. Many rules for multilateral trade, particularly at the World Trade Organization (WTO), may not be in harmony with the existing regulations for ecological and social sustainability.

Like many other countries, particularly developing countries, Indonesia faces many constrains in the implementation of Agenda 21 and national sustainable development. These constraints need to be identified so that they can be addressed in future development planning.

1)-1 Lack of Awareness and Common Platform

There is an almost general lack of awareness about both Agenda 21 and sustainable development among government officials, communities and corporation, even academicians. For instance, only the Ministry of Environment, Ministry of Foreign Affairs, few officials at sectoral ministries (mining, forestry, tourism), a few NGOs and a handful of academics know about the National and Sectoral agenda 21 documents. This is due mostly to the fact that not enough effort has been made to raise general public awareness about the significance of Agenda 21. As a result, the National Agenda 21, which provides a guideline for planning of sustainable development at the national, local or sentral level, has not been fully implemented.

In the same manner, sustainable development is an issue that is often discussed at seminars and policy discussions, but the government has not formulated integrated policies, let alone facilitated the implementation of sustainable development. In addition to a general lack of awareness, there is no common platform on what constitutes sustainable development and how it should be implemented. Often, the term sustainable development is used as a jargon to denote environmental consideration only, rather than a holistic concept for development.

Even the environmental concern has not been fully integrated into development planning. There is also a lack of common perception about what constitutes good government for sustainable development.

1)-2 Centralized and Fragmented Approach to Development

For the past thirty years, development planning and implementation has been conducted in a centralized and fragmented manner. Most major decisions are made by the central government, leaving very little space for local governments to plan development based on local potentials and needs. In the same manner each sector particularly with strong economic interest (such as forestry, mining, fishery, agriculture, industry), implements programs without coordination among each other or with relevant agencies such as the Ministry of Environment, Ministry of Health or even the Coordinating Ministry of Social Welfare. As a result the integration of environmental and social concerns into the decision making for economic development is good only on paper, but is weak in actual implementation. Although Indonesia has ratified many environmental agreements and even formulated many of its own laws, they are not effective for two reasons; first the sectoral laws have not taken the environmental regulations into account; secondly, often the environmental laws are not followed by implementation guidelines and therefore enforcement and compliance are weak.

Some efforts have been made and are being formulated to address the above constraints. Among others, the formulation of the Indonesian National Planning Program (PROPENAS) is now a more open, albeit not perfect, process than in the past. Thus there is room for major groups to advocate for the three pillars of sustainable development (economic, social and environmental) to be addressed in a balanced and integrated manner. Secondly, the Law No.22/1999 on Regional Governance now enables local governments to formulate their own development plan with input from the local population.

Law No.25/1999 on Fiscal Balance should be able to provide local governments and communities with more financial resources and independence in managing natural resources for economic development. But after decades of centralization, there is a need to strengthen local capacity. Also an ideal arrangement needs to be worked out between the national and local level governments.

1)-3 Inadequate Political Will, Institutional Capacity and Law Enforcement

The implementation of sustainable development has been hampered by inadequate political will. This is reflected from the fact that the government has only recently started the process to put in place basic arrangements for the functioning of good governance, which is the main prerequisite for the conduct of sustainable development. The decision making process within government structures has not been fully transparent and often does not involve the participation of stakeholders. This is exacerbated by poor access to information.

An attempt was made to address some of these constraints through the Good Environmental Governance project undertaken by BAPPENAS with the assistance of UNDP in 1998-1999. The project produced an Advisory Document which provides recommendations to the government, private sector and civil society on priority reforms that might be taken to resolve major environmental problems facing Indonesia.

Indonesia also lacks a strong and effective system to implement sustainable development and Agenda 21. Thus far, the Ministry of Environmental is charged with developing the national and sectoral Agenda 21, in cooperation with various agencies. It is also responsible for the coordination of line ministries in terms of environmental management. However, Agenda 21 and, for that matter, sustainable development, is more than just environmental management and the MoE does not have a mandate to plan and implement sustainable development.

Thus the arrangement has not been effective, But recently the government has put the MoE under the umbrella of the Coordinating Ministry for Economic Affairs (Formerly it was under the Coordinating Ministry For Social Welfare) and this is considered more appropriate in the effort to mainstream sustainable development issues into economic development. The process of setting up the Indonesian NCSD is another attempt that may be able to address this issue.

Sustainable development is also hampered by insufficient legal instruments and weak enforcement. Many of the relevant policies and regulations are incomprehensive, ambivalent and overlapping, thus making enforcement difficult. They are often formulated without public participation thus communities do not know about these regulations and therefore cannot participate in their enforcement. Law enforcement agencies themselves are weak due to lack of funding, quality human resources and infrastructure, In many cases law enforcement agencies have not understood regulations particularly in cases such as pollution, forest fire, illegal logging and illegal trade of endangered species.

1)-4 Inadequate Provision for the Involvement of Major Group

For more than three decades, development process in Indonesia has been conducted in top-down manner by excluding the participation of major groups. It is one of the reasons that the largest part of the Indonesian people has never heard of Agenda 21 or sustainable development, as well as the international commitments that the government has made. This also means that the governments has made. This also means that the government has not tapped the potentials of major groups to ensure sustainable development. For instance, nongovernmental organizations have an important role to play in policy reform, community education and empowerment and in social work geared towards sustainable development. Yet, their voices have been very little heard. Similarly, local and traditional communities have experiences and knowledge in local level sustainable practices.

But their role has not been recognized and they have in fact been marginalized from the entire development process.

Although currently there are attempts to integrate ideas and practices of major groups into the development process, in general genuine public participation has not been fully realized. This is mainly due to inadequate political will on the part of the government and lack of adequate systematic and transparent mechanisms to ensure public participation in sustainable development planning and implementation.

1)-5 Inadequate Financial for the Technological and Human and Resources

Indonesia has limited financial, technological and human resources capacity in its effort to implement Agenda 21. Even before the 1997 economic, when Indonesia was enjoying a high economic growth rate, funding for sustainable development was already limited due two to inappropriate budget allocation and a relatively high rate of debt service. The situation has been worsened since the crisis occurred. Indonesia's dependence on loans and grants from international financial institutions and bilateral donors/creditors is relatively high. A disproportionately large part of the fund is spend on subsidizing the ailing banking sector while the country lacks a comprehensive economic recovery scheme. Meanwhile, Indonesia has limited knowledge and capacity to make maximum use of the new institutional and financial opportunities that are emerging. The opportunities to utilize the debt for nature swap or, the better derivative of which such as the debt for sustainable development swap schemes have increased in the last five years, but only few have realized these opportunities.

Financial constraints have caused problems in human resources development. Low budget allocation for education and poverty are factors leading to inadequate human resources for development.

The government has a low capacity to capitalize on the limited skilled and qualified human resources since appropriate economic and administrative incentives are lacking. This has exacerbated the under utilization of existing qualified human resources as well as inappropriate placement of highly qualified people.

Technological constraints are due to lack of proper planning and incentives at the national level and lack of technology transfer at the international level. Domestic technology development, particularly for sustainable development, is very weak because budget allocation for research and development in public and private sector is low. In most cases the government merely imports the technology, which may not be suitable for local purposes.

2) Public Sector Investment

Investment in infrastructure include power, transport, communications, irrigation and municipal water supply and sanitation. In order to support the rapid growth of private sector investment, and thus the creation of jobs and non-oil exports, infrastructure investments should increase significantly (by nearly 50% in comparison with expenditures under REPELITA IV). Investments in human resources development and poverty reduction, including health, education, basic agriculture, population and family planning and other related programs should also absorb a higher share of a growing public sector budget. (Investments in human resources development, which have benefited from massive investments in physical capacity in the past, will emphasize increasing quality, while poverty-related programs will emphasize a more targeted approach to the remaining pockets of poverty on Java and in the outer islands). Other investment, particularly in state-owned enterprises, have declined markedly, and consistent with the role of the private sector as the new “engine of growth-this trend is expected to continue.

Table 7. Priorities for Public Sector Investment

	Actual (%) 1984/85-1988/89 (REPELITA IV)	Estimated (%) 1989/90-1993/94 (REPELITA V)	Indicative Projection (%) 1994/95-1998/99
Infrastructure	43.0	59.0	61.0
HRD/Poverty Sectors	25.0	25.0	27.0
Other	32.0	16.0	12.0
Percent of GDP	8.8	9.4	10.2

Investment in urban water supply and drainage, sewerage and sanitation (including related investments under the Kampung Improvement Program), and solid waste management should rise substantially, from Rp 2.0 trillion in REPELITA IV, and an estimated Rp 1.3 trillion in REPELITA V, to about Rp 5.9 trillion during REPELITA VI (all in 1989 prices). The share of these expenditures as a percentage of GDP would rise from 0.2% to 0.4%. Similarly, within the growing allocation for road transport, investments in urban roads and other transport-related infrastructure are expected to expand substantially in order to deal with the challenges of congestion and vehicle emissions arising from the rapid pace of urbanization and the increasing number of motorized vehicles. Urban transport investment, therefore, would represent roughly 0.5% of GDP (excluding investment in natural gas/CNG development under the power sector).

The budget allocations whose sole or primary purpose is either to provide an environmental public good or to address some negative environmental externality. They include four categories of expenditures: (i) routine expenditures by agencies that exist solely for environmental management; (ii) routine expenditures on conservation, protection and rehabilitation by natural resource management agencies (but not units that primarily support natural resource extraction); (iii) routine expenditures by environmental units in other line agencies; and (iv) development expenditures on projects that are totally or primarily aimed at environmental management.

The Ministry of Finance (MOF) classifies expenditures in both the routine and development budgets into 20 budget sectors. These sectors relate to functional categories, such as defense and education. The sector that nominally pertains to environmental management is sector 10, Environment and Spatial Planning. This sector include the major environmental agencies, in particular the Ministry of Environment (Kementerian Lingkungan Hidup, KLH) and the Environmental Impact Management Agency (Bapedal, Badan Pengendalian Dampak Lingkungan). As the analysis below reveals, however, only a minority of expenditures in sector 10 are actually environmental, and a substantial amount of environmental expenditure occurs in sectors whose primary function are non-environmental.

Figure 1 compares the sum of development and routine expenditures on all activities in sector 10-non-environmental as well as environmental-with the sum for just core environmental activities in the sector. As noted in the previous section, the estimates of development expenditures include expenditures of own resources only.

The figure reveals that official statistics on total expenditure in sector 10 greatly overstate core environmental expenditure in that sector, which was only about one-fifth of its total expenditure in most years. The figure also shows that core environmental expenditures declined sharply during the crisis years, after rising steadily through

FY96/97. Because of the cumulative declines during FY97/98, core environmental expenditures in FY98/99 were only three-fifths of the amount in FY94/95.

Figure 2 decomposes the estimates of core environmental expenditures in sector 10 were finance by the development rather than the routine budget. The heavier cuts in development expenditures during the crisis did not reverse this pattern, because the difference between the development and routine budgets was so great before the crisis (more than an order of magnitude). The budget for natural resources/environmental/spatial planning sector for the year 2003 estimated around 0.76% of the total development budget (67.05 trillion Rp). This budget should be increased for 4.0 – 5.0 % of the total budget for development.

Figure 1. Sum of Development Expenditure (Own Resources) and Routine Expenditure in Sector 10 (Environment and Spatial Planning) of the National Budget (Rp billion, constant 1993/94 prices)

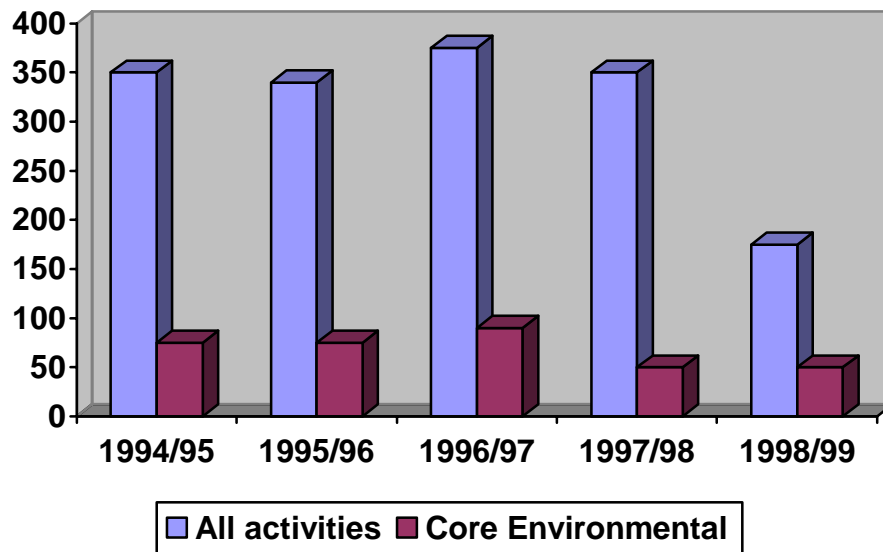
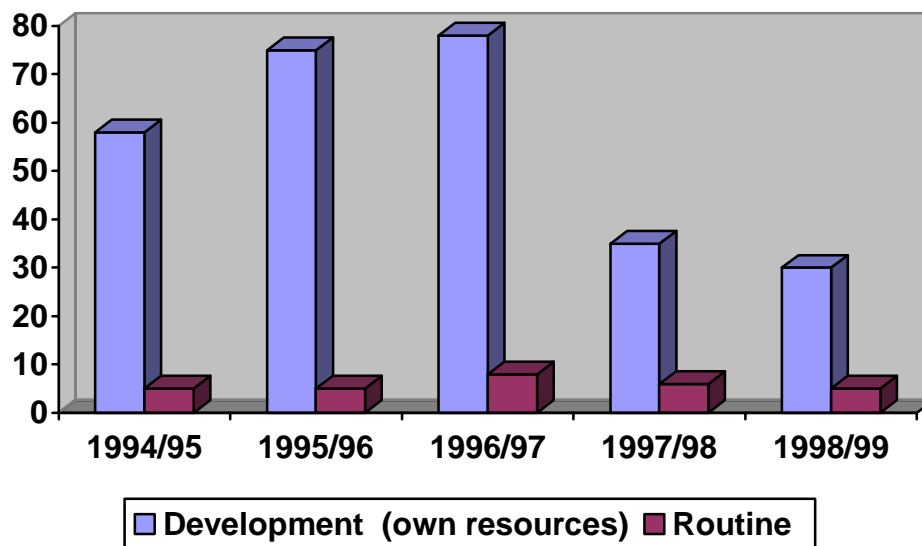


Figure 2. Composition of Core Environmental Expenditure in Sector 10 of the National Budget (Rp billion, constant 1993/94 prices)



3) Protecting the Urban Environment

To deal with the rapid growth of urban areas, and to meet the existing backlog of demand for urban services, will require a substantial increase in public sector investment. It will also require more effective policies and incentives for environmentally responsible behavior by firms, households and individuals, and greatly enhanced institutional capacities for urban environmental planning and management. The main challenge is to define a strategy for the management of urban areas that accommodates the need for growth while protecting the quality of the environment. At stake is not only the efficiency of the “urban-enterprise”—with significant implications for overall economic growth—but also the health and welfare of Indonesia’s urban citizens.

In most large cities, improving the availability of safe water will require a major expansion of the piped water supply. While the distribution network will need to be extended, most cities could increase in the supply of treated water significantly simply by reducing “unaccounted for” water in the current system, which is often as high as 35-40%. Increasing the number of connections is constrained by the high “up-front” cost of connection. To overcome this difficulty, part of the connection fee could be included in the monthly charges for water. Supply interruptions and low pressure in the pipes force many households to install home reservoirs, to use pumps applied directly to the pipes, or rely on other sources of supply (e.g., shallow wells). Given the deteriorating condition of many large urban water supply networks, low water pressure, combined with fecal contamination of groundwater, leads to contamination of piped water through infiltration. To improve quality and reliability will require a major effort to improve the quality of construction and “O&M”. This will also help to reduce “unaccounted for” water, and thus improve the reliability of the system. Greater reliability of piped water is also needed to reduce the demand for groundwater in cities where excessive extraction for industrial and residential use is a major problem.

To reduce fecal contamination of urban water supplies will require a significant improvement in the availability of **sewerage and sanitation services**.

Many parts of most Indonesian cities can continue to rely on “private sector” approaches (pit latrines and septic tanks), but the conditions of their use will have to be improved (e.g., the proper removal and disposal of septic tank sludge). Water-borne sewerage collection systems are highly expensive, and are unlikely to be economically justifiable for most residential areas in the near future. The intensive development of commercial areas, however, may justify the investment costs needed in trunk lines, and could be cost-effective for high-rise buildings that would otherwise have to invest in their own treatment plant to meet local environmental standards. GOI has already initiated a planning exercise covering up to 25 cities to assess their sanitation needs. Preliminary

indications are that up to 60% of the urban areas can continue to rely on-site solutions, but the rest will need to be connected to a sewerage system. The “least cost” technical options will need to be defined, and issues of financing and cost-recovery-and the institutional arrangements for managing the system within each city-will need to be resolved.

Improvements are needed in both the collection and disposal of **urban solid waste** in all of the larger cities of Indonesia. Even in the poorest neighborhoods, waste removal is a high priority, and primary waste collection is often managed by local residents. Greater involvement of the private sector in waste collection should be encouraged, including the design, construction and operation of “transfer stations” in larger cities. Long-term planning is needed for the siting of future landfills, and improved management of existing landfills should be a high priority-especially those located in environmentally vulnerable areas. Waste recycling can reduce the need for landfills, and is already a thriving activity in many cities-with strong support from non-governmental organizations.

The number of motorized vehicles in Indonesia more than doubled during the 1980s, to 9 million vehicles, a third of which are in urban areas, and this trend will continue. Expansion of the urban road network, however, has lagged behind, leading to rapidly growing traffic congestion and vehicle emissions in the major metropolitan areas. Reducing the growth of traffic congestion will be essential for minimizing efficiency losses and for protecting the health of the urban population.

(In Bangkok, for example, nearly a third of the city’s potential GDP is lost because of congestion-induced travel delays). While much can be accomplished in the medium term through a combination of policy reform and public sector investments, longer-term solutions will require a comprehensive approach, including : more effective land-use planning; improved traffic management and engineering; higher technical standards for motor vehicles; the introduction of cleaner fuels; expansion of public transport system (and their quality and reliability; and more effective policies for demand-side management.

The potential for reducing energy-related air pollution in Jakarta was examined in a recent Bank report. That report concludes that pollution-based fuel taxes, together with the introduction of unleaded gasoline and CNG (Compressed Natural Gas), would pay significant dividends. Compared with a six-fold increase in SPM (Suspended Particulate Matter) by the year 2020 under the “unchanged practices” scenario, SPM would only increase by about 90%, and emissions of lead would decline by 80%. The economic benefits, in term of reduced health costs, would be quite significant. Health damages from energy use would be reduced by 84%, and total health damages from SPM and lead would be reduced by over 50%. As these results suggest, however, without complementary measures to control the emission of non-energy-related pollutants (from

industry and the burning of solid waste), the health costs of air pollution will continue to rise.

4) Controlling Industrial Pollution

There are two key issues of industrial pollution control facing Indonesia today : (a) what to do about pollution from existing firms, and (b) how to “delink” future pollution loads, and the damage they cause, from the expansion of industrial output. The first is important, given the current level of industrial pollution, but the second is the more critical issue : by the year 2010, assuming continued rapid growth, existing firms will represent only about 15% of total industrial output and, by the year 2020, less than 8%. Coming late to the challenges of industrial pollution control carries with it enormous advantages-not less of which is the opportunity to learn from the mistakes of others.

The recommended strategy for cleaning up pollution from existing firms involves six key elements. **First**, continue to improve the incentives framework for efficient private sector growth, including market-based prices for natural resources and “full-cost” pricing of urban services. **Second**, carefully target the pollution control effort, by industry, by pollutant and by area-focusing on the worst polluters and the most damaging pollutants in the most threatened areas of the country. **Third**, continue efforts to strengthen the institutional capacity for pollution monitoring and the enforcement of pollution standards, especially at the provincial level. **Fourth**, give highest priority to encouraging the adoption of “clean technology”, and especially waste minimization initiative, to reduce pollution loads at the least cost while simultaneously enhancing industrial efficiency and competitiveness. **Fifth**, rely increasingly on the power of public information-about trends in ambient environmental conditions and firm-specific pollution practices-to build consensus, capture the attention of industry leaders, and bring community pressure to bear on unresponsive firms. Finally, move quickly to develop and implement plans for controlling toxic and hazardous waste, including storage, transport and treatment issues, with special attention to the needs of smaller firms and emphasizing the importance of reducing the use of such materials in the production process.

Reducing the level of pollution from new and expanding firms will require more effective attention to environmental issues and concerns at the initial stages of project design and approval. The recommended strategy includes four key elements. **First**, use existing environmental impact assessment (“EIA”) procedures for prior review of potential environmental effects, but target the effort and ensure professional and expeditious reviews-possibly by “contracting out” with an experienced firms. **Second**, expand the review to include issues of technology choice. Wherever, there are significantly different options available, require further justification for adopting older, less inefficient and more highly polluting technologies. **Third**, ensure that provisions are made for appropriate “end-of-pipe” pollution abatement in new and expanding firms, to avoid more expensive

“retro-fitting” latter on. **Fourth**, ensure effective local government input on location issues, especially for major projects but also for any that are highly polluting, and encourage the location of medium-and larger-scale firms in private sector-sponsored industrial estates.

4. The Importance of Institutional Strengthening

Indonesia has had a long-standing commitment to the basic concept of sustainable development and environmental protection, and has already established a legal framework and regulatory procedures designed to implement those concepts. As in most developing countries, however, the institution responsible for environmental management face a variety of constraints in carrying out their mandate. As a result, environmental issues and concerns are not yet effectively integrated in development planning and implementation.

There are a large number of institution in Indonesia that have an important role to play in environmental protection and the sustainable management of natural resources, at both the national and provincial levels. Most are in the public sector, but non-governmental institutions, including universities and NGOs, will be increasingly important in the coming years. At the national level, the key agencies include the State Ministry for Environment, central agencies responsible for the management and use of natural resources (Forestry, Agriculture, Industry, etc) and others responsible for key aspects of development planning and coordination (e.g. the State Planning Agency – BAPPENAS, and the Ministry of Home Affairs – responsible for administration of provincial and local governments).

The State Ministry of Environment. The origins of MLH can be traced to the preparations made by GOI for the UN-sponsored “Conference on the Living Environment” held in Stockholm in 1972. As a follow-up to that work, a “Committee for the Formulation of Environmental Policies” was set up under the leadership of the Vice Chairman of BAPPENAS, reporting directly to the President. In 1978, a Minister of State for Development Supervision and Environment (PPLH) was created, out of which grew the State Ministry for Population and Environment (KLH) in 1983. The last major reorganization of KLH occurred in 1988, and resulted in the formulation of a “priorities and planning committee” (to be assisted by a Policy Analysis Unit) directly under the Minister, and four division, each headed by an Assistant Minister. With the recent cabinet changes, however, the population responsibility of KLH were combined with Indonesia’s Family Planning Program activities to form a new Ministry, and the State Ministry for Population and Environment (KLH) became MoE.

Table 8. The Institutional Framework for Environmental Management

----- National Level Institutions -----		
<u>Central Ministries</u>	<u>Environmental Agencies</u>	<u>Other Key Agencies</u>
<ul style="list-style-type: none"> - Industry - Agriculture - Forestry - Mines and Energy - Public Works - Communication and Transportation Assessment - Ministry of Home Affairs - Health, etc. 	<ul style="list-style-type: none"> - State Ministry for Environment (MLH) - Environmental Impact Management Agency (BAPEDAL) - Environmental Studies - Centers Network (BKPSL) - Government-sponsored Agency (BPN) and Non-Profit Research Organization - Private Sector / Non Government Organization (NGOs) 	<ul style="list-style-type: none"> - State Planning Agency (BAPPENAS) - Central Bureau of Statistics (BPS) - Mapping Agency (BAKORSURTANAL) - Land Management - Technology Agency (BPPT)
----- Regional Level Institutions -----		
<u>Offices of Central Ministries</u>	<u>Environmental Agencies</u>	<u>Key Government Agencies</u>
<ul style="list-style-type: none"> - Industry - Agriculture - Forestry - Mines and Energy - Public Works - Communication and Transportation - Health, etc. 	<ul style="list-style-type: none"> - Bureaus of Population and Environment (BKLHs) - Government Laboratories - University Environmental Studies Centers (PSLs) - EIA Commissions (Komisi Industry Daerah AMDAL) - Prokasih Teams etc. - Private Sector /NGO 	<ul style="list-style-type: none"> - Office of the Governor and Staff - Planning Agency (BAPEDAs) - Provincial Government Office for : Agriculture Forestry Police, Prosecutors and the Courts

The Environmental Support Network (PSLs and NGGs). A part of MoE mandate is to develop environmental skills, encourage greater awareness of environmental issues, and enhance the opportunities for wider participation in the process of environmental management. A major initiative supporting these objectives has been the development of university-based Environmental Studies Centers (PSLs). A primary objective of the PSLs has been to enhance the availability of environmental expertise to GOI officials responsible for environmental planning and policy analysis. The demand for sound economic analysis of environmental issues, however, has greatly exceeded the supply of well-trained university graduates. Despite its best efforts, therefore, MNL has not been able to establish its planned Policy Analysis Unit, and has had to rely on (mostly expatriate) consultants to carry out policy-related studies. Government-sponsored and non-profit research organizations.

A second initiative has been to encourage the development of environment of environmental NGOs (non-governmental organizations). There are literally hundreds in Indonesia, at the national, provincial and local level. Many focus their activities on issue of sustainable growth and environmental protection. They are quite diverse, and their roles are continuing to evolve. Many, such as the national Consumers Union (YKB), have sponsored education and awareness campaigns; others, such as the Government-sponsored Family Welfare Movement (PKK), have worked directly with local communities in trying to improve environmental conditions; and still others, such as the national level, and for more equitable implementation of those policies at the local level. More recently, NGOs with links to the business community (such as the Business Council for Sustainable Development, which includes a number of leading Indonesian businessmen) are beginning to emerge.

A few NGO's have managed to grow in both size and sophistication, and their views are increasingly represented in public discussion of emerging environmental issues. Many of these NGOs belong to WALHI, the umbrella network of environmental NGOs, which was established in 1980. In most cases, however, environmental NGOs are relatively small organizations characterized by voluntary (or low-paid) staff and a shortage of professional expertise and administrative skills. While official Government policy encourages the involvement of community and self-help.

1) Environmental Management in the Provinces

The Provincial government is responsible for environmental management at the regional level. In principle, the authority vested in the provincial government is wide-ranging : to coordinate the implementation of development plans; to set environmental standards; to approve location permits and other licenses for new projects; to monitor adherence to environmental laws and regulations; and to enforce those laws. The institutional capacity

for environmental management at the provincial level, however, is still quite weak. This shortcoming is compounded by a number of other factors, including the strongly hierarchical administrative structure of the national government, the fact that development planning is largely sector ally-oriented and centrally-driven, and the rather severe shortage of environment-related skills available to provincial and local government agencies.

Capacity for Pollution Monitoring and Control. As noted above, provincial governments have primary responsibility for pollution monitoring and control. Their capacity for doing so, however, is constrained by a combination of factors, including the diffusion of responsibility and authority for various aspects of environmental monitoring, shortcomings in the quality of laboratory analysis of industrial waste emissions, and the lack of experience by the judicial system with the administration of environmental laws and regulations.

2) Policy Responses and Legislative Framework for Water Quality Management

Water pollution control is administered by various laws. Many of these laws were originally enacted to primarily regulate the use and management, rather than protection, of natural resources and the environment.

With decentralization, municipalities and rural kabupaten (districts) are entitled to plan and manage environmental services, construction and operation of central treatment facilities for wastewater. Decentralizations may eventually bring about improvements in the management of water quality, since decision-makers will be nearer the problems and the affected constituencies.

It is too early to assess any change in the situation, but one negative result is that ambient river quality monitoring data are no longer being sent to a central location. It will therefore become increasingly difficult to assess the condition of Indonesia's waters in any comprehensive manner.

Other major obstacles to improving water quality include weak and inconsistent enforcement of existing laws and regulations, failure to implement the 1995, effluent discharge permit program, lack of standard operating procedures for hospitals to handle wastewater, and lack of sufficient effluent flow data to determine hospital pollution loads.

Enforcement of existing environmental laws is weak due to inadequate coordination among various agencies low technical capacity for proving violations, and limited access to information. However, to initiate regulatory reforms and improve firms compliance with environmental standards, GOI has been trying to complement existing command-

and-control regulations with market-based instruments and public disclosure tools, albeit with limited success. These instruments are intended to provide incentives that will result in a change in the behavior of water users and polluters. Although a pollution charges program is outline to control water pollution from industrial enterprises, implementation has been only limited to the pilot phase in one region in the country. The challenge before decision makers is to apply this program in a coherent way to allow for reductions in the cost of compliance and provide incentives for polluters. In addition, application of economic instruments (such as taxes) for the extraction of ground and surface water, as well as appropriate water resources pricing, will also spur conservation efforts.

Currently, water quality in many rivers is not regularly monitored. In addition where water quality monitoring is conducted, some sites are monitored weekly and daily, but results are reported monthly/yearly. There is no mechanism to incorporate monitored data in a timely manner, into rehabilitation schemes.

The Clean River Program or Program Kali bersih (PROKASIH), inaugurated in 1989 by GOI, was devised as an innovative response to growing pollution loads in critical watersheds. The program targeted the worst industrial polluters, in 24 highly polluted rivers, with a stated goal of reducing their pollution loads by 50 percent within two years, on a voluntary basis.

The Prokasih Program involved five steps : (I) establishing of local Prokasih teams; (ii) identifying specific firms in highly polluting industries; (iii) getting these firms to sign voluntary letters of commitment to reduce pollution loads by 50 percent within an agreed timeframe; (iv) monitoring subsequent result; and (v) applying increasing pressure on those not making efforts to comply with their commitment. As of 1994, voluntary agreements were in place for more than 2,000 firms; pollution loads appeared to have been reduced in some provinces, particularly those with the strongest technical capacity to pursue the objectives of the PROKASIH program.

The implementation of PROKASIH was carried out by provincial authorities, with the support of central agencies as need. In addition, the media were encouraged to report on environmental damage caused by pollution and on significant clean-up efforts, and NGOs helped to facilitate the participation of community groups in related environmental activities. Despite its achievements, the overall impact of the Prokasih Program is considered mixed, due to the limited, voluntary nature of the program, as well as the NGOs limited capacity to monitor the program.

Table 9. Water Quality Legislation

Legislation	Regulated Activities and Issues
Water Pollution Control and Management Regulation - 2001 (Government Regulation No. 82)	Currently being drafted to replace Government Regulation No. 20 of 1990 and the National Water Act
Sea Pollution Control Regulation 1999 (Government Regulation No.19)	Regulates discharges of pollutants into sea water
National Water Act – 1997	Provide a framework for water quality management
Water Pollution Control and Management Regulation – 1997	Provides for the preparation of a water quality strategy, regulates the classification of water bodies’ use, and monitoring of water pollution
Decree for Coastal Conservation Program (Program Pantai Lestari No. KEP-45/MENLH/11/96)	Provides framework for pollution control of coastal and mangrove areas and coral reefs.
Surface Water Quality Standards – 1995	Classifies surface water according to use functions
Control of Water Quality in Water Resources regulations – 1990	
Liquid Waste Quality Standards – 1990	Regulate the levels of effluent discharges and restrict concentration of levels of chemical and/or metal pollutants from different types of activities
Clean River Program Decree – 1995 (Program Kali Bersih No. KEP-35/MENLH/7/1995)	Designates rivers, water quality an monitoring standards for the PROKASIH program

3) Policy Response and Legislative Framework for Air Quality Management

Efforts to manage air quality have been hampered by weak enforcement capacity. In addition, the knowledge base to effectively manage these pollutants is poor-there is little in the way of detailed emission inventories or source characterization, dispersion or economic modeling and government monitoring capacity is limited. Overall, air pollution control has not received GOI attention and funding at anywhere near the level warranted by the very large and well-documented health consequences.

The number of public participation in Indonesia is mainly passive, with authorities providing information to the general public. In the national Ambient Monitoring Networks program, there are thirty data display screens which display Pollution Standard Index (PSI) values for the public. However for reasons that are not at all clear, actual monitoring information for individual pollutants is not available to the public. Thus, this index would have limited usefulness for individuals and agencies interested in making assessments and investigations on the short-term and long-term averages of specific pollutant concentrations. This is nevertheless a positive step towards informing the public of air quality. Before 2000, neither print not electronic media published monitored air quality data.

The Ministry of Environment launched “Program Langit Biru” (Blue Sky Program) in 1991 to address air pollution problems. For stationary sources, the program gives priority to power plants, cement, paper and pulp, and steel industries.

The Clean Air Program (CAP), announced in 1991, is an effort by the City of Jakarta to increase public awareness of air pollution. Under CAP, emission tests were conducted in road and parking lots in Jakarta by the City Environmental Impact management Agency (BAPEDALDA) in cooperation with the City Police (POLDA) between 1996-2000. Parameter such as HC, CO, and opacity were tested. In addition, pilot “Emission Reduction Weeks” (PUTE) were held in Jakarta under CAP where free emissions testing were conducted on vehicles.

Cars not meeting the emissions standards were then serviced. Emissions were tested after servicing to ensure that they finally met the standards. The results of the PUTE reveal that for the majority of cars, HC and CO emissions drop to acceptable levels just after servicing and rise again within a few months if vehicles are not regularly maintained.

Table 10. Air Pollution Legislation

Legislation	Issues and Regulated Activities
Degree No. KM-8-1989 of the Minister for Communications addresses Vehicle Emissions Standards in the Context of Road Worthiness	This decree limits CO and HC emissions from idling gasoline powered vehicles
Act No. 14 (1992) on Traffic and Land Transportation	States that all motorized vehicles are subject to testing with respect to emissions and noise
Government regulation No. 41 regarding the Control of Air Pollution of 1999	This regulation describes responsibilities for air quality monitoring and data collection, such as emissions inventories. A permit process and sanction was also outlined. Implementation and supervision of vehicle road worthiness (including emissions testing) is to be conducted by the Ministry of Communications
Ministry of Energy and Mineral Resources Degree No. 1585/K/32/MPE(1999) on criteria for Marketing of Gasoline and Diesel in Indonesia	Specified the date of lead phase-out in gasoline as January 1, 2003
Government of DKI Jakarta Decree No. 95 (2000) on Jakarta Tightening of Emission Quality Standard from Moving Source	Requires that all vehicles comply with Emission Quality Standards Describes that inspection will be followed by maintenance, using a decentralized I & Management system. Involves the private sector, with local government as facilitator
Governor of DKI Jakarta Decree No. 1041 (2000) on Motor Vehicle Emission Standards for DKI Jakarta	Sets emission standards, Voluntary based. Issued by local/city government

4) Policy Responses and Legislative Framework for Solid Waste Management

Specific laws and regulations were developed to properly and efficiently manage solid waste services. With decentralization, municipalities and rural kabupaten are entitled to plan and manage environmental service, including solid waste management. While decentralization is expected to bring about improvements in the quality of services offered, it is too early to assess any change in the situation.

Before decentralization, solid waste management spanned across several departments and ministries ; the Ministry of Public Works, Ministry of Home Affair, Ministry of Health, Agency for Technology Assessment and Development, BAPEDAL, and the Sub-Directorate for Solid Waste Management. This structure resulted in overlapping responsibilities and weak implementation and enforcement of solid waste laws and regulations.

With decentralization, local governments have acquired more responsibilities in planning and implementing solid waste management programs within their locality.

Enforcement of existing law is generally weak due to lack of political will, inadequate coordination among various agencies, low technical capability for proving violations, limited access to information, and lack of adequate funding. To improve compliance, GOI and local governments are trying to complement existing command-and-control regulations with market-based instruments and public-private partnerships.

The KENALI B3 Program, set up by BAPEDAL in 1998 is a strategic partnership program for managing toxic and hazardous waste. It aims to increase awareness among hazardous waste producers about regulations and the need to comply with them. Under this program, an increasing number of companies are said to have applied for permits to deal with hazardous wastes.

Table 11. Hazardous and Toxic Waste (B3) Legislation

Legislation	Regulated Activities
Environmental Management law-1997	Contains general provisions for solid, toxic, and hazardous waste management
Government regulation No. 74 of 2001 Concerning Hazardous and Toxic Waste management	Regulation states that : <ul style="list-style-type: none">- Every person and corporation is prohibited to dispose of B3 waste directly into water, soil, or air;- B3 waste producer are required to process B3 waste;- Permits are needed for collecting, transporting, and processing, including final dumping
Head of Environmental Impact : Agency Decree No. KEP-68/BAPEDAL/05/1994 concerning Permit Procedure and technical Requirement Storage and Collection of Hazardous and Toxic Materials activities	Permits needed for storing, collection, operating, and treatment of hazardous and toxic material
Head of Environmental Impact Agency Decree No. KEP-01/BAPEDAL/09/ 1995 concerning Procedure and Technical Requirement Storage and Collection of Hazardous and Toxic Materials	Collection and storage of hazardous and toxic material
Head of Environmental Impact Agency Decree No. KEP-02/BAPEDAL/09/ 1995 concerning Documentation of Hazardous and Toxic materials activities	Documentation requirement for hazardous and toxic material
Head of Environmental Impact Agency Decree No. KEP-03/BAPEDAL/09/ 1995 concerning technical requirements for treatment of Hazardous and Toxic materials	Treatment of hazardous and toxic material
Head of Environmental Impact Agency Decree No. KEP-04/BAPEDAL/09/ 1995 Concerning procedural requirements for material after treatment, treatment and storage location, for Hazardous and Toxic materials	Location for treatment and storage of hazardous and toxic material
Head of Environmental Impacts Agency Decree No. KEP-05/BAPEDAL/09/ 1995	Use of symbols and labels for hazardous and toxic material

concerning Simbol dan Label Limbah Bahan Berbahaya dan Beracun	
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5. Public and Business Potential for Developing Environment Industry in Indonesia

To prevent at least reduce the level of environmental pollution, the government with the approval of the House of Representatives issued Law Number 23/1997 on Environment management. The law stipulates among others that the development activities especially in the field of economy must take into account their impacts on the conservation of the environment.

The principal of the sustainable development cover the integration of environment criteria into economic practice to guarantee that the strategic plans of the companies meet the demand for business growth and sustainable evolution, at the same time meet the demand for the conservation of natural capitals. This require great changes not only in the control of air pollution, the holes of ozone layer, water conservation, use of raw materials and the management of waste treatment, but also in international issues effecting transaction, trade, finance and political agenda.

Therefore, the industrialists have a key role in the realization of the sustainable development. The government can only make policies and programs on the development. But if not supported by the industrialists, the policies and programs make not sense. With their activities, they have power to affect sources of raw materials, production process, consumer reaction and waste disposal methods. A pro-active move by the industrialists to find a positive incentive to change and to improve environment performance, makes possible the reduction of the level of pollution problem in accordance with the existing regulation. The move can also improve the communication with the society, enhance the industrial development and finally materialize the social sustainable future for all people and generations in the world.

International trade has experienced various changes in its system. And the most monumental change is the process of globalization sweeping all economic aspects. The globalization is not limited in the establishment global market for products and services but also in the development of the production system which applying a global vision, international technology of innovation and creativity and dynamic employment. The global economic system becomes increasingly competitive.

To win the global economic competition, it is necessary for businessmen to understand the rule of the game in the competition. The rule of the game is determined by the high production of products and services and their low selling prices, but also by the characteristic of other products and services offered to the consumers. The characteristics

cover the products' quality, conformity with the taste and need of the consumers, comforts and availability of the products, quick and on time delivery.

In addition, in managing environmental impacts applying high technological equipment and involving environmental consultants, the companies should use a standard recognized by international business community. The use of the standard is aimed at ensuring the world that the companies have manage environmental impacts brought about by the production of their products and telling the world that their products are friendly to the environment.

The international business community recognizes a number of environment management systems. The most popular standard is that introduced by the international Standardization Organization (ISO), namely ISO 14000. the standards generally suggest the application of a system in dealing with environmental impacts. The implementation of the system ensures real results on the improvement of environmental performance producing goods / services of low price and high quality while conserving the environment.

International and pressures for the implementation of environmental impacts then create business opportunity with promising prospect for producers and suppliers of environmental technological products as well as consultants providing services on the management of environmental impacts. Some five thousands of manufacturing companies operate in Indonesia. But the manufacturers implementing the management of environmental impacts in accordance to international credible standards are still in a small number, amounting to less than 500 companies. So, the market is still big.

Companies in Indonesia including state-owned enterprise and major private companies pay a great interest in the management of environmental impacts as reflected by a large number of companies participating in an exhibition entitled "Environment Expo 2000 organized in Jakarta Convention Center in June 2001.

Besides, a great intention of Indonesia companies to sell their products in export market due to poor buying power of the people in the country has prompted the companies to implement environment management system as the key to entering the global market. Therefore, environment technological equipment and environment management services are at present in high demand. So there must be business opportunities and environmental industry development hidden in problems facing the environment

1) Pollution Abatement Investment

There is very little information available on the actual costs of pollution abatement in Indonesia's manufacturing sector. Experience in the industrialized countries, however,

can provide at least an order of magnitude sense of the required investments in “end-of-pipe” abatement. In the OECD countries, total costs varied from 3-5%, and averaged about 4%, of total investment in the 1970s and early 1980s.

To examine the potential impact of abatement costs on Indonesian industries, an effort was made in this study to estimate these costs—using a combination of U.S data on the unit costs of pollution control and BPS data on the level of output from existing Indonesian firms. One of the most important features of the estimated “abatement cost curve” is that unit costs rise with the proportion of total pollution eliminated, increasing rapidly in the higher ranges. According to our estimates, for example, abatement costs range from about US\$275 million at the 30% level, to US\$1.9 billion at the 70% level, and US\$4.8 billion at the 90% level.

Abatement costs also vary quite significantly between pollutants, which reflects differences in the nature of the abatement technology that is available, and between industries since, different industries have quite different pollution intensities per unit of output. To further complicate matters, pollution intensity—and thus the costs of abatement—will also vary significantly between different firms within the same industry, depending on the age and type of production technology employed and the efficiency with which it is used.

The costs of pollution abatement actually imposed on Indonesia industry, of course will depend on the standards that are set and the extent to which individual firms comply with those standards. Applying the goals of the PROKASIH Program (i.e., a 50% reduction standard), total (capitalized) costs would amount to about US\$700 million for existing firms. Amortized over 10 years, this would imply an annual cost of about US\$70 million—which would be equivalent to about 0.6% of GDP, but less than 0.5% of total industrial sector sales—and only about 1% of value added.

Larger reductions, of course, would result in higher costs, and that fact will need to be taken into account in setting pollution control standards. In deciding on the appropriate level of standards, the first consideration should be the social and economic benefits associated with a cleaner environment. It is extremely difficult to come up with precise estimates of these benefits. Based on the qualified estimate of the health costs of water and air pollution in Jakarta, however (approximately US\$ 500 million a year), it is clear that they are not negligible.

2) Participation of the Business World and Non Governmental Organization (NGO) in Environmental Management

It is becoming increasingly clear that the members of business world should be concerned about environmental issues. They are called upon to take responsibility for

lowering the amount of waste produced, protecting environmental quality and human health, as well as increasing efficiency of resource use. Agenda 21, a United Nations action program, demands the full participation of the business world in environmental management and Law No. 4/1982 states that any person engaging in measures which preserve the environment and contribute to sustainable development.

The role of the business world is strategic, especially in PJP II, the era of industrialization it is expected that the share of private investment will be more than twice that of government. The increase in business activity, especially industries which involve the processing of natural resources or involve a change in the landscape has the potential to cause environmental problems.

Thus the implementation of environmentally friendly business principles and strict enforcement of environmental laws will determine the success of environmental development.

At this time environmental consciousness in the Indonesian business world is beginning to develop. This is demonstrated by the appearance of foundation and other environmental agencies which involve the business world. Even so, at this point the most obvious results of this involvement is the contribution of funds used to promote environmental cause.

The business world should care about the environment considering :

- The increasing environmental consciousness which is giving rise to green consumers who prefer environmentally friendly products. The business world also needs to care because of increasingly strict regulations and provisions in the environmental field, both national and international, which are directly related to business interests, such as environmental standards, ecolabelling, ISO 14000 and clean production. This development is an opportunity as well as a challenge for businesspeople to develop products which are clean and environmentally friendly.
- The business world, and particularly the industrial sector, is the main variable affecting the supply of natural resources both for its own needs and for development general. Therefore, any damage or pollution of natural resources which occurs during the extraction, production, distribution and transportation process of a business will in turn threaten the sustainability of the business itself.
- The intensity with which environmental issues arise can be an environmental opportunity as well as a threat for the business world to create new fields of work related to environmental management, such as technologies for cleaning the air and water and for recycling
- International agreements such as those found in Agenda 21 Chapter 30 which states that business and industry must be full partner in managing the

environment and must consider that environmental management is the highest priority for the company and the determining factor in successful sustainable development

- The business world can become a supporting resource in providing funding or capital / loans for environmental activities and this will improve the image of companies, particularly those which are clean and environmentally friendly.

2)-1 KADIN (Indonesian Chamber of Commerce)

KADIN is the primary organization of all associations and business groups in Indonesia. KADIN is organized as a federation and functions as a forum for communication and consultation between Indonesian government and between Indonesian business people and foreign business people in the areas of trade, industry, and services. Kadin has branches (Kadinda) in all 27 provinces of Indonesia.

In order to increase environmental awareness in the business world as well as introduce business opportunities in the environmental area, Kadin has formed a special environmental bureau. In the current period the organizational structure includes a Kadin representative for the environment. Kadin has launched an activity which is meant to protect natural resources and prevent environmental damage.

2)-2 Indonesian Environmental Forum

WALHI is national forum of NGOs and nature groups who are concerned about environmental issues. Founded on 15 October 1998, WALHI aims to increase the participation of NGOs in environmental improvement and development, to channel the aspirations of NGO members in a national forum with the goal of creating a development process which improves the social welfare of the most vulnerable members of society without causing the degradation natural resources.

Members of WALHI are found in all provinces of Indonesian and are grouped in regional forums. Every three years, they meet in the National Environmental Meeting. This meeting elects a Presidium which represents all of Indonesia.

The Presidium also elects an executive director who manages routine WALHI activities.

The principal function of WALHI is to facilitate the exchange of information among NGOs, the community at large, and the government. WALHI's program includes :

- Development and management of an environmental information center.
- Human resources development through training, internships, seminars, and field work.

- Development of programs, campaigns and advocacy.
- Development of local, national, and international cooperative networks.
- Policy research and campaigns related to biodiversity conservation, eco-system management and environmental advocacy.
- Facilitate dialogue between the community, the government, universities and the private sector.

2)-3 Indonesian Center for Environmental Law (ICEL)

ICEL was established on July 19, 1993, as a private foundation. This non-profit organization maintains a strong commitment to saving the environment through an environment through an emphasis on environment law.

ICEL's goals are :

- Make an active contribution to the development of environmental law in Indonesia, both regional and international
- Improve the application of environmental law for the benefit of the Indonesian public
- Support efforts by the members of the community to bring environmental issues to court
- Disseminate information about legal principles and developments and changes in law in relation to sustainable development in Indonesia and other countries.

2)-4 Care International Indonesia

Care International is a non-profit agency supported by 11 member countries including UK, Canada, Australia, USA, France, Germany, Japan, Italy, Denmark, Austria, Norway. The member countries support programs in 45 developing countries.

Care International has worked in cooperation with the government of Indonesia since 1967. Care International's Indonesia headquarters are located in Jakarta with representative offices in Ujung Pandang, Pacitan, Mataram, and Maumere. Projects carried out in Indonesia include.

- Community self-funding for Drinking Water and Sanitation Facilities (1991-94)
- Rural Community Development in Sulawesi (1994-96)
- Dry lands/farming systems (1984-94)
- Provision of environmental education materials
- Assistance in preparation of Drinking Water Delivery and Sanitation for Low Income Groups Project. This project targets two million people in six provinces (1994-98).

3) Multinational Corporation

The Contribution of multinational corporation to EI refer to :

- Environmental management system and reporting at corporate level
- Environmental technology and processes (software) and
- Environmental product, equipment and instrument (hardware)

EI of the MNCS come through wholly owned companies, joint ventures, and through sub-contracting and transfer of technology (licensing) to national conglomerates or large public enterprises. As shown below in the Table : During 1967-1968 there were 3773 project with total investment 139.449.8 US \$

Table 12. Foreign Investment Projects (Extraction Projects) 1967-1998

Industrial Classification	Projects	Percentage (%)	Infestation (US \$ million)	Percentage
Food and Beverages	279	7,4	5.717,6	4,10
Chemicals	782	20,7	64.623,1	46,30
Textile & textile products	640	17,0	7.216,9	5,20
Pulp and papers	105	2,8	25.930,7	18,60
Wood and wood products	302	8,0	1.499,0	1,10
Non-metallic mineral products	155	4,1	7.120,7	5,10
Basic metals	125	3,3	8.458,7	6,10
Fabricated metal products	1.220	32,3	17.828,0	12,80
Pharmaceuticals	47	1,3	418,4	0,30
Others	118	3,1	636,7	0,40
Amount	3.773	100.0	139.449,8	100,00

Source : BKPM,Capital Investment Coordination Bureau

There are three categories of environmental market segments : air. Water and soil pollution, including industrial waste processing and disposal. EI represent a wide range of social, political and economic conditions, is critical to sustainable development and to

enabling nations to attain the Millennium Development Goals (MDGs) and to realize the Johannesburg Plan of Implementation by 2015. Effective and rational management and use of natural resources, growing economies fueled by expanding exports, and high quality of life for the people, are directly linked to a dynamic and technologically advanced EI like wide, constantly larger domestic and foreign investments, combined with R&D and transfer of technology, are essential requirements for a dynamic, market – driven EI.

In Indonesia, the international agencies and financial institutions along with the major donors have so far contributed significantly more than the MNCS, to the development of EI and more generally to sustainable management of national resources. The major donors active are Japan, US and Germany. They are the major exporters of pollution control product and technology with market share in 2001 of 26%, 21% and 12%.

4) International Environmental Cooperation

International cooperation is based on two premises. First, the environmental is a global issues and therefore its monitoring and preservation are the responsibility of the world community. Secondly, there is a growth in feelings of international solidarity in working together to solve environmental problems, particularly in the third world. In Indonesia, many environmental preservation activities are undertaken jointly among the government, communities and foreign parties. This cooperation takes the form not only of technical assistance and loans, but also practical cooperation which directly involves all parties.

Cooperation can be bilateral, regional or global, through international institution. Additionally, international banks also play a major role in handling environmental issues in Indonesia.

4)-1 Bilateral Cooperation

(1) Australia – Indonesia

Of all its development cooperation programs, the main sectors are education and training, health, infra structure and agriculture.

Australia's development cooperation policy is particularly concerned with women's issues, nature conservation and human rights.

The East Java Pollution Control Implementation Project – PCI is a project of AIDAB with Bapedal which began in December 1993 with AIDAB of aid approximately \$ 20 million.

The target of the project is to help the Indonesian government.

Institutional development ;

- Control of hazardous waste and coastal water quality ;
- Minimization of waste and waste processing practices ;
- Public awareness and participation ;
- Formation of trade and education relations ;
- Development of human resources through practical training in Indonesia and Australia.

(2) Japan - Indonesia

JICA is the Japan International Cooperation Agency, was established on 1 August 1974 and is an official representative of the Japanese Government with the main responsibility being increasing technical cooperation with development countries.

JICA activities in the environmental fields in Indonesia :

- Research on tropical rain forest
- Center for training in the fields of clean water and residential environmental sanitation
- Logging management practice in Madiun Central Java
- Pilot plantation project in Banakat, South Sumatera
- Forest study at Banakat, South Sumatera
- Feasibility study of the Industrial Growth Forest (HTI)

(3) United Kingdom – Indonesia

One of the seven main priorities of British Development Cooperation is to help developing countries deal with environmental problems. The program is managed by ODA (Overseas Development Agency) ODA has operated in Indonesia since 1964, and ODA support includes :

- Loan for increasing protection capacity, particularly for infrastructure development
- Technical assistance grants
- Support for NGOs such as VSO (Voluntary Service Overseas), OX form and AWB (Asian Wetland Bureau)
- Investment loans and shares in the government and community sectors
- Monitoring of ground water
- Biological research for biodiversity
- Initiative related to conservation of biodiversity

(4) Canada – Indonesia

Official Canadian aid is managed by the Canadian International Development Agency (CIDA). The main aim of Canadian development cooperation is to support the process of sustainable development in developing countries.

(5) U S A

USAID began work in Indonesia in 1950. In general USAID Indonesia cooperation covers the field of agriculture, conation, family planning, health, industry and infrastructure, food problem and disaster preparedness, and environment and population.

In the 1960s USAID focused its assistance on controlling the rate of population growth, infrastructure improvement and efforts to increase the role of private sector.

In addition to increasing economic capability, urban and regional development planning an increasing agricultural production, education and family planning, USAID also developed a natural resource management program.

Against a background of environmental damage and pollution due to development, USAID worked with Indonesia to find a solution its many environmental problems through the following programs :

- Natural Resources Management
- Sustainable Agriculture
- Biodiversity

4)-2 Regional Cooperation

(1) ASEAN Environmental Cooperation

ASEAN cooperation on the environmental began about two decades ago when the ASEAN Environment Programme (ASEP) was launched in 1978 At first this cooperation was carried out by the committee on science and Technology (COST) and the ASEAN Experts Group, ASEAN senior officials on the Environment (ASOEN) established at the June 1990. ASOEN was pioneered based on the Jakarta Resolution for Sustainable Development at the October 1987 ASEAN Ministerial Level Meeting and the Manila Declaration (1987) on ASEAN function cooperation. ASOEN took on the mission to develop systematic and integrated principles for sustainable development for the overall development process an to focus itself on implementation guidelines for protecting natural resources and the environment in ASEAN.

(2) EC-Asia

Cooperation between the EC and developing countries in Asia is becoming more intensive. This is because this region hopes to maintain rapid economic growth and is impressed with the EC's good economic growth, stable political conditions, good economic policies and technology mastery. The presence of the EC in Asia, particularly Southeast Asia, is for economic cooperation and also for purposes of technological innovation. The main EC interests in Asia are in transfer of technology, particularly development of agricultural production. Other interests are issue of population policy, telecommunications and energy production infrastructure in rural areas.

In the fields of the environment there are there important aspects of EC-Asia cooperation, i.e. :

- Care of tropical rain forest, particularly in Southeast Asia
- Dealing with the problem of deforestation due to population pressure, particularly in the Himalaya valley
- Limiting negative impacts of industrialization in densely populated areas.

The EC also provides support so that the war against the production and use of narcotics can continue and be intensified. The EC began cooperation with Indonesia in 1976, Through 1992 the EC has allocated 242.93 million ECU for :

- Development assistance, 224.20 million ECU (92.30%)
- Economic cooperation, 17.03 million ECU (7.03%)
- Humanitarian assistance, 1.70 million ECU (0.70%)

(3) Indonesia – UNDP

UNDP is the largest multilateral institution in the world which provides development cooperation assistance. UNDP has been in Indonesia since 1967, focusing its programs mainly on human resource development, institutional development and transfer of technology programs. For nearly three decades cooperation between UNDP and the government of Indonesia has stressed socioeconomic and human resource development. In line with Repelita V, the UNP areas of activity have aimed to develop socioeconomic capability in order to raise the standard of living.

In the 1994-1995 period, the final stage of the UNDP program was covered in the Fourth Country Programme (CP-4).

This program was also in line with the general orientation of Repelita V for increased standards of living, achieve economic balance, availability of food, diversification of agriculture, a strong infrastructure base, and develop the sectors of industry and export growth.

(4) UNEP

UNEP mobilizes program with UN agencies, government institutions, and NGOs, on a regional and international level. UNEP's focus is on issues of climate change, pollution, water, forest, resources, nonrenewable resources, industrial management with an environmental perspective, hazardous chemicals and development of international environmental law.

The UNEP center for industry and the Environment provides access to practical information and brings together industry and the government in the fields of environmentally-friendly industrial development through technical cooperation and information transfer.

Indonesia was one of 58 members of the UNEP Board of Leadership, a 4-year position, from 1 January 1990 to 31 December 1993. The UNEP mission in Indonesia is to :

- Support Indonesia in environmental education and training, public information, development and cooperation planning, environmental law and legal instruments.
- Development close cooperation with experts and decision-makers, scientists and funding agencies, industrialists and environmental activities, for the purpose of environmental preservation.
- Initiate funding support for seminars, workshop, studies and report-writing on sustainable development with an environmental perspective and studies of carbon dioxide and other green house gases and the impact on air temperature and agricultural output.

One important environmental effort of UNEP is the global Environment Facility program (GEF) aimed at supporting activities to protect the ozone layer and biodiversity, reduce global warming and protect international waters.

With GEF which is co-managed by UNDP and the World Bank, projects for the preservation of biodiversity in Indonesia will protect flora and fauna in Kerinci-Seblat National Park, and develop policy studies on environmental conservation.

4)-3 Asian Development Bank (ADB)

The main aim of ADB presence in Indonesia is the increase Indonesia's competitive advantage in the international world by developing capability in the sectors of infrastructure, human resource management and by decreasing the level of environmental damage. In 1993 ADB has development signed 190 projects worth US \$95 million.

During 1991 ADB provided US\$ 340.000 in grants to Indonesia (through the Ministry of Mines and Energy) to improve environmental impact analysis management and improve

the Ministry's capability in analyzing environmental impact. ADB also provide technical assistance for a project on biodiversity conservation. Technical cooperation in the amount of US\$597,000 will be funded by the Japan Special Fund to develop a tropical rainforest ecosystem conservation and biodiversity project in seven provinces in Indonesia.

The ADB provide financing for development project the major project are (Schmidt 1999; ADB 2003) : capacity building for reduction of loses in water supply, water pollution project, Irrigation project, coral reef, rehabilitation and management, central Sulawesi Integrated Area Development and Conversation. Marine and Coastal Resources Management and conversation and Clean Vehicle Fuel for Blue Skies with total amount 178,6 million US \$.

4)-4 World Bank Indonesia

The Work Bank has been in Indonesia for over 20 year. Until 30 September 1992 Indonesia had received 40 credits from IA with a total value of US\$901.6 million and 170 IBRD loans with a total value of US\$17,047.54. Its first priority is the agriculture sector.

Over a third of IBRD assistance has been for agriculture with the aim of assisting the government to increase rice production through investment in irrigation, fertilizer distribution, research and agricultural development.

Secondly, assistance has been given for development of electricity and energy. Investment in this field is intended to help balance the high demand for energy by the industrial sector with consumer demand in both rural and urban areas. This assistance supports the development of non-oil and gas sectors and helps ensure that Indonesia uses its energy resource wisely.

One environmental management program funded by the World Bank (IBRD) is the Integrated Pest management Program (IPB) which began in 1993. This US\$32 million program is training approximately 800.000 farmers to apply IPM. One aim of the IPM program is to reduce the dangers of hazardous waste by reducing the production and use pesticides.

The world Bank has, invested US 80 million into a project designed to improve the potable water quality, easy access to the water supply and sanitation services (Unternehmens Beratung, 1998). This investment also aims to implements a program that will increase people's awareness in health and hygiene.

6. Recommendations

1) General Recommendation

Strengthening Environmental Management

1. Expand Ministry of Environment mandate to review environmental implications of macroeconomic and sectoral policies.
2. Implement the revised Environmental Impact Assessment regulations to make procedures more efficient and result more effective.
3. Clarify the legal mandate for pollution monitoring and control, including establishment of a permit system and the introduction of direct charges on industrial effluents/emissions by provincial, municipal and river basin authorities.
4. Continue to explore and support “alternative dispute resolution” mechanisms and other means to resolve conflict over natural resources and environmental degradation.
5. Continue strengthening Ministry of Environmental and other central, provincial and local agencies responsible for environmental planning and management and pollution monitoring and control.
6. Strengthen policy analysis capacity available to Ministry of Environment for review of environmental effects of proposed macroeconomic and sectoral policies.
7. Strengthen Environmental Impact Assessment implementation, including Review Commissions and private sector capacity, and promote the involvement of local community group and NGOs in the \ Environmental Impact Assessment process.
8. Expand the quality, timeliness and availability of data on environmental conditions and trends.
9. Promote the preparation of sectoral EIAs, and strengthen the capacity of central agencies to prepare and implement sectoral action plans for addressing environmental impacts.
10. Partnerships should be formed between public and private stakeholder interested in environmental protection. The partnerships should include representatives in government agencies, policy maker, companies (inside and outside the environmental industry)
11. Establish a clearing house for environmental technology and services that is ready accessible and user friendly.
12. Reduce the multiplicity of agencies and bureaucratic levels involved in the approval in the approval / licensing of el initiative and in administering and monitoring compliance with standards and regulations.

2) Water Resources

1. Adopt the Integrated River Basin Development approach for the management of surface and groundwater resources, especially for the critical watersheds on Java.
2. Clarify the legal provisions for a permit system and the charging of effluent fees by provincial or river basin authorities.
3. Incorporate rural water supply and sanitation improvements more systematically in targeted poverty programs.
4. Provide for community participation (including women's group) in the design and implementation of projects to improve the availability of safe water.
5. Evaluate the efficiency implications of existing policies and incentives for the allocation and use of surface and groundwater.
6. Strengthen the capacity and authority of the agencies responsible for the sustainable use of groundwater.
7. Develop more effective mechanisms for cross-sectoral and inter-agency coordination for water resources management, through the formulation of provincial and national "Water Boards".
8. Strengthen the collection, analysis and monitoring of data on water pollution in rivers, streams and aquifers, including measure of the efficiency of water use in irrigation, municipal and industrial uses.
9. Strengthen the institutional capacity of GOI agencies involved in rural water supply and sanitation, and cooperative efforts with NGOs and the private sector.

3) Urban Environmental Management

1. Develop spatial plans to guide urban growth as a participatory process to ensure consensus on priorities and a "shared vision" of the future spatial development.
2. Ensure community participation in defining urban service needs, and involve project beneficiaries in project design.
3. Promote constructive partnerships for improving urban environmental quality, such as recent NGO initiatives to support recycling.
4. Continue efforts to strengthen the capacity of municipal government agencies to plan and implement development projects, as a key element in the devolution of additional authority and responsibility.
5. Strengthen the capacity for urban sector environmental planning and management, including the design and implementation of "strategic structural plans", the development of policies and incentives for encouraging environmentally responsible behavior by firms, households and individuals and improve mechanisms for inter-agency coordination.
6. Strengthen the collection and analysis of data on ambient quality of water and air in urban areas, and the extent of compliance with GOI standards.

a. Urban Water Supply

1. Formulate a regulatory framework for the Municipal Water Supply that would strengthen their structure and increase their managerial autonomy.
2. Provide for community participation (including women's groups) in the design and implementation of projects to improve the availability of safe water.
3. Improve the quality of initial construction and pay increased attention to O&M needs.
4. Strengthen the capacity of Municipal Water supply to implement the needed investments, improve the reliability of supply and reduce water losses in urban areas.
5. Strengthen the collection and analysis of data on access to safe water and sanitation and surface and groundwater contamination.

b. Sewerage, Sanitation and Solid Waste

1. Determine institutional arrangements for development of public sewerage systems and strengthen the capacity of the selected agency for planning, implementation and operations and maintenance.
2. Improve the management of existing landfills, especially those located in environmentally vulnerable areas.
3. Strengthen the collection and analysis of data on volumes of solid waste collected and recycled, and toxic and hazardous wastes.
4. Explore the least cost options for the expansion of sewerage and sanitation services, including in situ and off-site approaches.
5. Evaluate strategies for financing and cost recovery arrangements for the expansion of sewerage and sanitation systems.
6. Recover the full costs for the provision of sewerage, sanitation and solid waste management services from industrial and commercial developments, and increase cost-recovery from households to the extent feasible.
7. Take advantage of the potential for community self help in the design and implementation of sewerage, sanitation and waste management projects.
8. Encourage greater involvement of private operators in solid and hazardous waste collection and disposal, but improve management and regulation of landfills and ensure safe operation of hazardous waste treatment facilities.
9. Develop a long term plan for the siting of future landfills.

c. Urban Transport and Vehicle Emissions

1. Coordinate development of transport networks, employment centers and residential areas so as to reduce the need for long distance commuting and encourage non-motorized transport, and improve alternative forms of communications.
2. Improve the quality and efficiency of urban bus systems, relying as much as possible on private sector participation for both investment and management skills.
3. Develop an education and awareness program, including published data on ambient air quality trends to strengthen the consensus for needed policy measures.
4. Review technical options for vehicles and fuels, including engine design and emissions standards, CNG and unleaded gasoline.
5. Develop carefully designed program to phase out two-stroke motorcycle engines.
6. Evaluate the feasibility of a "mass transit" system for Jakarta, including issues of financing and cost recovery.
7. Review prospects for congestion pricing and other market-based incentives for reducing reliance on private vehicles and encouraging public transport.
8. Consider the introduction of pollution-based fuel taxes to promote the use of cleaner fuels, such as unleaded gasoline and CNG.
9. Introduce vehicle emissions inspection for high use ("fleet") vehicles in key urban centers wherever feasible.

4) Energy Resources

1. Implement a program to facilitate the transfer and application of energy efficient technology and practices in the industrial sector.
2. Implement a demand side management program to increase the efficiency of electricity use in all sectors.
3. Consider the feasibility of introducing pollution-based fuel taxes that reflect the social damage of energy-related pollution.
4. Review the policy and incentives framework for expanding the use of renewable energy sources in rural areas.
5. Evaluate the impacts of air pollution, including acid rain, on human health, construction materials and natural ecosystems.
6. Evaluate the fuel efficiency in the transport sector and its implications for air pollution.
7. Strengthen the institutional capacity for the promotion of energy efficiency and expanded use of renewable energy resources (especially non-traditional resources for use in rural electrification).

8. Strengthen the collection and analysis of data on energy resources and consumption, including measures of the efficiency of energy production and use.

5) Industrial Pollution Control

1. Clarify the legal mandate for pollution control, and strengthen the institutional capacity to implement pollution control strategies, including laboratories, pollution monitoring and control authorities, and the legal system, including alternative procedures for resolving disputes.
2. Establish a capacity for supporting “pollution prevention pays” campaigns, including environmental efficiency audits and industry-specific technical assistance.
3. Finalize the draft regulations on the storage, transport and treatment of hazardous waste, and develop the institutional capacity for effective regulation and emergency response.
4. Strengthen the AMDAL capacity of key government agencies responsible for industrial sector investment approvals and the integration of waste minimization, “clean technology” and cost-effective pollution control measures into industrial sector policy.
5. Review the legal and administrative issues involved in the introduction of direct charge on industrial water and air pollution, including the possibility of “earmarking” those charge to fund pollution monitoring and control programs and a program of positive incentives for waste reduction and treatment-especially for smaller firms.
6. Develop more precise estimates of the current and future level of toxic and hazardous waste generated in specific areas as a key element in planning for waste treatment facilities.
7. Encourage private sector development of industrial estates to improve the location of industrial firms and to take advantage of economies of scale in the provision of waste-treatment facilities.
8. Encourage the adoption of more responsible attitudes to sustainable development by the business community, including a “waste minimization / clean technology” approach to process innovation as an element of competitive business development strategy for the longer term.

References

Asian Development Bank; 1994, Climate in Asia. Indonesia Country Report on Socio Economic Impacts of Climate Change and a National Response Strategy. Manila.

BPS 1997. Statistic Year Book of Indonesia 1997

BPS. 1999. Statistic Year Book of Indonesia 1999

BPS. 2000. Statistic Year Book of Indonesia 2000

Jeffrey R. Vincend, et.al., 2002. Bulletin of Indonesia Economic Studies, Vol : 38, No. 1.

LITBI, 2002. Profile of the potential & reliable business partners in Indonesia.

Ministry of Environment, 1998. Indonesia Initial National Communication : Under the UNFCCC, Jakarta.

National Development Planning Agency, 1999. Planning for Fire Prevention and Drought Management Project. Volume 2. Causes, Extent, Impact and Cost of 1997/98 Fires and Drought. Asian Development Bank TA2999-INO. Jakarta

National Development Planning Agency, 1993. Biodiversity Action Plan for Indonesia. Ministry of National Development Planning/National Development Planning Agency. Jakarta

Paving the way sustainable development in Indonesia, 2003. National Committee. The Forth Preparatory Committee Meeting (Ministerial level for world summit on sustainable development).

State Ministry of Environment National, 1997, Agenda 21 Indonesia, Natural Strategy for Sustainable Development State Ministry for Environment, Republic of Indonesia and United Nation of Development Program.

State Ministry of Environment National, 1997. The Indonesia Environmental Almanac for Environment. Republic of Indonesia. The Environmental Impact management Agency (BAPEDAL), The Kalpa With Foundation

State Ministry of Environment National, 1999. Indonesia The First National Communication under the United National Framework Convention on Climate Change State Ministry of Environment.

- State Ministry of Environment National, 2002.** Paving the way for Sustainable Development in Indonesia. National Committee The Fourth Preparatory Committee Meeting. Ministerial level for the World Summit on Sustainable Development.
- State Ministry of Environment, 1998.** First National Communication. Jakarta. State Ministry of Environment.
- State Ministry of Environment, 1999.** Indonesia Vulnerability and Adaptation to Climate Change. Jakarta, State Ministry of Environment.
- State Ministry of Environment, 2001.** National Strategy Study on Clean Development Mechanism. Jakarta. State Ministry of Environment.
- UNDP/World Bank/BAPPENAS, 1995.** Water Supply and Sanitation Sector Review, Strategy, and Action Plan Preparation.
- Walton, Thomas E., Priya Mather, Toru Uemachi, and et.al. 2003.** Indonesia Environmental Monitor 2003, Special Focus : Reducing Pollution. Washington, D.C., Jakarta : The World Bank
- World Bank, 1993,** Asia Environmental Strategy (Draft). Environmental and Natural Resource Division, Asia Technical Department. Washington DC.
- World Bank, 1994.** Indonesia : Environmental and Development.
- Zuhal, 1995.** Ketenagalistrikan Indonesia “ Ganesa Prima, Jakarta”.

Abbreviations

PAM	Perusahaan Air Minum Water Utility Company
PDAM	Perusahaan Daerah Air Minum Regional Water Utility
PROPENAS	Program Perencanaan Nasional Indonesia National Planning Program
BAPPENAS	Badan Perencanaan Pembangunan Nasional National Planning Agency
PPLH	Pengawasan dan Pengembangan Lingkungan Hidup Office of the State Minister for the Supervision of the Development and the Environment
MLH	Menteri Lingkungan Hidup Ministry of Environment
KLH	Kependudukan dan Lingkungan Hidup Population and Environment
WALHI	Wahana Lingkungan Hidup Indonesia Indonesian Environmental Forum
YLKI	Yayasan Lembaga Konsumen Indonesia Consumer Association
PKK	Pendidikan Kesejahteraan Keluarga Family Welfare and Education
PROKASIH	Program Kali Bersih Clean River Program
BAPEDALDA	Badan Pengendalian Dampak Lingkungan Daerah City Environmental Impact Management Agency
POLDA	Polisi Daerah City Police
REPELITA	Rencana Pembangunan Lima Tahun Indonesia Five Year Development Plan
KADIN	Kamar Dagang dan Industri Indonesia Chamber of Commerce
ITB	Institut Teknologi Bandung Bandung Institut of Technology
BKPM	Badan Koordinasi Penanaman Modal Capital Investment Coordination Bureau