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THE RELEVANCE OF ENVIRONMENTAL PROTECTION IN INDONESIA

I
INTRODUCTION

Proponents of environmental protection policy in less developed countries must answer adversaries whose arguments are as strong as, if not stronger than, those confronting environmentalists in the industrialized countries. Their critics charge that spending scarce public resources on environmental protection would retard economic growth and would hamper efforts to increase agricultural production and to provide miniminally adequate housing, health care, and education for the impoverished majority of the population. Policy makers in less developed countries are unwilling to forego short-term gains in order to obtain the less certain long-term benefits promised by environmentalists. Three factors help to explain this reluctance. First, confidence in national economic and political institutions is weak, making any long-run undertaking appear risky. A short-term gain mentality prevails. Second, environmental goals are not of pressing importance to the public and therefore lack political support. Third, the inefficiency and unreliability of existing legal and administrative machinery cause policy makers to doubt the utility of instituting new, unfamiliar, and complex programs to deal with environmental problems.

The Republic of Indonesia is a case in point. Since President Soeharto's accession to power in 1965-66, economists in the National Development Planning Agency and the Ministry of Finance have dominated the country's development planning. Many of these foreign-trained "technocrats" dismiss environmental concerns as irrelevant to the top priority issues of food, infrastructure, and procurement of investment capital. Thus, the Foreign Investment Coordinating Board represents a powerful source of opposition to environmental controls. Over the last eight years, its effort to enhance

1. "Technocrat," or rather "teknokrat," is the Indonesian term for these economists. See P. Polomka, INDONESIA SINCE SUKARNO 105-08 (1971).

2. The principal infrastructure project areas in the First Five-Year Development Plan include road repair and rehabilitation, railways, shipping, air communications, postal and telecommunication services, and tourism.
the attractiveness of investment in the extraction of the country’s abundant natural resources through economic incentives and a carefully cultivated image of political stability, have met with substantial success. Production from the largely foreign-operated oil fields on Sumatra and the north coast of the main island of Java is reported to have grown from $330 million worth in 1968 to $552 million in 1971. The value of lumber exports from the foreign timber concessions on the outlying islands of Kalimantan (Indonesian Borneo) and Sumatra rose from $3.6 million in 1966 to $90 million in 1970 to $150 million in 1971.8 The Foreign Investment Coordinating Board fears that environmental controls could stem the flow of investment funds into Indonesia. That the Board was reportedly influential enough to prevent discussion of environmental problems at the national level until 1970 gives an indication of its power.

Should the government fall too far short of its economic growth objectives, many observers fear serious political consequences. With a per capita income of less than $100 per year, Indonesia is among the poorest countries in Asia. Java in particular is a political tinderbox. With some eighty million people packed into an area about the size of the state of Louisiana, population density on Java exceeds 1,500 people per square mile, a figure matched only by Bangladesh.4 As early as 1924, Dutch studies showed that rural living standards on Java were in a state of gradual decline, and there is no indication that the trend has since been reversed.5 With vivid memories of the mass violence that followed the attempted coup of September 30, 1965,6 the Jakarta government is acutely aware of Java’s political volatility.

Among the Indonesian public the conservationist constituency is very small, consisting mainly of a few university faculty and natural scientists. For the great majority of Indonesians, the environmentalists’ concern with complex interdependencies and long-term consequences appears irrelevant to their lives. The short-term gain mentality referred to above is pervasive. In a country which during the last


25 years has suffered two severe currency devaluations, an inflation rate that reached 650 percent, and a traumatic change of government,\(^7\) confidence in the future of the economy and the political order, a prerequisite for long-term undertakings such as environmental protection programs, needs time to grow.

In spite of the economic and political considerations outlined above, Indonesia has begun to adopt legal measures to maintain and restore environmental quality. Since 1972, when an Indonesian delegation attended the United Nations Conference on the Human Environment,\(^8\) both the national and Jakarta metropolitan governments have taken formal action regarding the environment. At the national level, the People's Consultative Assembly (Majelis Permusyawaratan Rak-yat) stipulated in 1973 that "in the implementation of development, Indonesia's natural resources must be used in a rational manner. Exploitation of natural resources must be such that the human environment is not damaged . . . and future generations are accounted for."\(^9\)

The President in a 1972 decree\(^10\) established an interdepartmental Formulation Committee (Panitya Perumus) to draft a working program for "environmental development."\(^11\) Lemigas, the state Oil and Gas Institute, has established an ecological research program. In the capital, a new general anti-pollution regulation was promulgated as early as 1971.\(^12\) The following year, the Jakarta city government established the Urban and Environmental Research Center (Pusat Penelitian Masalah Perkotaan dan Lingkungan),\(^13\) among whose responsibilities is the elaboration of the city's general anti-pollution law.

Institution of environmental controls in Indonesia faces impediments at two levels. The next section will discuss problems at the poli-

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\(^10\) Decree of the President on Oct. 17, 1972, Concerning the Formulation Committee, [1972] Number 60.

\(^11\) Rachwartono, *supra* note 9, at 15-23.

\(^12\) Regulation of the Jakarta Capital City on Aug. 31, 1971, Concerning Air, Water, and Off-shore Pollution, [1971] Number 12.

\(^13\) Decision of the Governor of the Jakarta Capital Region on July 14, 1972, Concerning the Establishment of the Urban and Environmental Research Center, [1972] Number Db. 12/29/24/72.
cy level—specifically, whether developmental and environmental goals are compatible. Potential inexpensive solutions using labor-intensive programs will be explored. Water pollution problems in the Jakarta Special Capital Region will be examined as an illustration, in line with the Jakarta environmental office's designation of water as the city's highest environmental priority. The following section then examines how law can shape the context in which governmental decisions regarding the environment are made in Indonesia. A major theme to be developed is that the diversity of the Indonesian economy, which ranges from traditional family production units to modern industrial corporations, requires a similarly diverse set of environmental regulatory standards.

II

THE POLICY ISSUES: ARE DEVELOPMENTAL AND ENVIRONMENTAL GOALS COMPATIBLE?

In order to persuade policy makers of the legitimacy and urgency of measures to protect the environment, it must be demonstrated that a healthy environment is not a luxury only developed nations can afford. Enumerating the costs of environmental neglect is not sufficient. Environmental goals must be shown to facilitate, or at least to be consistent with, the achievement of pre-existing developmental objectives. In Indonesia, the interrelationship of development and sound environmental policy is beginning to be assessed.

From 1966 to 1973, the policies of the Soeharto government were concerned almost exclusively with economic growth and stabilization. Initially, greatest emphasis was given to curtailment of inflation; later, in 1969, with the launching of the First Five-Year Development Plan, Pelita I, the main objective became growth in output in the specified sectors. Briefly, the strategy of Pelita I was to direct a large proportion of the development budget into agriculture, aiming

14. Interviews with Special Capital Region government officials, in Jakarta, July 1973. Other frequently discussed environmental problems in Indonesia which have been accorded high priority by the Paniya Perums are marine pollution and the effects of forest exploitation. With regard to marine pollution, there is considerable concern about the effects of oil spills and unregulated dumping from ships in Indonesian waters and about depletion of sea fisheries, particularly in the Moluccas and the Bagan Siapiapi area on the east coast of Sumatra. Recent discussion of deforestation problems has centered on the foreign timber concessions in Kalimantan (Indonesian Borneo). For a general discussion of environmental and resource management problems in Southeast Asia see G. Conway & J. Romm, Ecology and Resource Development in Southeast Asia (1973) (Ford Foundation Office for S.E. Asia).

at self-sufficiency in rice by 1974,\textsuperscript{16} to rehabilitate the long-neglected infrastructure to pre-World War II levels,\textsuperscript{17} and to facilitate foreign investment as a means of expanding the country's capital and technological base.\textsuperscript{18}

As Pelita I neared completion in the early months of 1974, however, pressure on the government to devote more attention to the social and distributive consequences of economic growth began to mount. Students demonstrating in Jakarta issued demands that “development strategy should guarantee balanced growth in the economic, political and social sectors, equal distribution of the products of development and the growth of indigenous entrepreneurs.”\textsuperscript{19} In mid-January, riots involving large numbers of the poor and unemployed, ostensibly protesting Japanese foreign investment, brought home the need for more jobs. Finally, critics pointed out the negative consequences of failure to consider environmental factors in development projects. For instance, failure to curb deforestation upstream of the immense Jatiluhur dam in West Java has aggravated sedimentation, which has cut the dam's estimated useful life from sixty to less than ten years.\textsuperscript{20}

A close examination of the problem of water pollution in the Jakarta watershed should cast more light on the compatibility of pollution-preventive measures and development objectives. The causes of pollution in the watershed include population and land use distribution, industrial waste disposal, sewage disposal, and pesticides. Following a description of the causes, possible solutions will be discussed.

\textit{A. The Physical Setting}

The Ciliwung and other streams that empty into Jakarta Bay have their origins in the mountain range running across the middle of West Java. When Batavia\textsuperscript{21} was founded in 1619, the surrounding mountains and the sloping plain south of the town were heavily forested and sparsely populated. With the introduction of wet-rice cultivation and plantations in the environs of Batavia during the sev-

\textsuperscript{16.} Id. at 3-6.
\textsuperscript{17.} Id. at 7-12.
\textsuperscript{18.} Law Concerning Basic Foreign Investment, [1967] Number 1.
\textsuperscript{19.} Quoted in translation from Deklarasi Mahasiswa Indonesia (Indonesian Students' Declaration), a set of six demands by the student senates of fifteen universities in Jakarta presented to President Soeharto on December 30, 1973; reprinted in PANJI MASYARAKAT (BANNER OF THE PEOPLE), January 15, 1974, at 41.
\textsuperscript{20.} For discussion of the environmental and social costs and benefits attaching to alternative types of dams in Indonesia, particularly Java, see O. Soemarwoto, \textit{Pendekatan Ekosistim Terhadap Masalah Waduk (The Ecosystem Approach to the Problem of Dams)}, 3 PRISMA, Feb. 1974, at 25-37.
\textsuperscript{21.} Batavia was the Dutch name for Jakarta.
enteenth, eighteenth, and nineteenth centuries, natural forest cover was progressively removed. The effects of deforestation were quickly felt in the town. Natural variations in dry- and rainy-season flows became more extreme, so that the yearly cycle became one of heavy flooding during the rainy season followed by sharply reduced dry season flows which contributed to the spread of debilitating and often fatal diseases. In the late nineteenth century, heavy sedimentation at the harbor at Pasar Ikan necessitated construction of a new harbor at Tanjung Priok.

After the ouster of the Dutch in 1942, the last vestiges of controls on deforestation in the upper watershed disappeared. Encroachments by local villagers on the Dutch-established forest preserves, which up to then had been closely guarded by special forest police, were ignored and in some places encouraged by an indifferent Japanese occupation government. Since independence, the Indonesian government has been unable to prevent the opening of marginal farm land on the upper slopes of the watershed by poor, land-hungry villagers. The resulting heavy erosion causes siltation of irrigation channels, which in turn reduces irrigated acreage and impedes rice intensification efforts. Annual floods in the Grogol and Rawamangun districts of Jakarta cause extensive damage, while the meager dry season flows result in nuisance conditions and health hazards.

The greater part of the area that drains into Jakarta Bay is planted in wet rice. Since the advent of BIMAS, the government’s program for spreading the technology of the Green Revolution, rice farmers’ use of chemical fertilizers and pesticides has increased at a rapid rate. Large amounts of these fertilizers and pesticides wash into the rivers. One official has estimated that about 25 percent of all


23. Id. at 305; see also Stockdale, Sketches, Civil and Military, of the Island of Java 128-34, 143-45 (2d ed. 1812).


25. Id. at 20. During the last year of the occupation alone, an estimated one-sixth of Java’s small remaining forest area was wantonly stripped away. Id.


27. Bimbingan Masyarakat, meaning Guidance of the People.

28. Katili, supra note 3. Though figures for the Jakarta watershed are not available, the government’s estimate that demand for nitrogen fertilizers increased by 750,000 tons from 1967-68 to 1972-73 gives an idea of the magnitude of fertilizer use increments. Id.
DDT used for agricultural and domestic purposes is discharged into rivers and ends up in the Java Sea. Though definite findings are not available, it has been charged that the persistent toxins in the pesticides have caused diminution of yields from the inland fisheries, an important source of protein in Java. As pests develop resistance to pesticides, new strains of pests appear, which, together with other elements of the Green Revolution technology, greatly reduce the stability of wet-rice ecosystems. The situation is worsened by the tendency of many farmers to overuse pesticides. As harvest time approaches, pesticides are in many places applied as often as once a day.

As they approach Jakarta, the rivers pick up additional wastes from the new, largely foreign-owned industries that line the Jakarta-Bogor road and cluster in the Pulo Gadung industrial estate. In the absence of industrial effluent standards, determination of the level of waste treatment in these plants, which include dairy, pharmaceutical, and rubber-processing enterprises, has been left largely to the companies themselves and their perception of the limits of public tolerance. On occasion that tolerance has been exceeded, as in the 1972 dry season, when the foul-smelling effluent from the Frisian Flag dairy plant brought protests from neighboring residents.

By far the greatest part of the rivers' waste load derives from Jakarta itself, where a population approaching six million tries to make do with a system of canals and drainage conduits built over 35 years ago to serve a population less than a tenth as large as today's.


30. Land fisheries provide about 40 percent of total annual fish catches in Indonesia, and most land fisheries are on Java, as reported in A. Sismatadji Hardja, SUMMARY REPORT ON POLLUTION CONTROL IN INDONESIA 7, March 1972 (Ministry of Public Works and Power, Jakarta).

31. To be sure, one may say that rice monoculture destroys the natural ecosystem. But rice culture as practiced in Java and throughout SE Asia has been unusually heterogeneous in that each small region, each valley, has traditionally had its own slightly different rice strains, especially suited to conditions in that district. By introducing the single IR-8 strain, this healthy heterogeneity is wiped out, and if one area is hit by a pest, the whole region using that strain is more vulnerable to the pest than it was previously.


33. Confidential interview with officials of the Special Capital Region government, July 1973, in Jakarta.

34. According to 1972 figures, Jakarta produces 7,400 cubic meters of solid waste per day, and up to 11,000 cubic meters during the wet and fruit seasons, approximately 76.4 percent of which comes from households; 14.4 percent from markets; and the rest from industry, offices, hotels, and animals. As oil revenues and the fruits of development make some sectors of the population more affluent, the volume of garbage
Official estimates indicate that less than 40 percent of household and market wastes are disposed of in an orderly manner, i.e., by incineration or by removal to an open dump or a sanitary landfill site. Much of the remaining 60 percent is discharged into rivers and canals.

The high nutrient levels resulting from discharge of untreated sewage can be beneficial up to a point, in that they stimulate the rapid growth of milkfish and Tilapia in the tambak fishponds along the coast and of hydroponically-grown vegetables such as kangkung and sweet potatoes. In several Jakarta canals, however, excessive nutrient loads have permitted overgrowth of waterweed, which clogs the canals and then decays, reducing the dissolved oxygen concentration below life-sustaining levels for fish and other aquatic animals. During the dry season, biological oxygen demand levels as high as 200 have been recorded in the Cideng River. During the rainy season, waterweed and other debris cover river bottoms and impede flows, thus worsening the floods.

A minority of Jakarta residents is served by the pre-World War II pipe system or buys tins of water pilfered from the pipes and sold by water peddlers (tukang air). Most, however, depend on private wells for household water. Many wells are subject to contamination from septic tanks placed too near the wells or from seepage from drainage conduits. Though reliable statistics are not available, it appears that ground water contamination is increasing for a large proportion of Jakarta households. Also, growing demand has reportedly lowered water table levels up to 20 meters over the last several decades, forcing residents to deepen their wells. As a result, serious subsidence and salt water intrusion problems have been reported, particularly in the northern neighborhoods of the city.

Finally, the waters of Jakarta Bay exhibit the cumulative effects of the all but uncontrolled deforestation and disposal of wastes into the rivers of the Jakarta watershed. B.O.D. levels in excess of 100 can be expected to increase exponentially. Likewise, as "modernization" replaces leaves and paper wrappings with plastics, tin cans, and the like, the proportion of non-biodegradable wastes and the difficulty of disposal will also increase. SASMITADIHARDJI, supra note 30, at 3-4; WIROSANDJOJO, Pencemaran Lingkungan di Daerah Padat Penduduk (Environmental Pollution in Densely Populated Areas), 3 PRISMA, Feb. 1974, at 41.

35. WIROSANDJOJO, supra note 34, at 41.
36. Id. at 42. Biological oxygen demand, or BOD, is an approximation of the concentration of putrescible organic compounds in water, obtained by measuring the amount of oxygen required by microorganisms to degrade such compounds. Measured in units of milligrams/liter, a relatively pristine aquatic system will have a BOD of around 5. Sewage and some industrial wastes characteristically display high BOD. C. WARREN, BIOLOGY AND WATER POLLUTION CONTROL 59 (1971); T. TEBBUTT, PRINCIPLES OF WATER QUALITY CONTROL 44-50 (1971).
37. Katili, supra note 3.
38. WIROSANDJOJO, supra note 34, at 43.
have been recorded at the Bina Ria water recreation area on Jakarta’s north coast. The coral communities of Pulau Seribu are being smothered by the flood of silt coming from the land. Due to a combination of land-based pollutants, oil spills, and harmful fishing practices, fish catches are dropping. Some species have disappeared. Most graphically, a stream of rubber cuttings from a Jakarta sandal factory can be observed floating past the fishing platforms that dot the bay, making its way out to sea.

B. Population and Land Use Distribution

A major problem evident from the above physical description is the pattern of population and land use distribution in the Jakarta watershed. At one end of the river system, economically marginal farmers destroy ecologically vital forest cover, causing siltation damage the length of the rivers. At the other end, Jakarta’s overpopulation creates a concentration of wastes in the streams that flow through the city, and in Jakarta Bay, grossly in excess of those waters’ natural absorptive capacities.

In order to restore ecological balance, patterns of land use in the upper watershed must be changed and concentration of wastes in the Jakarta area reduced. An extensive reforestation program during the agricultural slack season employing local people, who would otherwise be further exploiting the forests of the upper watershed or increasing Jakarta’s unskilled migrant labor force, could help to alter land use patterns. Such a program would offer the advantages of labor intensity, employment for excess rural labor, and reduction of rural-urban migration. In economic terms, costs would be low (competitive rural wages are about Rp.150, or 40 cents per day, less than a third of unskilled rates in Jakarta); and benefits, in terms of reduced flood damage and larger rice harvests due to increased irrigation capacity, would be great. The cost of inaction is the greatly re-

40. Author’s personal observation at Jakarta, July 1973.
41. For a discussion of the appropriateness of labor-intensive and capital-intensive technologies for developing countries see C. Kindleberger, Economic Development 249-68 (2d ed. 1965) [hereinafter cited as Kindleberger].
42. Taking marginal upper slope land out of cultivation could be expected to cause a temporary drop in overall food production in the watershed. It would take some time for the forests to re-establish themselves in the upper watershed and for the resulting increases in the efficiency of downstream irrigation and in the rice fields to become evident. It is assumed, however, that the increased rice yields resulting from improved irrigation will exceed the yields of the upper slopes and that the economic value of the increment in rice production will exceed that of the subsistence cassava grown on the upper slopes.
duced productive potential of downstream irrigation works.43

At the other end of the river system, in the Jakarta Special Capital District, land use controls can cluster and segregate sources of industrial waste to facilitate treatment and reduce environmental damage. Both the grouping of new industry in industrial parks according to the 1965-1985 Jakarta Master Plan, and the planned relocation of the more noxious industries away from the major canals, work in this direction. If strictly enforced, zoning controls can protect environmentally and economically desirable uses, such as truck gardening in the Pasar Minggu district and tidal fisheries.

However, their applicability is likely to be limited to foreign, state, and the few large private domestic industries. Many domestic industries are already hard pressed to meet the competition of the heavily capitalized and technologically more advanced foreign firms which have recently established themselves in Indonesia. Most would not survive if forced to relocate or to upgrade existing pollution-causing machinery and processes, and this would be politically unacceptable. The arguments for allowing domestic industries to be exempted from zoning and other environment-related controls will be discussed below.44

Another strategy of the Jakarta Special Capital District government is to slow population growth through family planning and through the “closed city” policy, whereby unemployed migrants are denied local identification cards and shipped out of the city. The effectiveness of the latter policy is doubtful, since many, if not most, of the deported migrants quickly make their way back to the city. Moreover, the policy tends to restrict income and mobility opportunities, which are unique to Jakarta, to the educated middle and upper classes, and thus to work against redistributive goals.

Unless the city government is prepared to use Draconian measures against illegal migrants,45 to devote substantial resources to policing them, and to somehow increase dramatically the probity and efficiency of its officials and police force, its efforts to restrict migration

43. Another method of preventing erosion, in addition to reforestation, is the construction of large numbers of small rock dams all along the small streams that intersect the wet-rice terraces. These could be built by individual farmers. They would inhibit flooding and would retain silt, which could be dredged and applied as fertilizer. The Chinese have obtained substantial benefits from such small dams. See Whitney, Ecology and Environmental Control, in CHINA'S DEVELOPMENTAL EXPERIENCE 95 et seq. (M. Oksenberg ed. 1973).

44. See text accompanying note 68 infra.

45. The measures currently employed to demonstrate the Jakarta government's displeasure at the presence of unskilled unemployed migrants in the city are quite harsh. See J. Williams, Sadikin Closes Jakarta, INSIGHT, Feb. 29, 1973, at 16.
and thereby to keep a lid on the volume of wastes and on other urban problems can have only limited success. This is due to the differential between living standards and life opportunities in the rural and urban areas of Java. In the case of Jakarta, the differential applies not only in relation to the countryside, but also in relation to the other urban centers of the archipelago, from which thousands of skilled, educated people migrate each year seeking greater opportunity in the capital. A broad policy aimed at increasing educational and job opportunities in the provincial capitals while decreasing the rural-urban opportunity gap could ease many of Jakarta's problems, among them its excessive concentration of wastes. It would take some time before the environmental benefits of such a policy of deconcentration would be felt, however.

C. Industrial Waste Disposal

As foreign investment increases the volume of industrial wastes generated in and around Jakarta, local zoning controls will become less adequate. More direct controls aimed at reduction or treatment of industrial wastes released to the environment will be required. The government's major objection to such controls is that they could discourage both foreign and domestic investment and consequently would diminish prospects for increased employment. The Soeharto government is anxious not only to attract individual investment projects, but also to promote a favorable image in the eyes of foreign investors and governments, on whose goodwill it depends for grants and loans to finance development. Providing a favorable investment climate is regarded by the government as a means of expunging the reputation for political and economic irresponsibility which it sees itself as having inherited from the Soekarno years. The National Foreign Investment Coordinating Board is especially sensitive in this regard and has been a strong opponent of environmental controls.

If controls were imposed on a selective, rational basis, however, the government's fears of economic losses could be shown to be groundless. Since most foreign investors come from industrialized countries which already have stringent environmental quality controls, they should not find it difficult to distinguish rational accounting for environmental externalities from economic "irresponsibility." From the standpoint of the investor, the presence or absence of controls on industrial effluents is only one of many factors influencing the attractiveness of Indonesia for investment. The most important of those factors are overall political stability, rate of investment returns,

46. See A. Malik, Promise in Indonesia, 46 FOREIGN AFFAIRS 292 (1968).
47. See text accompanying note 3 supra.
discounted cash flow, and scarcity of the resource to be exploited. Others include the state of Indonesian labor and/or consumer markets, the competence and predictability of the bureaucracy, tax laws, and, as other countries begin to enact environmental protection measures, the relative stringency of Indonesian standards. On a case by case basis the government could weigh the particular mix of investment variables to insure that investors whose effluents would fall within the range of environmental tolerability as defined by the government would not be discouraged from coming to Indonesia.

Tax incentives and permits, the cost of which would depend on the type and amount of pollution a factory would generate, could serve this purpose quite well. Of course, a drawback to the economic incentive approach is that industries might find it more advantageous to pay the extra costs of polluting rather than the costs of cleaning up. Other potential benefits from the economic incentive approach are development of manufacturing processes and materials that are less harmful to the environment, and recycling retrievable substances and pure waste, which could become an industrial energy source. Revenue generated could be used by the government to create jobs aimed at cleaning up the environment, which would alleviate urban unemployment.

D. Sewage Disposal

With regard to health and esthetics, the inadequacy of Jakarta's human and domestic waste disposal system has long been apparent. Rapid population growth, together with reduced dry season flows, have long since exceeded the natural dilution and decomposition capacities of the city's rivers and canals. The costs of construction of a sewage system along conventional capital-intensive lines are prohibitive, however. Given the inadequacy of the Jakarta Special Capital Region's annual budget\(^49\) and, in the absence of a bond market or analogous municipal borrowing mechanism, the necessity of financing capital improvements out of operating revenues, a sewage collection

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and treatment system is beyond Jakarta's means so long as the capital-intensive approach is the only available alternative.

Addressing themselves to these economic constraints, researchers at the Asian Institute of Technology in Bangkok have devised and are now testing a model for a capital-saving, labor-intensive sewage collection, treatment, and recycling system for large Asian cities. The model involves hand collection and transport of human wastes to high-rate oxidation ponds, which decompose and process them into fertilizer, protein-rich dried algae for use as fish and stock feed, and recycled water for agricultural, industrial and, if further purified, household uses. The environmental advantages of such a system would be substantial: return of nitrogen and phosphorus nutrients to the food chain, prevention of release of excess nutrients to surface waters, reduced dependence on artificial fertilizers, stabilization of agricultural ecosystems, and an improved balance between rural-to-urban and urban-to-rural energy flows. This would be preferable to primitive conventional waste treatment methods, which simply move partially-treated wastes out of sight to river, lake, or ocean bottoms, with no attempt to make use of the nutrients stored within them. Because capital and opportunity costs are low, such a scheme shows promise of economic feasibility. It would also facilitate attainment of employment goals—many jobs would be created, most of them requiring little skill, whereas conventional systems would create fewer jobs, most of which would require scarce engineering skills. It should be noted, however, that behavioral changes would be required, both on the part of residents and on the part of the employees of the proposed system.

As for disposal of household and market wastes, a cue can be taken from the efficient system operating in Jakarta for recycling used bottles and scrap metal. The most indigent pick through upper- and middle-income households' garbage piles in search of glass and metal, which they sell to scrap merchants, who in turn resell to small factories and peddlers. Other types of waste, such as coconut shells and paper, could also be collected in a similar but less degrading manner,

50. A model system for a city of 100,000 is described in McGarty and Tongka-same, Water Reclamation and Algae Harvesting, 43 J. OF THE WATER POLLUTION CON- TROL FEDERATION 824 (1971).

51. People in poor districts might have to use a neighborhood bathroom, instead of disease-breeding cesspools at their houses or the nearest canal; people in more affluent neighborhoods would have to install facilities that would accommodate sanitary storage and hand removal of wastes; and the employees of the system would have to adhere to strict standards of cleanliness.
provided there was available a simple, labor-intensive technology for manufacturing marketable items from such "waste" materials. That such technologies are not now available may very well be due, not to the inherent usefulness of such materials, but to the fact that no one has yet made a concerted effort to develop economically feasible methods of converting them into usable products.

E. Pesticide Use

Pesticide use is the issue over which conflict between environmental health on the one hand, and basic human survival needs and economic growth goals on the other, is sharpest. The trade-offs are particularly difficult on densely populated Java, which has been unable to feed itself for decades. Java's dependence on rice imports from the Outer Islands and abroad is a source of political grievance to the Outer Islands. Thus, the increased yields resulting from heavy applications of pesticides and fertilizers to the new high-yield rice varieties\(^5\)\(^2\) have meant a badly needed grace period for Java. Also, the technology of the Green Revolution involves double-cropping and more intensive cultivation techniques, which require increased labor inputs, and should therefore, at least in theory, help to expand rural employment opportunities.

Nevertheless, the environmental risks and potential economic losses are great. Heavy pesticide use tends to destabilize agricultural ecosystems in two senses. First, crops dependent on petroleum-based pesticides can be decimated if the supply of pesticides is interrupted due to energy demand elsewhere. Second, pests become resistant to existing pesticides so that increased application of new, more toxic pesticides becomes imperative. In consequence, risks of contamination of human drinking water and food increase. Moreover, the quality and quantity of coastal and inland fish catches are threatened.

Javanese agriculture has not always been as completely dependent on chemical pesticides as it is at present. Prior to independence, the Dutch devoted considerable research to the development of biological pest controls.\(^5\)\(^3\) Unfortunately, due in part to the present close alliance between foreign agro-industry and Agriculture Department officials, alternatives to chemical pest control are no longer seriously considered.\(^5\)\(^4\) As of 1973, there was not a single course on biological controls offered at the national Agricultural Institute at Bogor.

\(^5\)\(^2\). The biases of the "miracle rice" varieties are toward large inputs of chemical fertilizers and pesticides, as opposed to reliance on natural fertilizers and biological controls.

\(^5\)\(^3\). Interview with Indonesian plant physiologist, supra note 32.

\(^5\)\(^4\). See, e.g., Vicker, Multinational Firms Help Poorer Nations to Boost Food Output, Wall Street J., March 18, 1975, at 1, col. 6.
There is a parallel between pesticide technology and the technology of sewage disposal. In both cases, the conventional technology—for pesticides, that developed at the International Rice Research Institute at Los Banos, the Philippines; and for sewerage, that used in European and American cities—is expensive and environmentally harmful. At the Asian Institute of Technology, research intended to take account of the resource and environmental constraints of Asian cities has yielded results which appear both environmentally beneficial and economically feasible. The lesson is that the technologically most complex or most "advanced" solution is not necessarily the most desirable solution. Decisionmakers in Indonesia and other developing countries must assess and apply Western-developed technology critically, recognizing that assumptions and techniques appropriate in one physical, economic, and political context may not fit in another. The technological biases even of researchers working specifically on Southeast Asian problems, such as at Los Banos, may be inappropriate to Indonesia's and other countries' ecologies, economies and development priorities. Indonesia needs to build on the Rice Institute's work with its own research program, one in which the government promulgates guidelines that incorporate environmental as well as economic considerations.

III

ENVIRONMENTAL LAW AND INDONESIAN GOVERNMENT DECISIONMAKING

The 1945 Constitution makes no reference to environmental quality or to the effects of natural resource exploitation per se, but it does establish the principle that "land and water and the natural resources therein shall be controlled by the State and shall be exploited for the greatest welfare of the people." It thus indicates the scope of governmental authority and of public versus private rights and obligations so as to permit the future development of environmental controls. The Guidelines for the Direction of the Nation of 1973 go a step further in stating that "natural resources must be used ... in a rational manner ... such that the human environment is not damaged ... and future generations are accounted for." Most laws pertinent to environmental controls in Indonesia were enacted by the Dutch colonial government and thus predate the 1945 Constitution. Their continuing validity in independent Indonesia de-

55. It appears that the developers of the new rice varieties, most of whom it can be assumed were trained in industrialized countries, were gearing their assumptions and efforts more toward economic and technological conditions in industrialized countries than toward conditions in poor Asian countries.
56. Constitution art. 33, § 3 (Indonesia, 1945).
57. Rachwartono, supra note 9.
rives from Article Two of the Transitional Provisions of the 1945
Constitution, which provides that "all existing institutions and regu-
lations of the State shall continue to function so long as new ones have
not been enacted in conformity with this Constitution." At least
three older statutes bear on water quality. First, the General Water
Law of 1936 is considered in need of revision, but the interdepart-
mental committee which has been working on a new draft bill since
the middle 1960's has been unable to agree on an acceptable version.
Second, the forestry laws set aside forest preserves and regulate cut-
ting and other uses so as to prevent erosion and other consequences of
deforestation. Though these laws are more closely attuned to current
awareness of environmental problems than laws in other sectors af-
fecting the environment, recent despoliation of the forests of Kali-
mantan has pointed up the need for their revision. The Nuisance
Law establishes procedures for seeking abatement of property uses
detrimental to enjoyment of neighboring property in urban areas. Lo-
cal regulations concerning planning, health and sanitation, working
conditions and building specifications all derive from this basic
statute.

One major deficiency of these and other holdover regulations af-
flecting water quality is that they contain no mention of the vulnerabil-
ity of the environment or of the need for action to protect it. Further-
more, they divide responsibility for regulation of activities bearing on
water quality among a multitude of separate government agencies,
each of which is instructed to focus on a particular type of water use
without regard to possible harm to other uses. Such problems are
faced by all countries attempting to adjust older legal and administra-
tive structures to contemporary ecological needs.

Another deficiency of existing laws concerns their provisions for
identification of pollution sources and for abatement of pollution. For

58. CONSTITUTION Transitional Clause II (Indonesia, 1945).
59. Algemeen Waterreglement, Sept. 26, 1936, Concerning the General Water Law
60. See note 24 supra.
61. M. Kusumaatmadja, Pengaturan Hukum Masalah Lingkungan Hidup Manusia:
Beberapa Fikiran dan Saran (Legal Coordination of the Human Environment Issue:
Some Considerations and Suggestions) at 17-18 (1972) (mimeo, Bandung); see also
note 24 supra.
June 1926 S. 26-226 (iwg. 1 Aug. 1926).
63. Responsibility for data collection regarding water resource uses is reported to
be spread among the Directorate of Meteorology and Geophysics, the Institute of
Hydraulic Engineering, the Directorate of Geology, the Forest Institute, the Soil Institute,
and the Energy Institute. There is no organization for recording of comprehensive na-
tional data. LEMBAGA ILMU PENGETAHUAN INDONESIA [INDONESIAN INSTITUTE OF SCI-
ENCE] and NATIONAL ACADEMY OF SCIENCES (U.S.), A REPORT ON THE LIPI-NAS
WORKSHOP ON NATURAL RESOURCES 63 (Sept. 1972).
example, the Nuisance Law was useful for these purposes before World War II, when emissions were few and the urban population relatively small and homogeneous, and thus easily regulated. Today, however, the deluge of wastes generated by the diverse population of Jakarta, which has multiplied ten times since the war, and the proliferation and consequent blurring of emission sources have rendered ineffectual the abatement procedures specified in that law. Moreover, sanctions for violations of the law do not deter: while colonial penalties were often extremely severe, post-independence sanctions are frequently so light that they do not represent any real threat.

Yet another problem is that the generally vague language of Indonesian legislation allows administrators broad discretion. Many important policy decisions are made in the form of administrative regulations, ungazetted internal memoranda, and other unwritten determinations. As there are no formal decisionmaking criteria, there is little or no assurance that decisions will be consistent with statutory purposes. Another characteristic of the decisionmaking process is the tendency to pass responsibility upward. Decisions passed up to high levels include not only nonroutine, sensitive, or priority matters, but apparently routine matters, as well. As a result, high-level decisionmakers, many of whom must fill two or more top executive positions because of the shortage of managerial expertise, are inundated with trivial problems. Also, transmission of relevant information to the top of the hierarchy where the decision is finally made is often deficient. Since decisionmaking criteria are not formalized, subordinates may not know what data are required by the decisionmaker. Often they pass on to the executive only what they think he wants to hear.

In decisions affecting the environment, information problems are twofold. Not only is relevant information of any kind—ecological, economic or social—scarce and fragmentary, but what information there is includes little or no reference to environmental impacts or alternatives. Thus, the criteria employed in such decisions are almost wholly political and economic. For instance, the West Java government's response to residents' complaints about noxious fumes from a nearby factory in 1973 was, in the words of one official, to seek a mainly "political" resolution, to close the factory for a few days and ask its (foreign) owner to institute some minimal, unspecified controls.

64. "[T]he Supreme Court has interpreted its jurisdiction in the narrowest possible way, to the point where it is almost powerless to declare invalid executive orders which are contrary to the legislation they are meant to implement." E. Damian & R. Hornick, Indonesia's Formal Legal System: An Introduction, 20 AM. J. COMP. L. 492, 530 (1972).
Enforcement of environmental law is hampered by the political climate. Neither the President nor any other powerful national figure has declared an unambiguous commitment to environmental controls. This lack of enthusiasm may in part derive from a general disinclination to actively promote enforcement of outdated laws reflecting the aims of the colonial regime. But strong advocacy of strict enforcement of post-independence legislation has not been forthcoming either. Without support from the executive, enactment and enforcement of stringent controls is unlikely, since the power of the legislature, the judiciary, and public opinion to affect executive decisionmaking is limited. Finally, there is a scarcity of resources, in terms of data, skilled manpower, technical equipment, and funding, available for monitoring the environment and enforcing the law.

IV

DIRECTIONS FOR FUTURE ENVIRONMENTALISM

As has been noted above, the People’s Consultative Assembly (MPR) has provided a mandate for rational use of natural resources and protection of the environment. It is now up to the House of Representatives (Dewan Perwakilan Rakyat) and the various ministries to repeal those provisions of the old colonial legislation which are not in accord with the MPR’s Guidelines and to enact new laws and administrative regulations which interpret and implement the Guidelines.

In order to be effective, the new body of environmental law to be formulated by the DPR and the ministries should incorporate the following features. The first two are necessary elements of environmental law in all countries, developed and developing alike. The latter three are more pertinent to conditions in Indonesia and other developing countries.

First, the law should recognize the vulnerability of the environment and the need for protective measures, and should provide for coordination of the policies of the various government agencies whose activities affect the environment. Second, it should provide definitions, procedures for identification and abatement of pollution, and appropriate penalties.

Third, in prescribing strategies for correcting environmental abuses, the law should encourage the use of labor-intensive rather than capital-intensive technologies and further development of labor-

65. Interview, supra note 14.
66. See text accompanying note 9 supra.
intensive and waste-utilizing technologies. It should also prescribe the use of simple technologies which do not require many highly trained scientists and other skilled personnel, since such personnel are in short supply in Indonesia and require relatively high remuneration.

Fourth, the law should improve the decisionmaking process in the Indonesian bureaucracy. Due to the weakness of judicial, legislative, and extragovernmental checks on executive discretion, the discretion exercised by the executive is likely to remain the dominant factor in environmental decisionmaking for some time to come. Hence, the law should focus on improvement of executive decisionmaking rather than on creation of some fixed, precise set of environmental standards to which decisions affecting the environment must conform. Specifically, the law should provide for generation of adequate environmental information and for its presentation in a form appropriate for decisionmaking. It should specify the type of information required and should assign responsibility for its generation.

Finally, the new law should not attempt to apply uniform environmental standards to all sectors of the Indonesian economy. Since independence, a major goal in legal reform has been to replace the separate ethnic and religious legal systems of colonial times with uniform laws to be evenly applied to all Indonesians. In many fields of the law, progress toward unification has been slow but substantial.

However, the dual nature of the Indonesian economy discourages uniform environmental standards. The modern sector has abundant capital, advanced technology, and management that is capable of dealing with government bureaucracy. Also, it is geographically concentrated. But the contrast between the modern and indigenous sectors is still striking, even after thirty years of independence. The latter is labor-intensive, economically marginal, technologically unsophisticated, scattered geographically, and at a clear disadvantage in dealing with the bureaucracy. The indigenous sector could not sustain the burden of legal standards appropriate to the modern sector.

Uniform application of standards is also impractical from an administrative standpoint. It is much more difficult to keep records, carry out inspections, and levy taxes and fines on a small, marginal factory buried in a Jakarta kampung, for example, than on a large factory in the Pulo Gadung industrial estate. Given that administrative re-

67. KINDLEBERGER, supra note 41.
69. For a discussion of the nature and origins of Indonesia's dual economy see BOEKE, ECONOMICS AND ECONOMIC POLICY OF DUAL SOCIETIES, AS EXEMPLIFIED BY INDONESIA (1953).
sources are scarce, it is preferable to use them in those sectors in which the costs of enforcement in relation to potential environmental benefits are lowest—that is, in the modern sector.  

CONCLUSION

From the vantage point of the industrialized countries, economic and environmental goals often appear antithetical. The evidence presented here suggests, however, that the conflict between economic and environmental objectives which arises in economies in which labor is expensive and investment in capital and technology already substantial may not be as sharp in developing countries, where labor is cheap and plentiful. Indeed, failure to bring environmental as well as economic and other developmental criteria into government decisionmaking may in fact jeopardize achievement of economic growth goals. Environmental protection policies may promote employment and welfare goals, as well. In the Jakarta watershed, environmentally favorable programs for reforestation and domestic waste disposal involve low-cost, low-technology, highly labor-intensive approaches to public problem-solving. This should encourage initiation of badly needed projects which would otherwise be beyond Indonesia's means.

Finally, environmental legislation can be made a more effective instrument for directing government decisions regarding the environment if certain local conditions are taken into account. In particular, environmental law should reflect the availability of human, technological, and financial resources for dealing with environmental problems in Indonesia, the dominant role of the executive in government decisionmaking, and the need for flexible, non-uniform standards.

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70. Another justification for non-uniformity is that reasonable water and air quality standards will vary from region to region. Pollution levels in Java are already high and would require standards more stringent than would be necessary for the comparatively underpopulated and less developed provinces of the Outer Islands. Care would be required, however, lest Japan and other industrialized countries desirous of exporting their pollution interpret Indonesia's flexible approach as an open invitation to come in and lay waste the Indonesian environment. Indonesia should define in advance which environmental amenities in the less developed provinces are totally incompatible with pollution, and which can tolerate some pollution, though not more than is commensurate with local health, economic, and recreational needs.