

East-West Environment and Policy Institute

Research Report No. 1

**Environmental Considerations
in Foreign-Donor-Supported Projects:
Some Experiences in Indonesia**

by Arthur J. Hanson



East-West Center
Honolulu, Hawaii

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FOREWORD

Much of the economic development in the East-West Center region of Asia and the Pacific is dependent on renewable natural resources and the environment. These natural systems yield materials and energy, recycle the wastes of society, and furnish amenities as well as habitats. Successful development provides for the long-term sustained productivity and health of natural systems. The technical information necessary for balanced economic development planning must include an understanding of the environment and the natural resource base.

Since 1978, the East-West Environment and Policy Institute has conducted a multinational study of methods for natural systems assessment. An important input has comprised case studies from the developing countries. This research report was commissioned for a conference of environmental scientists and development officials held at the East-West Center. It documents several important and interesting projects where environmental consequences were significant to the success of economic development. Although some changes have since occurred in Indonesian government organization, the findings of Dr. Arthur Hanson will generally remain useful to professions in donor agencies and host country development units.

Collaborative work in this field continues in the EWEAPI Project "Natural Systems Assessment for Development."

Richard A. Carpenter
Project Coordinator

THE COURSE OF LONG-TERM DEVELOPMENT

... The Indonesian Nation desires to have a harmonious relationship between Man and his Creator, between Man and his fellow-man and the environment around him ...

... Rational use of Indonesia's natural resources is necessary in the execution of development. Exploitation of these natural resources should not destroy environmental conditions and should be executed by an overall policy which takes into account the needs of future generations ...

(excerpts from Chapter III of the Guidelines of State Policy, 1973)

Environmental Considerations in Foreign-Donor-Supported Projects: Some Experiences in Indonesia

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Arthur J. Hanson

ABSTRACT

This report explores the evolving role of environmental considerations over the period 1973–1977 in foreign donor-supported projects in Indonesia. The changing structure and relationships of government units responsible for environmental concerns are delineated, as well as their relation to international development agencies. As examples of the kinds of procedures and problems encountered, a wide range of projects undertaken by a variety of international development agencies are described. The cost of research and implementation of environmental impact statements is discussed at length, and suggestions are made for improving the input of foreign donor agencies.

INTRODUCTION

Indonesia has natural resources so varied and abundant that few other developing countries can compare with it. Yet, with the urgent demands created by poverty and by an enormous, rapidly expanding population, few other countries have a greater need for formulation and careful execution of resource and environmental management strategies.¹ The depth of concern among Indonesian planners for a livable human environment and wise use of resources is sometimes overlooked by foreign observers.² This is understandable when they confront obvious signs of waste such as the rampant forest exploitation characteristic of the last decade,³ as well as the low standards of housing and sanitation in both rural and urban areas. What most learn, however, if they carefully observe either cities or farming communities, is that Indonesians are exceptionally skilled in their adaptation to environment and, particularly on Java, form a true Conserver Society.⁴ This may be seen in the varied and intensive activities of farmers and aquaculturalists, in the food producing capacity of major cities, and in the careful preservation and/or recycling of almost any manufactured item. These observations will be tempered by visibly widespread environmental problems such as the destruction of

upland watersheds on Java and the more insidious problem of gradual degradation of slash-and-burn cultivation areas throughout the country.⁵

Over the past decade of REPELITA I and II planners and politicians have presented an increasingly coherent and well-funded effort to introduce resource and environmental management concerns into development planning.⁶ This effort is remarkable for the dimensions and breadth achieved. Environmentally based planning concepts pervade major ministry projects, figure prominently in discussions of the National Assembly, and have been incorporated into the National Guidance Policy (GBHN). Most recently, a Minister of State for Development Control and Environment has been appointed. The post-Sukarno period has been one of enormous expansion of investment activity in Indonesia and a time of hard lessons, especially in oil, in the social and ecological impacts of expanding agriculture and, of course, in the expansion of forestry from virtual stagnation to the country's position as a leading exporter of tropical hardwoods. The past decade has also been a period of relative political stability in which desperately needed infrastructure such as irrigation networks could be rehabilitated and enlarged,⁷ and in which the technical competence needed for proper management could be expanded (although the low number of skilled engineers, scientists, and managerial personnel is still a major constraint to project planning and implementation). It also has been a time of unprecedented intervention by outside agencies who contributed at least US \$1.75 billion in 1978–1979 in loans and grants for Indonesian development.⁸ This compares with a total annual revenue from exports of about \$8.5 billion in that year.

The ways in which this foreign loan and grant money are spent and projects are conceived or evaluated vary considerably among the donor agencies. So also do the capacities of Indonesian agencies to absorb this outside capital and associated foreign technical expertise. Development financing generally is done on a project basis and it is through projects that the government has the best capacity to create resource and environmental management strategies. Through analysis of actual projects insight can be gained into limits on both Indonesian and foreign agency progress towards creating sound environmental assessment, as part of project planning, and in implementing appropriate management strategies. The examples chosen for review are representative of major initiatives in development: river basin development, agricultural land development, regional development planning, industrial development projects, and public health. The approach and the degree of interest in environmental impact assessment vary considerably in the operating guidelines of the various multilateral and bilateral donor agencies.⁹

For all the foreign agencies environment is a new concern, often with

implications of imposed outside standards. The easiest way to handle environment assessment is to leave detailed analysis to local planners—whether or not a real capacity exists. The arguments sometimes include the following reasoning: that the priorities of developing countries rarely include the environment; that many such countries welcome polluting industry for the employment created; and that donor agencies should respond to requests of the host government even where environmental problems may be created. The creation of environmental legislation, environmental planning offices, and other such positive measures on the part of recipient countries may, in the short run, have only limited influence on changing the response of donor agencies, whose planning and project cycles are often three to five years. But, eventually, these agencies cannot fail to be influenced by relatively strong internal directives, which, notably in United States Agency for International Development (USAID) and in the World Bank, have designated environment assessment as an essential component of project analysis. Furthermore, some agencies like Food and Agriculture Organization (FAO), which acts as an implementor of United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP) projects, claim a well-established involvement in environmental management work.

Because both developing countries and donor agencies are separately evolving their philosophies and mechanisms for the environment, it is possible that we will see highly divergent situations develop. There is little doubt that Indonesian government policy towards environmental concerns in development is more advanced than the policy initiatives of some donor agencies. Therefore, it is important to determine if donors are working with environmental units in government and universities, in addition to any internal environmental assessment studies they may conduct on projects. What follows is a description of processes and case studies important to the establishment of environment as a key concern in development planning decisions.

EVOLUTION OF INDONESIAN ENVIRONMENTAL PROCESSES

Within the complicated channels of Indonesian decision making, based on a consensus system, there is often a gradual emergence of a firm decision rather than open confrontation, legal battles, or extensive hearings. Also, what is sometimes mistaken by outsiders for a 'no decision' status can be very definitive, an especially important matter in environmental assessment. Only limited possibilities exist for public participation in decisions. Furthermore, information flow into and out from the gov-

ernment is frequently inaccurate or misinterpreted. On some issues, however, public concern is clearly an important element in environmental decisions. For example, concern for pollution and fish shortages by traditional fishermen and the operators of the 115,000 hectares of coastal fishponds along the north coast of Java may be more important than any scientific monitoring unit for marine pollution, since any threat to social stability is taken very seriously by the government.¹⁰ Environmental problems that directly impinge on a community's livelihood fall into this category. On Java practically any large industrial development discharging noticeably toxic elements is potentially at risk of creating disfavor, since natural production processes are so intensively tapped everywhere.

The actual staff capacity, at either central or local government levels, for monitoring and evaluating environmental problems is very limited. Furthermore, the poor communications between agencies result in conflicting advice and severe limitations on effective regulation and policy implementation. This can work for or against individual environmental decisions. The agencies involved in environmental decision making during the period 1975–1977 are shown in Figure 1. This diagram also attempts to illustrate likely points of environmental assessment during project planning and implementation. Four agencies are of particular importance in the process.

The Ministry of Public Works (PUTL or PU) is the most important project implementation department. In 1975 it controlled about 40 percent of the Development Budget, and it is responsible for road construction, for water resource development, and for many elements of human settlement planning. It is also a major proponent and executor of regional planning studies. Public Works is a relatively efficient and innovative agency with environmental engineers and planners on the staff. It is also the agency most in need of careful evaluation since its projects are often of monumental scale and significance in environmental management.

Actual environmental decision making is closely linked to budget planning and approval interchanges between departments (such as Public Works) and the National Planning Bureau (BAPPENAS). A Bureau of Environment and Natural Resource Management within BAPPENAS is the principal regulating agency through which any project may be temporarily or permanently blocked simply by withholding approval of funds. There are severe limits to the number of projects that can be investigated carefully since the staff is small. The obvious danger exists of being considered "antidevelopment." This bureau, however, is certainly not off the mainstream of BAPPENAS decision making; and it does not require a formal Environmental Impact Statement (EIS) before it can intervene to halt a project or to change concepts. In fact, until the late 1970s,

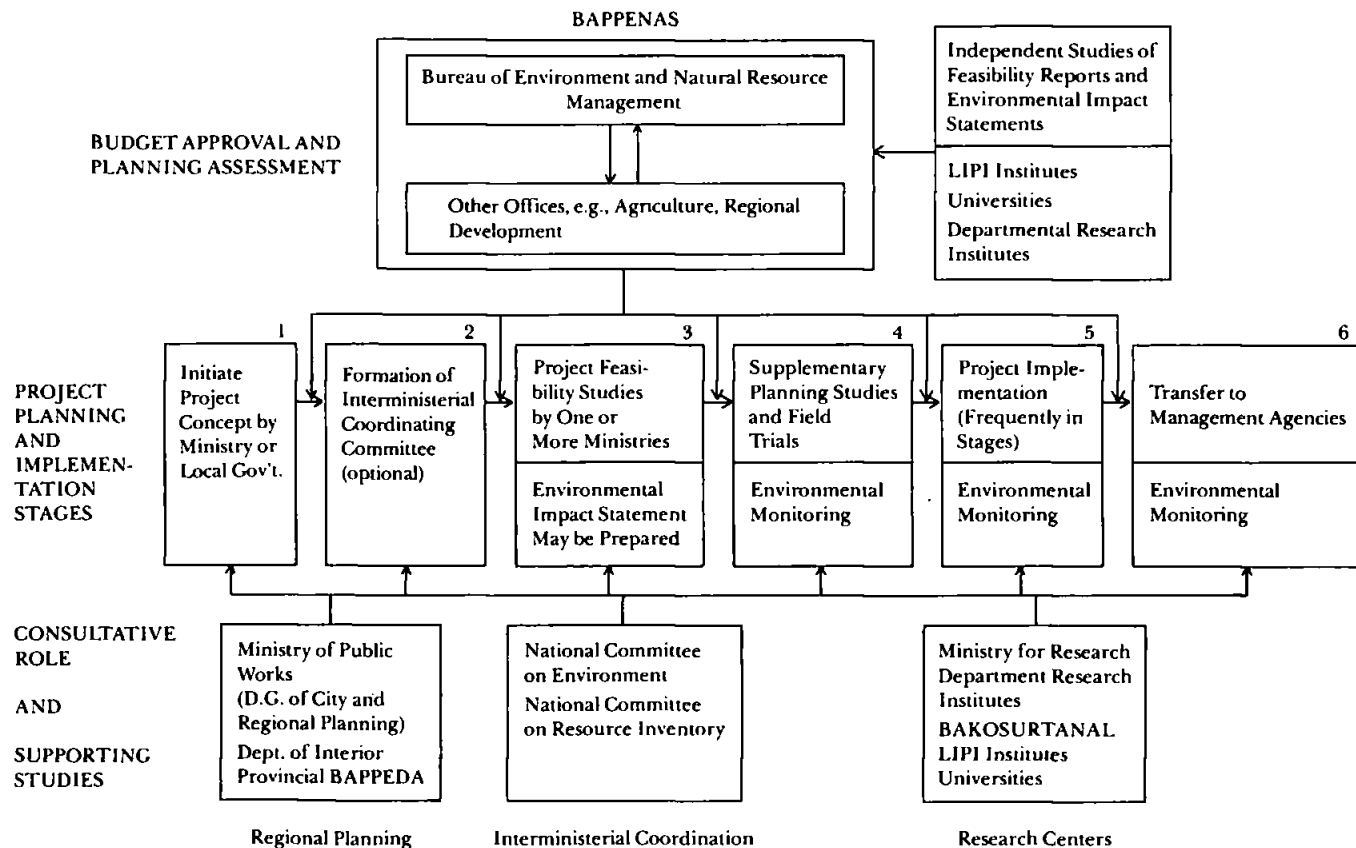


Figure 1. Environmental inputs for technical planning and project implementation during the period 1975–1977.

there was no formal Indonesian government requirement of an EIS for most projects.

The first major initiative to institutionalize environmental concerns came with the 1973 appointment of the Deputy Head of BAPPENAS as Chairman of the National Committee on Environment. This Committee, plus a National Committee on Resource Inventory headed by the Minister of State for Research, formed a flexible means of coordinating resource and environment information flow, plus monitoring and management studies.¹¹ These committees, incorporated of departmental representatives, de facto became a kind of Resources and Environment Board functioning in lieu of an environmental protection agency.

In early 1978 a long-awaited cabinet-level environment position was created. The new Minister of State for Development Supervision and Environment, Dr. Emil Salim, controls neither a large staff nor a sizeable budget. Thus it is apparent that the government has not decided to move towards an Environmental Protection Agency style of bureaucracy. The Minister has been very effective in his initial dealings with departments and provides greater authority than the interdepartmental committees and BAPPENAS office could command. He has linked universities formally to his activities through the formation of environmental study centers within at least 15 of the universities. Eventually these are intended to provide both necessary training in environment as well as the skilled personnel for both policy and action research on environmental problems. Goodland (in press) provides an up-to-date description of the activities of the Ministers' office in the period 1978–1980.

Including government agencies, university staff (generally exceptionally well linked to government agencies), and Indonesian consultants, there are perhaps only 200 to 300 reasonably senior people involved with resource and environment decision making. The key to understanding whatever successes have occurred in environmental planning lies in the extraordinary degree of communication possible among these senior people. This statement may seem at odds with earlier comments on lack of communication and the number of interdepartmental miscommunications. Yet both are true. The ease with which communication can take place means that decisions can be made on a very personal basis—and quickly. The large volume of work undertaken by most senior people, a propensity to obscure issues where a decision is not quickly desirable, and a ponderously large, often ineffective lower level staff partially explain the frequent miscommunications.

It is fair to conclude that most expatriate advisors working in Indonesia fail to understand the full extent of this communications network (although many spend a lot of time trying). Most advisors find it difficult to

be aware of the bureaucracy outside of the agency with which they are primarily affiliated. Yet they must prepare plans for, or implement, projects that may have wide-ranging environmental impacts. Furthermore, the initial terms of reference for project development, as developed for site-visit teams to expand into detailed proposals, are frequently vague or, at the other extreme, so specific as to make comprehensive analysis difficult. These guidelines may give no indication of the degree of scrutiny the actual project plan may face in its interdepartmental rounds within the Indonesian government. For the foreign scientist, engineer, or planner, it may seem sound advice to leave to Indonesian colleagues environmental concerns this person may consider extraneous to the project's central theme. This is less likely to be the case in certain categories of proposals, especially those dealing with land and water resource development, which are predicated upon wise resource or environmental management, than with proposals dealing with industrial development.

In the case of industrial developments there are two extremes: projects planned with the assumption that Indonesia cannot afford pollution control, does not need such controls, etc.; or, conversely, that Indonesia should take full advantage of the most up-to-date outside technology and start her industrialization without the environmental damage seen elsewhere. Both views exist among foreign advisors.

The general point is that, with the realities of skilled manpower shortages over the past decade, much of the country's technical input on projects (environmental and otherwise) has depended greatly upon the perspectives of outside consultants. These consultants may work closely with Indonesian colleagues, or almost completely independently. The donor officers and planners who hire consultants, review their work, and manage project funding may be located in Indonesia or in more distant headquarters. Some have very limited knowledge of Indonesian policy or agencies other than in their selected field. All donor agencies must deal with BAPPENAS since program priorities and project approvals are dependent on it.

BAPPENAS deals with masses of technical planning documents prepared, in large measure, by Western and Japanese engineering consulting firms under contract to specific government departments. It is fair to say that, at present, perhaps in contrast to six or eight years ago, the evaluation system is simply overloaded with information. Yet many of the analyses have been done quickly and without access to all the *right* information. Sometimes very good and relevant work is overlooked for reasons as simple as foreign project staff not being able to read Indonesian government or university research and project documents. In the case of Indonesian staff, there is a marked tendency to ignore colonial-era research

contributions and statistics. For all these reasons technical inputs for project planning can be incomplete or even misleading.

The actual number of environmental impact statements that have been produced for projects is fairly small. One must be prepared to assemble environment arguments by sifting through more general project documentation. The examples that follow include some of the pioneering attempts at environmental analysis. Study of such cases provides a measure of what environmental accomplishments actually emerged through the interaction between foreign development agencies, Indonesian government departments, and BAPPENAS in these early years of environmental awareness.

ENVIRONMENTAL CONSIDERATIONS ON SOME PAST PROJECTS

The projects to be described have been chosen to represent a cross-section of development project types and to include a variety of international development agencies. All were either in a feasibility study or implementation stage. The normal procedure for a project to be undertaken is as follows:

1. The project concept is forwarded to BAPPENAS by the originating government department for approval as a development priority.
2. Each year a list of approved projects is published and made available to donor agencies.
3. Donor agencies select projects from this book or, frequently, await formal listing of projects they have informally helped to develop through individual departments.
4. An evaluation team composed of donor agency staff or specialist consultants define detailed terms of reference (sometimes called a prefeasibility report) in conjunction with the department or departments concerned.
5. This proposal is then reviewed both within the foreign agency and by the Government of Indonesia (at this point various departments and BAPPENAS may intervene with comments).
6. If agreement is reached the study or project implementation takes place.

Often the initial agreement is for an expensive and comprehensive feasibility study meant to review alternative approaches (eg, for harbor siting or for water basin development). Such studies may take several years to

complete and involve field teams of engineers, economists, and various resource and social science specialists.

A further variant on the above outline involves projects already under way (often on a pilot-scale) with Indonesian funding. The government may choose to seek outside funding either to bring in further expertise or to expand the scale of a project. It is not inconceivable that in some cases a department's motivation may be to obtain a foreign stamp of support that will restore glamour to projects that have had difficulty in maintaining governmental funding. Finally, it is clear that the interests of donor agencies can have an important bearing on what is given priority by the departments.

From an environmental assessment perspective what is important to note is the relatively long time span and multiple points for intervention in this process. Many projects take three to four years or more from the time the initial proposal is forwarded until a full feasibility study is completed. Thus there would be time for an environmental assessment either by the Indonesian government or by the agency's contractor.

River Basin Development

Citanduy River and Segara Anakan Estuary

The Citanduy River flows from the semienclosed highlands of West Java into the major estuary of the south coast, a semienclosed mangrove swamp region called Segara Anakan.¹² The river is notable for its immense sediment load and for flood damage in the lower reaches. These are consequences of upland deforestation, although the floods are caused by gradual incursion of agriculture into a natural inland swamp area. Segara Anakan is the home of perhaps 4000 people engaged in estuarine fishing and harvest of mangrove products. The estuary is shallowing at a dramatic rate as a result of the river sediment inputs. By some estimates it could be filled within decades. This infilling has been a matter of concern since the 1940s, as has been the more inland flooding. To partially control the latter, dikes were constructed and now need rebuilding. Changing the course of the river to discharge directly into the open ocean is one possible solution to the shallowing of the estuary.

In 1973 USAID, working with the Water Resources Directorate-General of the Ministry of Public Works, initiated a comprehensive feasibility study for development of the river basin and estuary.¹³ The study considered power development but was primarily concerned with water control and land reclamation to expand agricultural output. The effort

was notable in several ways. The studies included a compilation of all existing work on the basin by an Indonesian and expatriate staff situated in the field for over a year. An attempt was made to address issues of upland land rehabilitation. Midcourse diking to achieve flood control was recommended. The contentious issue was a recommendation to transform the estuary into a shallow, freshwater lake and ricefields rather than mangrove. This reclaimed land would be virtually the only major unit that could be added to expand the existing agricultural base. In the economic analysis by the contractor the calculated benefit-cost ratio supported implementation. The fishermen living in the estuary would either become farmers, harvest from the 1000-hectare lake, or move elsewhere. The cost of the Segara Anakan land reclamation would be in excess of US \$20 million. It was initially given strong support by PUTL.

Accompanying this plan was a document which was likely one of the first environmental impact statements prepared for any project in Indonesia. Unfortunately the EIS was a very poorly prepared study which could hardly be considered objective, since it attempted to develop a scenario that overinflated the worth of the reclaimed landscape while ignoring the medium-term problems directly associated with reclamation. It ignored probable effects of development on the inshore and off-shore shrimp fisheries. In addition, it failed to fully develop alternative arguments for environmental management, which range from moderate changes under the existing regime to diversion of the river without blocking the estuary. The document was circulated by the Ministry of Public Works, as part of the routine review of the overall plan, to BAPPENAS, to other Ministries, and to senior environmental specialists in the universities. The course of decision making from this point is of interest because it became one of the first successful efforts of the then newly formed BAPPENAS Bureau for Natural Resources and Environment to prevent implementation of a project with potentially detrimental effects.

This Bureau commissioned a parallel set of studies by Indonesian scientists to produce a clearer perspective on the value of the mangrove forest resources, and on the "health" of the estuarine fishery resources (which were claimed to be in a serious state of decline in the original foreign consultant's EIS). In addition, the Director General of Fisheries became involved in the controversy (and, through this office, a series of FAO-commissioned studies were initiated on the estuarine stocks). USAID was informed of the unacceptability of the original document and its contractor was, in turn, requested to complete an additional study focusing on the topics of the estuarine fisheries and of any possible relationship between the valuable offshore fisheries and changes in the estuarine environment. This study, completed in less than two months by a

U.S. marine ecologist, clearly pointed out most of the deficiencies of the EIS and hypothesized a strong relationship between the maintenance of the estuary and mangrove and the offshore fish and shrimp production. A year after this study USAID's contractor retained another senior fisheries-management scientist to provide as balanced a report as possible on the probable impacts on fish stocks of reclaiming the estuary. With the completion of this report the Segara Anakan reclamation essentially has become a dead issue—both the Director General of Water Resources and USAID realize the ecological and social consequences are likely to be substantial, and benefits moderate. The question of what should be done to best manage the estuary remains open, however. Monitoring of changes and development management plans for fisheries and mangrove forest are under way.

In this case there has been no serious attempt to involve the local residents of the estuary in the decision process. In terms of local government participation the situation is complicated because the estuary straddles the boundary between the provinces of West and Central Java. Furthermore, the port city of Cilacap, located very close to the eastern boundary of the estuary, is itself undergoing radical transformation as it has become the site of a large refinery and other industrial concerns. Regional studies have not treated this development in the same context as the river basin analysis.

The decision not to proceed with the estuarine reclamation was made by central government bureaucrats through a process which lasted at least three years and involved no "hard" positions on either side (PUTL or BAPPENAS). The role of USAID in this process was largely to respond to Indonesian government concerns. Once it was established that basic acceptability of the project was uncertain, there was no effort to rush quickly toward implementation. Had there been a proper environmental analysis in the original feasibility study it is likely that the overall basin plan might have been implemented on schedule instead of being delayed for an extended period.

Sederhana Irrigation Projects

In contrast to massive-scale water resource development projects like the Citanduy case, the Sederhana irrigation projects aim to develop small systems often involving field units of only 50 to 500 hectares.¹⁴ Emphasis is on irrigation improvements using low dams and channeling, which can be carried out by local contractors and farmer groups. Cost is relatively modest but generally gives one of the highest calculated internal rates of return of any type of water resource development. These projects are of

particular interest for implementation in river valleys off Java since elaborate, well-established technical irrigation systems are uncommon. What constitutes an adequate environmental impact assessment for such systems? The question became an important one for USAID, which funds Sederhana development projects on the island of Sulawesi.

In a relatively isolated part of the island schistosomiasis is prevalent. Mindful, no doubt, of situations elsewhere in which the incidence of this disease has been increased as a consequence of more sluggish water flow, USAID-Washington declared that an environmental impact statement would have to be prepared for each of the many small projects. Since few or none of the projects would be in the schistosomiasis-affected area, this decision appeared to be unreasonable in terms of the workload involved. It was so perceived by the local office and, eventually, the order was rescinded. In this case the origin of the environmental concern came from outside the country, although fairly intensive studies on the schistosomiasis problem have been mounted through the Ministry of Health in recent years.

Land Development Projects

Ricefield Development in Coastal Swamplands

Since the 1930s there has been an established interest in opening the vast coastal peat-swamp forests of Sumatra and Kalimantan to Javanese rice farmers.¹⁵ None of the early schemes met with much success, as a result of the limited managerial capacity and instabilities of government. During REPELITA I, however, six pilot projects were established in Sumatra and Kalimantan by the Ministry of Public Works. Settlers (transmigrants) from Java and Bali were moved onto deltaic lands where canals cut between rivers permit irrigation and flushing of the peat or muck soils. The fluctuations of water level induced by the tides aid this process and, in theory, minimize the need for investment in pumps or polders. The pilot projects were successful enough for the government to announce, in 1974, that up to one million hectares of these lands would be brought into production for small holdings of two hectares per family. The fundamental objective of the projects is to substantially increase rice production and therefore to reduce dependence on imported supplies.

There are serious environmental and resource management concerns connected with the project.¹⁶ These include possibilities of soil toxification, loss of a substantial timber reserve, disturbance of estuarine-dependent aquatic stocks, and health problems such as malaria and water-

borne diseases. The projects, however, offer an almost unique opportunity to create integrated area-management strategies that could enhance the overall production from the natural resource base. Although broad-based environmental assessment was not a part of the planning process in 1969 when the pilot projects were initiated, by late 1973 Public Works had established a budget for ecological studies to be carried out by Indonesian universities. These studies were started in 1974 and continue at several institutions. In fact they have served as a major source of financial support which helped to coalesce environmental working groups in three of the universities. The studies have influenced BAP-PENAS to take a cautious approach in the development that is now proceeding at a much reduced rate, although the long-term objective of a million hectares of land developed still exists.

There are two points of concern from the perspective of this paper. The first is the extent to which the original PUTL concern for ecology was motivated essentially by a perceived need to have an EIS available, since it was hoped that foreign agencies would fund parts of the development. Second, after foreign donors actually did become seriously involved (from late 1975), has their work taken into account the range of environmental issues?

Somewhat to the frustration of Indonesian scientists involved, PUTL clearly was interested in an environmental approach couched in standard terms that might prove acceptable to foreign donor agencies. For example, there was a strong emphasis on Leopold matrix techniques and the USAID environmental assessment guidelines, with the hope that university groups could relatively quickly produce a single final project report. The university groups pointed out the need for long-term, management-oriented work once the initial exercise of problem identification had been undertaken. The need for broader objectives than rice cultivation was repeatedly stressed. Although PUTL still perceives its role as an initiating rather than as a management agency, the now-established trend of moving towards more comprehensive analyses of ecology and development concerns is having positive effects. For example, the development agency now takes more care in evaluating brackish-water forest distribution, local-settler land-use patterns, and areas of very marginal soil condition when defining settlement and drainage plans (although problems still do arise). There is a greater emphasis on test farm activities, especially those related to multiple cropping. Ecological concerns are included in training sessions for provincial level drainage engineers.

These trends might have been enormously accelerated by the involvement of the Dutch government aid agency and the World Bank, which in 1976–1977 jointly contributed about US \$6 million in loans and grants to

establish a more concrete physical, socioeconomic, and agronomic field-trial data base for the projects in Sumatra. The terms of reference for this work were established by a joint Indonesian-FAO/World Bank/Dutch Government team. This team focused rather narrowly on certain socioeconomic, soil, water control/microclimate, pest, and disease problems which could influence the growth of a single crop of rice per year. These questions are all valid concerns and the work, although carried out at enormous expense relative to the additional information added, was of limited use in future planning. It is as much the fault of the Indonesian negotiators as of the "traditionalist" composition of the foreign team that broader terms of reference were not established to include, for example, the Indonesian environmental teams, or to bring in outside advisors in addition to soil scientists, agronomists, and coastal engineers. Certainly it would appear that the World Bank Environmental Office had either not been consulted or did not have the opportunity to alter the terms of reference. An alternative perspective on this case would be that the Indonesian agency received exactly what it wanted, without the encumbrances of a comprehensive environmental analysis independent of its own preliminary work.

As a somewhat bizarre contribution to the process of environmental analysis by foreign agencies, the swamp-land development became one element in a U.S. legal suit brought by the Natural Resources Defense Council against the US EXIM Bank. Their intention was to force that organization to include environmental concerns in their analysis for funding. The EXIM Bank provided credits for the United States-made dredging equipment used to dig canals.¹⁷

Upper Solo River Land Rehabilitation

Perhaps the most critical environmental issue on Java is the creation of stable, soil-conserving ecosystems throughout the highlands. There has been no adequate land use regulation since the Dutch colonial period and even then there were some erosion problems in the highlands. The lack of agricultural land for an expanding population, and the past periods of strife during which people fled to the hills, have been important contributing factors to forest cutting and to extension of dryland farmland on steep, easily eroded slopes. As noted previously, the problem is of such magnitude that the government by 1977 was spending more than US \$50 million per year on a massive reforestation and greening program throughout the country. In addition, the large sums of money committed to irrigation rehabilitation are, in part, to undo the damage caused by the deposition of soil and to lessen flood damage caused by too rapid runoff.

To these figures may be added the lost income and employment opportunities on the degraded lands surrounding highland village communities.

Creating a conceptual management framework that could serve as a model for highland rehabilitation projects was a goal of a very significant UNDP/FAO environmental management project in the Upper Solo River Basin of Central Java.¹⁸ The Solo River is the largest river on Java and its upland watersheds include some of the most damaged areas. This project was initiated through the Director General of Forestry in the Department of Agriculture. The resident staff of Indonesians and foreign consultants has included specialists from many disciplines, with a watershed economist as the principal integrator of information. The approach has been to engage in pilot projects involving local people in order to create what it is hoped will be reasonable standards of cost and manpower for inclusion in government "package" programs used in "re-greening" or rural development projects. The project leaders recognize the need for alternatives where forestry, agriculture, and animal husbandry are more appropriate, since small plots of land (generally less than two hectares) are the most common size of holding.

This work, conducted at varying levels of intensity over seven years, is a relatively low-cost operation in comparison to many projects for water basin development. It offers considerable potential as a demonstration and training activity in addition to the direct policy spinoffs that are now occurring. As a type of environmental assessment that provides detailed, generally pragmatic answers it deserves careful scrutiny. It is the kind of research activity that should be contemplated as part of any major land or water resource project. Yet it is almost unique within the country as an example of a functioning, integrated upland-management project.

How do Indonesian and foreign bureaucrats and scientists alike learn and adapt from an environmental management project like this? At first there was concern that costs were too high for wide application. And there is a general worry that the results from one watershed cannot be applied to a country-wide, or even province-wide program. For the first years of the project these concerns were so strongly felt that even the sponsoring government department did not pay full attention to the experimental work. A second problem was the inability of the foreign project personnel to communicate across departmental barriers to include the Director General of Water Resources staff in their efforts. A full five years passed before a reasonable level of communication was established. Now middle-level managers and scientists review findings through visits to the experimental sites. The World Bank has followed up the project with a very large-scale project based on the work. Within BAPPENAS and the na-

tional coordinating committee on the Reforestation and Regreening Program there is rapid feedback of results into policy, and the stimulus for further experimentation. The work is finding its way into university curricula as well. Senior staff in several universities have reviewed individual elements of the study for the sponsoring government department. Such material forms the main source of up-to-date information available to students on problem solving in their own environment rather than by North American or European textbook examples.

Regional Development Planning

Regional planning and environmental analysis are, of course, closely related in both objectives and study methodologies. The Indonesian government has created a two-tiered system of regional planning units: at the provincial level (BAPPEDA), and at the *kabupaten* or county level (BAPPEMKA). In addition, each of the major cities has an urban and regional planning unit. Several central government agencies interact with these local government agencies: the BAPPENAS Division of Regional Planning, the Ministry of Public Works Directorate of City and Regional Planning (*Tata Kota dan Daerah*), and the Ministry of the Interior, which is the line agency responsible for local government activities. There have also been several major resource-oriented regional studies conducted by the Ministry of Agriculture. Finally, the BAPPENAS Bureau of Natural Resource Management and Environment is training specialists within provincial BAPPEDA units in techniques of environmental assessment, in the hope that these staff members will become the logical assessors for local projects.¹⁹

Indonesia has been divided into a number of macro regional planning units for which extensive studies have been prepared by foreign study teams, funded through donor agencies, working with *Tata Kota dan Daerah* in the Ministry of Public Works. World Bank funded the second phase of a study on the southern provinces of Sumatra originally carried out with West German government funding.²⁰ The Canadian International Development Agency (CIDA) has funded two such studies: a regional analysis of the small islands comprising much of Eastern Indonesia, and a similar analysis of the five provinces in Sulawesi.²¹

An example of a regional approach primarily oriented to resources is the FAO/Department of Agriculture South Sumatra Land and Water Resource Development Project.²² This study, conducted between 1972 and 1974, attempted to produce model development concepts for upland and lowland ecosystems over a five-million-hectare area. In theory these

types of studies provide an ideal opportunity for identifying critical environmental issues at an early planning stage, for defining optimal source management studies, and for bringing together social and ecological concerns. Two studies will be examined to show (1) how comprehensive the large regional analyses attempt to be, and (2) how a very modest conceptual approach can be effective.

Eastern Indonesia

The CIDA-sponsored study of Eastern Indonesian environments and opportunities for development was a comprehensive effort completed in three stages of writing over a four-year time span. Several environmental specialists in fields such as fisheries, forestry, water resources, and land management were involved. The topics of the main background studies illustrate the breadth of the regional analysis: institutional framework, land resources, water resources, human resources, food and plantation crops, animal production and range management, forestry, fisheries, mining and petroleum, industrial development and trade, transportation development planning and policy, banking, finance and credit, marketing, and social services delivery.

In such studies there is always a concern whether breadth is accompanied by depth of analysis and whether there is sufficient focus on specific geographical units. The latter point is especially important in dealing with variation among the islands of West Nusatenggara. The study, in fact, does bring out many of the differences, especially in the degree of damage from shifting cultivation, in unexploited water resources, and in the current stock of forest resources. There is also a considerable body of information on differences in farming practices. The important topics of village sanitation and water supply are not given especially noteworthy treatment.

The common complaint against all the regional planning studies undertaken in Indonesia is that they fail to achieve more than a general level of understanding. On some topics the collated information is already known to decision makers. Furthermore, since much of the information is gathered by foreign scientists and planners, there are misconceptions and sometimes reservations about projects already planned or being implemented. This leads to controversy in findings and in the priorities set forth in the regional studies. Furthermore, it has been found that the data base brought together in a massive effort over a fairly short time span can become quite obsolete before recommendations are fully digested and acted upon. This problem is further complicated by the rather poor procedures for ensuring wide distribution and debate about the study results.

Although training is considered an important element by both CIDA and the Indonesian government, there has not been the number of trainees required to ensure an ongoing, high-gear approach to implementation.

Despite these critical comments, which are rather widely held views, the regional planning studies clearly represent an important stage of environmental analysis. They are the first serious endeavors to present a recent, comprehensive portrait of both the existing resource and social conditions in major regions of the country and the processes that are changing these conditions. It should be pointed out that in none of the studies so far conducted is environmental impact assessment of existing projects singled out as a topic for special consideration. Instead, the assessments are scattered throughout various documents. Certainly the Eastern Indonesia study has been written with an ecological approach to management, perhaps because the authors feel exploitation of natural resources must continue to be the mainstay of existence in these islands.

The large, multiprovince regional planning studies can be helpful to agencies seeking to identify high priority projects for future assistance. However, until they can become part of an ongoing evaluation/planning process that can influence individual government departments, their effectiveness will be limited. Until recently the regional studies had a firmly established end-point: the production of bulky documents without a concrete plan for implementation. The plans are not directly produced for the BAPPEDA network but for the Ministry of Public Works. With specific regard to environmental analysis, the shortcoming is the absence of any mechanism, other than a one-time suggestion, to influence or monitor ongoing development efforts. Quite likely this phase of fairly massive regional analyses will draw to a close with follow-up work that will be more linked into specific provincial planning networks. Certainly there are significant opportunities for environmental inputs in such programs if sufficient attention is paid to diversity of staff so that qualified environmental planners are included as well as regional planning experts.

JABOTABEK

The Jakarta urban area and the surrounding communities of Bogor, Tangerang, and Bekasi are home to more than 7 million people. Over the coming generation this population will expand to form one of the major urban complexes of the world, with a population which may reach 13 million. The city is subject to flooding, which appears to be increasing in severity as ecological damage increases in the hills behind Bogor. To the south, east, and west, and in the waters of Jakarta Bay, there is still a rich production base which is important to meet food needs of the city. For

these ecological reasons, plus the normal reasons of transportation coordination, water supply, land planning for industry, housing, and recreation, the time had come to establish an urban regional authority.

A six-week workshop, sponsored through Dutch funding, to provide an upgrading exercise for planning officials in the province of West Java, furnished the spark that led to an explosive rate of activity to create such an authority. The workshop produced a document entitled JABOTABEK. This outlined the likely rate of growth of the urban complex, the environmental constraints on future development (including the presence of large floodplains, with a poor structural foundation for building on either side of the city), and current needs for sewers, improved railroad linkages, etc. The name and concept were rapidly approved by the Governor of Jakarta and local community governments. They received strong support from the Governor of West Java and the Ministry of Public Works. There is now a full-time JABOTABEK regional planning staff, and manifestations of their efforts are beginning to appear. This is an example where a very small initial financial and technical contribution was able to focus an important problem in a way that was both understandable and palatable to decision makers. It must be considered one of the more useful environmentally based analyses, although the original document was hardly more than a sketch outline.

Industrial Development Projects

Most of the industrial projects being undertaken in the country are joint-venture efforts, or involve foreign management teams working on contract under Indonesian counterparts. Often there is a contractual agreement between bilateral or multilateral aid programs and private foreign companies. On the Indonesian side, industrial corporations may be either state-owned or private companies. There have been massive misdealings by management in some of these companies — with the state-owned oil company PERTAMINA heading the list. From an environmental perspective there are several issues. One is simply whether there is a commitment to prevent pollution. Or is the theme of the developing country being too poor to install such equipment the prevalent view? The second question deals with workers' environments. Are good industrial health standards enforced by the companies and government inspectors? The third point concerns the large-scale industrial projects that radically alter local economies. Do such projects (eg, petrochemical complexes, integrated logging operations, mining communities) develop environmental assessment guidelines that take into account resource and social

impacts and consider alternative strategies for dealing with the problems? Unfortunately it is difficult to pick "representative" examples to answer these questions because there is a great deal of variation in the degree of attention paid to resource and environmental concerns by foreign-funded corporations.

Certainly the large number of industrial projects created in the mid-1970s were beyond the monitoring ability of BAPPENAS or any other agency's environmental staff. There appeared to be some concern on the part of the Ministries of Health and of Manpower to establish good industrial environments for workers and to minimize pollution. There have, however, been more or less serious incidents of pollution (eg, the Gresik Petro-chemical Plant, which in the early 1970s destroyed production in brackishwater fish ponds in East Java by discharging chemical wastes) that appear to be the result of a "pollute and be damned" philosophy. This would seem to be a very poor strategy nowadays on the part of any joint-venture business, since the reaction of the government is reasonably firm and negative towards polluters causing economic loss to primary producer communities. These plants are very visible targets, and sooner or later any major polluter is likely to be subject to direct negotiation with government. The opening of an industrial park in Surabaya that is touted by its sponsors as a pollution-free endeavor is a sign of the changing times.

What is more uncertain is the degree of concern for equipment maintenance and routine management needed to reduce, or to cope with, unexpected spills. The port of Cilacap has a new refinery designed to process cheaper, high sulphate Middle East oil for domestic consumption, in place of higher-priced Indonesian crude, which can be shipped to Japan. The refinery and port facilities were to utilize good pollution control techniques. Yet monitoring by Indonesian scientists indicates a fair degree of pollution is taking place. This continuing type of pollution resulting from routine operations is the most difficult to properly evaluate since effects on the fisheries or mangrove forests may be gradual.

The World Bank-funded urea fertilizer plant on the Musi River near Palembang, South Sumatra, is another example where pollution-control devices have been installed yet may not be entirely effective. In the original project document prepared by the Bank, environmental impact assessment occupies about a paragraph and essentially is without value, since it fails to fully describe the resource base which could be affected by a pollution incident, and since it does not fully develop a management scenario for such an incident. In fact, local residents and fishermen complain about massive kills, in the vicinity of the plant, of the very valuable *Macrobrachium* river prawns which migrate up- and downstream past it. The kills are claimed to be a result of discharges from the plant. In what is

typical of the limited technical-manpower situation, the Oil and Gas Research Institute (LEMIGAS) took more than two years to establish a monitoring program for the Musi River. The question is whether a major industrial project costing in excess of US \$100 million should not have a resident scientist to be concerned with environmental impacts on area resources. In contrast, the giant INCO operation to develop a nickel mine in a remote area of Sulawesi has retained local and outside experts to advise on certain impacts of their operation. This sensitivity to environment and to social impacts associated with the mine is evolving partially in response to Indonesian government scrutiny.

The forest industry in Indonesia is well known to most embassies as one of the most chaotic and graft filled areas of investment activities. There are some remarkably good corporate industrial concerns (eg, Weyerhaeuser) which clearly hope to develop a long-term stake in forest exploitation and secondary processing of wood products. But the greater numbers of concession holders have not fulfilled terms of their agreements and likely are most concerned about immediate profit taking. In this situation, what responsibility do embassies feel to police their national companies? Without detailed knowledge of the interactions within specific embassies it is difficult to provide an answer to this question. Superficially, at least, the answer is that no significant effort is made to induce companies to take a better approach to forest management. However, some major commitments to improve forestry practices have been made by donor agencies working directly with government departments (CIDA has been especially active).

These observations touch only the surface of environment and resource issues involving foreign corporations active in Indonesia. As a final note, it is important to review potential regulatory channels involving industrial development. One is the approval by the foreign investment review board. It was suggested by Aden (1975) that this review board is an important obstacle to including environmental concerns in projects. This may have been true at some point several years ago but is not the case today. Secondly, the virtual freedom enjoyed by PERTAMINA to plan and execute massive programs, often unconnected with the oil industry, has now come to an end. Certainly in the period prior to 1975 the degree of resource and environmental concern associated with this company's projects (and those of its many foreign contractors and subcontractors) varied greatly. Finally, it should be noted that the continuing efforts of a small number of Indonesian environmental scientists have been very influential in keeping the topic of industrial pollution visible to senior decision makers in government.

Public Health Projects

The final category of cases to be briefly reviewed covers a variety of human ecology issues: malaria control, urban and rural water supply, and sewage disposal systems. Each of these problems can be considered as a form of environmental management in addition to any associated environmental impacts. The malaria control activities involve increasing use of DDT in house spraying (the compound does find its way into village marketplaces for agricultural use, although this use is illegal). Both USAID and WHO are involved with malaria control. In addition there have been various epidemiology study teams commissioned to do basic ecological research on disease vectors and their control. There are no direct environmental impact assessment studies associated with disease control projects.

Certainly a guarantee of good drinking water and careful disposal of human wastes are two of the most important environmental issues for Indonesia. The problems are serious in both city and village and are not always amenable to standard engineering solutions. For example, burying wastes instead of directly discharging them into fish ponds or flowing water will reduce a valuable nutrient source in an agricultural economy where organic nutrients are in limited supply.²³ In land development projects little attention has been given to low-technology means of supplying good quality drinking water although this can be the most important limiting factor in the settlers' view.

In cities, however, marked progress in the development of water supply and sewage systems can be expected in the coming decade. There is already a heavy involvement of foreign agencies in attempting to expand antiquated city water systems (eg, Colombo Plan Seven Cities Water Project) and in providing sewage systems appropriate to the needs of cities like Jakarta and Surabaya. UNEP is concentrating its inputs to Indonesia on urban *kampung* improvement projects—to improve the quality of life for the millions who live in very crowded villagelike settings within the cities.

In this work there are opportunities to enhance existing food production chains dependent on raw sewage and the eutrophication of sewage-laden waters. Whether these existing production systems (which include hydroponic crop production, fish production, and harvesting of aquatic weeds for pigs) will survive once a major sewage project is established is questionable. Studies are also needed on the impacts of any sewage outfall on water quality and on fisheries. These should be issues raised by foreign contractors who have worked on Jakarta and Surabaya water and sewage disposal problems. In the Surabaya case, environmental studies have been done as part of river basin studies funded by the British Government aid

organization working in conjunction with the Ministry of Public Works.

GENERAL OBSERVATIONS

The foregoing examples leave little doubt that a dynamic interaction has been established between Indonesian government agencies and foreign donors on environmental concerns. However, formal environmental impact statements do not figure prominently in most work. Instead, assessments tend to be done in a more traditional context such as land or water resource planning or urban planning studies. For the many foreign donor agencies which have engaged in such activities over the past decades, then, are there emergent concerns or approaches which are definitively different as a result of Indonesian or foreign environmentalism? Two trends appear evident. One is the increasing interest in regional studies and integrated rural development projects. By their nature such interests require detailed consideration of environment and of the interaction effects associated with different resource uses. The studies and/or management programs require large, multidisciplinary teams, generally working over time spans of two to five years or longer.

The second trend is a gradual tightening of the regulatory framework within which development projects are initiated. The pressures are coming from both Indonesian and foreign-agency central offices. Despite the existence of many resource and environment laws and regulations on the books there has been a vagueness about their application. Foreign and Indonesian development agencies have responded to each situation on an ad hoc basis with no fixed policy. This allows flexibility to test strategies on each side. Over the five-year period from 1970 during which environment became a major identifiable concern this may have been the most appropriate approach. By about 1975, however, Indonesian environmental strategists had sufficient backing and prominence that they could, and would, enforce certain standards on pathways of development, although they still cannot cope with the full load of existing and planned projects.

Environmental Law

Environmental law per se has not figured prominently in any of the projects reviewed, nor are legal proceedings likely to play a very significant role in the future (with some important exceptions relating to the sea). Existing laws include statutes from Dutch colonial times which, in some cases, are outmoded or impossible to enforce. New laws (eg. govern-

ing water pollution control in Jakarta) have been unrealistically stringent and difficult to enforce. The fundamental concept of sustained yield resource use is a part of the 1945 Constitution which is the present-day basis for law-making. Even with the inevitable introduction of more environmental legislation now in preparation, there will be little change from the present situation without a real change in enforcement capacity. Certainly there will continue to be aggressive pursuit of offshore marine polluters (the major foreign case so far has been the tanker grounding in the Straits of Malacca) and of unauthorized foreign fishing vessels. On land, the existence of strong antipollution laws may influence both joint-venture and Indonesian corporations to install appropriate control equipment. However, routine maintenance and monitoring to prevent chronic sources of damage are much less easy to establish through legislation.

Traditional *adat* law provides quite a different perspective on environmental law, for much of this unwritten code is concerned with resources and allocation processes.²⁴ *Adat* law dealing with resources is strongest in parts of Sumatra where local chiefs have had, in the past, very tight control over land, forests, and fisheries. Resource use is by renewable license rather than by outright ownership. Obviously there can be great abuses and concentration of wealth through such a system. Yet it does provide a means for preventing overexploitation of resources and for implementing management concepts. The grip of traditional law slips as each new project is initiated in an area and as forest or agricultural concessions are given out. Undoubtedly some multilateral and bilateral agencies would prefer to work more directly with villages still under traditional law. There are real constraints in doing so since all such activities are rigidly controlled by the Department of the Interior.

Agency Interaction

While the general trend within planning and regulatory elements of government is clearly towards a more responsible use of resources and environmental protection, to the degree that that objective is possible, the fact remains that the executing departments have widely varying interests and capacities to engage in environmental assessment. Furthermore, there are many examples of a lack of coordination, or vacuums in responsibility for particular problem areas (eg, field-level water management). Thus an agency like World Bank or USAID may face quite different levels of interest or expertise on issues of land development depending on whether its staff are working with the Ministry of Public Works, Agricul-

ture, or Manpower and Transmigration. The absence of an environmental protection agency, or of a single land and water resource development department, has certainly been a shortcoming in this regard, although for other reasons the loosely coordinated network operating through BAPPENAS and the National Committees on Environment and on Resource Inventories does have some special advantages.

The office and function of the Minister for Development Supervision and Environment are obviously intended to provide such coordination in much the same way as the Minister of State for Research was to work after its establishment in the early 1970s. The latter was more successful in filling gaps such as in remote sensing rather than in direct influence on departmental policy. The obvious strategy for the new minister would be to concentrate effort by taking over prime operating responsibility on an interdepartmental program where a large funding base is already available. The Reforestation and Regreening Program for restoring eroded watershed areas is one candidate in desperate need of such attention. Because the minister has no definitive powers for prosecuting polluters, companies which mismanage forests, or other environmental offenders, he will only be effective in such matters if close coordination with Justice and appropriate management departments is maintained.

One outcome of the growing number of resource and environment studies in so many departments is a massive accumulation of information based on foreign agency and Indonesian consulting reports, regional studies, research institute papers, etc. This information base is not freely available since most of it exists as limited-edition internal reports on specific projects. Often similar studies are conducted in parallel, or conducted without reference to relevant prior work. Serious academic analysis of much of the data would be desirable but this is rarely accomplished. It is ironic that, at a time when development agencies are spending many millions of dollars to provide detailed understanding of individual facets of Indonesian environments, the efforts to provide overviews or critical evaluation of studies have been very limited. Thus the badly needed updating of the colonial-era studies on resources and of approaches to their management is only beginning to take place. The regional development studies, which are certainly the most ambitious attempts in this direction, generally fall short of their objectives—partly because problems of time, language, and lack of access to all sources of information limit information collation, and partly because there has not been a particularly fruitful interaction between Indonesian academics and foreign planners in these studies. Certainly the line departments that commission planning studies do not always have the capacity, even when drawing from their research institutes, to form strong Indonesian teams to evalu-

ate and direct data synthesis efforts.

Research Structure

The case studies described above do not directly touch on the role of foreign donor agencies in the improvement of government research facilities. Each department has a research coordinating unit (*Puslitbang* — see below) and associated research institutes. In addition there are research units located directly under nondepartmental agencies of government, such as the Indonesian Science Institute (LIPI) and the Minister of State for Research. The major institutes related to resource and environmental concerns are shown in Appendix A. The spread of environmental research among such a variety of institutes is a reflection of the general strategy for environmental management.

Foreign-donor programs to assist research are generally limited to a specific institute and, frequently, to individual programs within the institute. Programs of assistance are of limited duration and always have a significant training component in the terms of reference. The first big wave of foreign-donor assistance to these institutes in recent years started in the period 1970–1972, with most ending between 1975 and 1977. More massive commitments are likely in the near future, particularly for agriculture, water resources, and remote sensing. In part this is a consequence of the recently evolved *Puslitbang* (Center for Research and Development) concept. These units have only been in existence since about 1976 and, thus, are only gradually developing their approaches to external funding agencies. Given the long lead time of developing research capacity, some of the initiatives being taken now may be expected to bring about fully functional research groups by the late 1980s. An indication of the massive gap between existing manpower and anticipated needs is provided in Table 1. This period of major expansion in research should be a time in which priorities can be reordered and attention given to training needs for environmental management specialists. These topics will be considered in some detail at a later point. In general the opportunity to create innovative approaches in research is being neglected by both Indonesian and donor agencies.

Research involving funding from donor agencies and teams of foreign experts runs into the following difficulties:

1. The job post is of limited duration so that even if an outstanding team can be assembled it is disbanded before full objectives can be achieved.

TABLE 1. Estimates of Existing and Required Scientists for Various Natural Resource-Related Fields^a

Fields	1975		1985
	Available	Required	Required
Agriculture	6700	18,500	55,800
Energy and Minerals	250		11,600
Public Works	400	1700	5900
Ecologists			
Universities Ph.D. level			120
Research Institutes			190
Total			
(including universities, institutes, government departments, projects)			
Ph.D. level			300
Bachelor, Master			2000

^aEstimates based on figures in Djojohadikusumo (1977) and a Workshop on Ecology held in 1977. Agriculture estimates include all levels of workers. Less than 1000 have been trained to a Master's level.

2. The research and management objectives are separated in ways which reduce the effectiveness of research inputs.
3. Constraints are placed on topics or approaches which may be followed by research staff, sometimes through terms of reference which are unduly limiting.

In addition there are difficulties in assembling necessary equipment and coordinating field activities; and, of course, in any major venture there are communication difficulties and stresses beyond those that might be anticipated in other settings. These observations are important because, taken together, they severely limit the effectiveness of any large interdisciplinary team of foreigners. Some of the most valuable inputs have come from smaller teams or individuals with flexibility in the ways they may operate.

In many parts of the world the trend is to develop large teams for environmental assessment involving either specific projects or more fundamental research endeavors. Given the above-mentioned hazards to this approach in Indonesia, donor agencies may well ask why they should fund such endeavors as regional planning studies, or burden existing large project teams of all sorts with new components involving the environment. It is also relevant to place realistic limits on Indonesian institu-

tional capacity to absorb foreign teams, especially in land and water resource development research. Certainly, however, it is worthwhile to continue experiments with environmental research teams, as well as to identify strategically placed individuals who can be trained in assessment techniques.

It would be remiss not to mention the vital role university, LIPI, and other research institutes' staff have played in promoting environmental issues throughout government. The institutions include senior biologists and physical scientists who spend much of their time engaged in practical discussion of environmental policy implementation. Their participation is significant in several ways. An observation frequently made is that the Indonesian government has a greater concern for the environment than appears to be the case in some other developing countries. In large part this reflects the steady pressure of the well-trained senior research scientists and university professors. The fact that Indonesian scientists are willing to and can focus their efforts on development issues leads to productive situations in which detailed advice can be made available to government planners. Appropriate programs of assistance to encourage this interaction could do much to improve management capacity within government.

Costs of Environmental Considerations

The cost added to a project by environmental considerations, and through subsequent management recommendations, could conceivably be a heavy additional burden. The usual counterargument, of course, is that unanticipated environmental damages can result in high expenditures that might have been prevented through careful planning. Before reviewing actual costs associated with some of the case studies, more general observations about development financing in Indonesia are in order. Perhaps the most important observation is that costs for almost any project—whether industrial or rural development—are exceptionally high compared to a developed-country situation. Furthermore, on some projects no matter how much money is available successful completion may prove difficult. If a project achieves a certain level of visibility or urgency (eg, resettlement areas for people moved from dam sites) money spent becomes secondary to the problems of achieving the final objective on schedule. It should also be noted that the more complicated the procedures or equipment required (whether for environmental concerns or for other purposes), the greater the likelihood of a major breakdown in the complicated budget procedures, customs clearance and other time-

related factors. Taking into account these observations, the total cost of environmental concerns, if figured at the same proportion of overall project costs, would be expected to be higher in Indonesia compared to developed-country settings. In fact, considerable reliance is placed on informed opinion rather than on expensive field monitoring for much of what has been discussed as environmental assessment. Thus expenditures appear to have been kept to relatively modest levels, unless the overall costs of soil survey work and engineering site testing are included.

The budget for swampland development is an interesting example to review because it is considered by the Indonesian government to be a relatively low-cost approach to opening new agricultural land. Even with the very expensive soil and coastal engineering survey work, the costs associated with design are less than 10 percent of the total project cost. Ecological studies (exclusive of soil studies) paid for by the Ministry of Public Works and conducted by university staff have cost about US \$75,000 to US \$120,000 for each land unit of about 100,000 hectares. The Musi-Banyuasin delta swampland development area is also proposed to be used as a seaport area with a 75-kilometer connecting road over the unstable delta surface to the existing river port of Palembang. The costs of each type of development would total well over US \$150 million. Clearly an investment of this magnitude in a relatively unstable coastal environment deserves considerable planning expenditure. The feasibility analysis for the port was conducted by a United States contractor on USAID funds at a cost of approximately US \$300,000. An environmental impact assessment was stipulated in the terms of reference. The assessment probably consumed 10 to 15 percent of the total contract funds.

Moving to a higher level of expenditure for studies, one might question the cost effectiveness of regional planning studies on the monumental scale of those described for Sumatra and the two areas of Eastern Indonesia. These studies cost perhaps US \$1.5 to \$2 million or more each. In the most realistic terms of development aid, however, these costs are still likely to be relatively small in relation to those of the projects that it is anticipated will materialize as a result of the studies. The costs for running pilot projects on environmental management would be expected to be much higher than costs for environmental assessment studies. This level of experimentation is particularly significant for many donor agency activities where it is anticipated that regular government funding will be available for proven concepts. For upland watershed pilot programs the cost figures range from about US \$80,000 per man-year for information synthesis studies up to perhaps US \$750,000 per year to maintain a small foreign team doing field studies. These figures, while large, should be considered in relation to irrigation loans of US \$100 million (World Bank

Irrigation X) and Indonesian commitments of US \$50 million per year in upland reforestation.

It is very difficult to locate accurate information on costs for purchase, installation and maintenance of pollution prevention equipment in Indonesian industrial operations. For the large fertilizer manufacturing plant built in South Sumatra it is estimated at 2 percent. It would be very useful to monitor these costs in several operations to accurately determine what fraction of total capital budgets and operating costs are involved. Such monitoring would also be valuable for land development and settlement projects. A World Bank financed upland transmigration site at Baturaja may prove to be the first location where relatively complete information will be available.

Work on another approach to economic analysis is also needed. This is the assessment of economic opportunities lost through failure to exercise alternative options, or as a result of environmental changes. It has been very difficult, for example, to encourage good analysis of trade-offs involved in the transformation of forest to agricultural land use, or of the economic impacts created by pollution problems.

As a final note on money spent for environmental concerns, one may predict that such expenditures will become a major item in future statistical reporting. The levels will depend upon what is included as an environment-related expenditure. On a 1977 list of recently proposed and approved World Bank projects in Indonesia is a US \$40 million project labelled Jakarta Environmental Protection. This project is to provide a sewer system for part of the city. If this type of project is added to land and water resource development, surveys, and urban development projects, a very significant portion of the total aid budget could be labelled environmental management.

Special Role of USAID in Resource and Environmental Assessment

Of all the foreign development agencies active in Indonesia, USAID is certainly the one most pressed within its internal channels to conduct comprehensive environmental analyses. In addition to requirements of environmental impact assessments, project development officers must now also prepare and take into account social impact assessments. These are, of course, interrelated in concept, although separated in operational terms of references. Certainly these additional burdens have not always been gleefully received by USAID field staff. The addition of an environmental assessment specialist to the field office, however, changed passive conformation to a reporting requirement into a more active concern for

creating appropriate environmental assessment techniques.

The virtues of a formal North American-influenced approach to environmental assessment and to the related concepts of social soundness assessment certainly remain open to question, especially if, through these assessments, groups in North America develop a capacity to stop project funding on the time scale possible with domestic United States projects. The importance of meeting deadlines for completion of projects cannot be overemphasized in a country like Indonesia. There is a strong political element, of course, in achieving planning goals. Avoidance of nonproductive use of scarce planning and management expertise and the need for time-coordinated completion of complementary projects are more fundamental reasons for concern about preparing environmental impact statements. There is also the important question of appropriate standards to be applied in project assessment. Perhaps on this issue more than any other is there potential for severe differences of opinion between Indonesian and U.S. project assessors.

While the role of environmental impact assessment may be nebulous for years to come, there are certainly other USAID approaches to resources and environment which deserve highlighting. One is the ability to link Indonesian agencies into the Environmental Protection Administration and other U.S. government apparatus for specific consulting and other needs related to technical matters such as oil pollution. A second includes the important initiatives the agency undertakes in rural development and agricultural production expansion. There is receptivity to undertake land rehabilitation, environmental protection of watersheds, and integrated resource management schemes. Unfortunately, for years to come these will be among the most difficult of any programs to implement.

Another major area of commitment lies in the support of educational institutions such as the important network of agriculture-oriented universities. The long-standing USAID fellowship and other support of the Bogor Agricultural University, for example, has produced a remarkably varied resource and environment staff. In addition to the normal range of agricultural scientists, there are foresters, oceanographers, and fishery experts, and at least some staff trained in resource economics. Finally, through USAID there have been opportunities for scientific exchanges which have had substantial impact on various elements of environmental activity in the country. In 1972 the National Academy of Science of the United States and LIPI cosponsored a workshop on resources and environment, which for the first time brought together Indonesia's leading environmentally oriented educators, scientists, and government decision makers. This meeting served to coalesce concepts that became the basis

for a remarkably wide-ranging and ongoing series of internal Indonesian meetings. These have, in effect, become the forum for debate on environmental policy issues. Such positive contributions towards clarifying and resolving environmental management concerns should not be overlooked in the overall assessment by United States-based groups of the "environmental soundness" of USAID programs.

Future Directions of Indonesian Government Environmental Assessment

The Indonesian government is continuing to be receptive to environmental assessment as a part of project planning. One of the next stage of activities has been to identify major projects involving donor agencies and/or multinational corporations which require more careful examination as Indonesian capabilities for assessment increase. It should be possible for foreign agencies seriously interested in creating improved environmental assessment processes to agree upon programs with Indonesian government offices. Without such agreement, there will likely be some dissatisfaction on both sides. The Indonesian government will be faced with uneven inputs and, of course, must meet the major question of having its development priorities examined by criteria that may be disagreeable to the government. A fact of life probably for any country that accepts external assistance is that it must sometimes submit project plans to scrutiny in ways it considers objectionable. As often as not the response to such scrutiny is to confuse issues, or even to push ahead rapidly on the contested matter as a deliberate response to outside interference. Certainly these actions are conceivable should there be a strong outside influence delaying decisions on development project funding.

As the projects reviewed above have shown, there is a far greater amount of money and effort being spent on resource and environmental management projects, and on resource inventory, than is ever likely to be spent on formal environmental impact statement-type analyses. While there is a continuing role for improving EIS procedures, donor agencies should not feel that they have adequately fulfilled responsibilities in environmental assessment by simply forwarding an EIS with the completed project plan. Certainly monitoring and adaptive assessment during the life of the project are important. It is necessary to bear in mind just how experimental are most tropical development projects. One of the most important achievements of environmental assessment efforts would be to link broad hypotheses of development to the specific constraints which, individually or together, make projects winners or losers. The greatest needs involving rural development in Indonesia are workable models for

(1) upland rehabilitation on Java and on some parts of other islands, and (2) integrated resource use programs involving agriculture and forestry over large expanses of potentially arable lands on Sumatra, Kalimantan, and Sulawesi. In both rural and urban areas the attention to public health and well-being, through water supply, waste disposal, housing design, vector control, and other programs has been approached on an issue-by-issue basis that fails to perceive impacts such as the removal of sewage nutrients on agricultural systems, or to fully explore alternative approaches to vector control, water supply, etc.

Ecological inputs are needed for every type of resource management, ranging from insect population dynamics to forest growth dynamics and sustained yield of fisheries. The great diversity imposed by island biogeography and the complex mosaic of land use requires locally based ecological principles in any type of development. Cultural diversity and the presence of dual economies require much more effective interaction among social science advisors, resource and project-oriented economists, and natural resource planners than has been the case in the past. There is nothing new in the call for such interaction. But, as the experience with regional planning and many of the Indonesian transmigration activities have demonstrated, integrated planning and management approaches are very difficult undertakings in practice. Yet these long-term efforts towards more intensive environmental management are perhaps the only means for ensuring that environmental assessment recommendations can be implemented.

Quite likely the evolving procedures for environmental assessment will find their most successful immediate applications on the large industrial projects being undertaken with foreign assistance. Perhaps the problems of maintenance and periodic accidents discussed previously may be counter-balanced by the opportunities, sometimes associated with large capital investments, for improving local environments. There are always two points of view: (1) that such investments will destroy traditional ways and create dependencies which may produce only temporary benefits or even create long-term social costs; or (2) that, properly planned, these investments can upgrade local community environments, enhance the local value added to resource products through advanced processing, and bring in revenue which can support better management or environmental quality parameters. These arguments would be interesting to debate on issues related to many of the new communities surrounding mineral and forest resource centers or industrial projects in Indonesia.²⁵

The three major themes—quality of human settlements, strategies of natural resource management, and impacts of industrial development—will probably rate equivalent status in the future environmental planning

efforts of Indonesia. Individual foreign donor agencies may well set different priorities according to their own project priorities and how they perceive environmental issues. The agencies will likely vary greatly in their effectiveness in dealing with domestic and foreign training to increase the numbers and, generally, the quality of environmental decision makers and researchers. Perhaps it will be possible to develop both guidelines on ways to improve their efforts and some comparative assessment of their performance. Some guidelines are suggested in the following section. The means for comparative assessment require extensive debate beyond the scope of this paper. Certainly there is no government or private organization in Indonesia which is conducting such assessment at the present time.

IMPROVING DONOR AGENCY INPUTS

Staffing

At present only USAID, of all the bilateral agencies, appears to have employed an environmental assessment officer for full-time service in Indonesia. Among the multilateral agencies, FAO is clearly the strongest in bringing together environmentally oriented teams for resource management programs. The World Bank resident staff has never included an environmental scientist. UNEP has concentrated its efforts in Indonesia on *kampung* improvement projects, working through its Bangkok regional office. In the past, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) has stationed a number of environmentally oriented regional advisors in Jakarta, but there is now no active post. Among private foundations and agencies active in Indonesia, only the Ford Foundation maintains a resource and environment position. The conclusion that may be drawn is that while the overall number of foreign-donor-agency and project staff involved on environmental issues is, in fact, rather large, there are only a few directly concerned with improving environmental assessment research and training. There is a chain of secondary consequences, of course. These include a lack of environmental information and guidance for project formulation or evaluation teams, who frequently conduct their work on short field missions; no direct point of contact for Indonesian environmental administrators and scientists; and the absence of staff to properly interpret or to defend priorities that may include alternatives to existing development concepts.

If there were a strengthening of environmentally oriented resident

staff, a number of activities might be included in their terms of reference. One, obviously, would be to monitor whatever form of environmental assessment is required for the agency's projects. Another task might be to provide advice to the multinational corporations working on joint venture activities within the country. There is an important role to clarify the expected standard performance in environmental management for any firm engaging in either project planning or implementation. There is also a role to be played in assessing how well standards and terms of contact are actually being met, either in projects directly funded through donor agencies or in the joint ventures which are often set up with the assistance of the home government embassy.

Resident staff from different agencies in fields such as agriculture and rural development engage in a great deal of informal coordination and communication. This is essential to maintain an understanding of new program directions in the Indonesian government, and to ensure that overlap in funding is minimized. At its best this communication leads to reasonably efficient and complementary use of funds. It is also a means to standardize somewhat expectations when the level of technical and managerial expertise available to tackle specific problems becomes known. The cross-communication between donor agencies is certainly not as developed as it should be even for fields such as those mentioned above. When it comes to the subject of environmental assessment, there is virtually none. For officers who have full-time responsibilities in agriculture, water resources, urban development, or science and technology, environmental assessment is something done to satisfy internal rules rather than being their principal concern. Furthermore, there are not even common grounds in the environmental assessment approaches of different countries. Thus it is not surprising that debate is limited.

If there were resident environmental staff, this situation should change, since their primary orientation would be towards a different set of issues. One of the important outcomes might be a greater emphasis on what is needed to build Indonesian competence in environmental assessment. Both foreign and domestic training opportunities, specifically for resource and environmental studies, as well as donor-funded support for research and environmental monitoring, would become more likely. These topics will be discussed in some detail here since they are critical needs.

Resource and Environmental Surveys

A general complaint in developing countries, including Indonesia, concerns the lack of basic information needed for adequate resource and environmental information. Projects started without adequate information on microclimate, water availability, or soil characteristics may fail. In other instances there may be simply a lack of understanding of the "rightness" of the resource base, as sometimes happens in forestry, in fisheries, and in mining.

The relative lack of resource information, especially off Java, has caused the Indonesian government to give a high priority to survey-type work. This priority gives rise to a rather disagreeable policy, whereby surveys are almost always well funded by the Indonesian government while worthwhile longer-term experimental work is often neglected. The rationale for this policy is that limited technical expertise and funds should focus on learning what resources and problems exist, while leaving some management questions to a later phase of development.

Donor agencies are committing large sums for remote sensing to be used in basic mapping, land use, forest inventory, etc. In addition, there are substantial budgets for soil surveys and water quantity (and sometimes quality) monitoring programs. Related to these physical environmental concerns are burgeoning social assessment programs. The investment in these survey activities is US \$10 to \$20 million for major remote sensing projects and well into the millions for others.

There are worries whether the very large data base acquired in this work can actually be put to good use, since the effort put into training of Indonesians is not always commensurate with either the scale or scope needed. A second fear is simply that massive efforts of a survey nature will fail to be sensitive to specific hypotheses or type of information needed. Scale in aerial photography for forest inventory is one example. At present many of the monitoring devices (eg, for water resources or climate), purchased at considerable expense, gather the wrong information, have been installed incorrectly, or cease to function after a short period. These problems persist even when good technical inputs are available and raise doubts about the effectiveness of any major environmental assessment dependent on such information.

Resource and environmental inventory work must be strengthened without becoming an overwhelming burden to the country. This is one of the most fertile areas for experimentation with combinations of advanced techniques (eg, in remote sensing) and relatively simple field survey/monitoring programs. While traditional standards exist for most land and water survey work, there are many opportunities for innovation. In

North America, certainly there have been advances in ecological surveys during recent years. The relevant parameters for baseline survey of tropical ecosystems, however, are less understood. This is especially true when working in areas where several different cultural groups are present—each with specific patterns of resource use. In such settings (especially in those ecosystems considered marginal in some way) conventional surveys may be very misleading.

The UNESCO Man and Biosphere program (MAB) had the potential and the initiative to stimulate new thinking on ecological analysis. Some of the concepts laid out in the excellent MAB planning documents could be implemented through integrated survey work. Unfortunately, however, there is little hope for direct results through the MAB framework. So far, at least, the MAB Indonesia Committee has not had a sufficient funding base to carry out large projects. Furthermore, it has been difficult to influence ongoing department programs through MAB.

The strengthening of both university and government research and survey institutes in recent years has come about partly through the vastly increased funding available for surveys. Technical staff who only a few years ago worked on outside tasks to supplement meager salaries now sometimes find themselves capable of earning \$2000 per month or more, through large per diem and other allowances associated with field studies. The benefit is twofold: (1) better appreciation of local situations and constraints, and (2) the opportunity for senior researchers to develop good teamwork. The drawback, however, is an emphasis on surveys to the point where good research follow-up rarely occurs. This is a matter of concern to senior scientists who are attempting to improve the balance between surveys and management-oriented research.

Innovative efforts are taking place in new units for environmental study at the universities. These include the Institute of Ecology at Padjadjaran University, the Center for Natural Resource Management and Environmental Studies at the Bogor Agricultural University, the Faculty of Geography and Faculty of Forestry in Universitas Gadjah Mada, and the Department of Biology at the Bandung Institute of Technology. In each case the units are intended to serve as centers for experimentation in the integration of scientific inputs for environmental assessment. They represent logical points for cooperation in establishing new methodologies although it is not their function to take on routine inventory and monitoring functions.

The established resource inventory agencies (See Appendix A) within government are generally receptive to new approaches. However, most are struggling with monumental work loads while simultaneously attempting to upgrade staff. Some probably are near their absorptive ca-

capacity to accept either Indonesian or foreign-donor funds. One of the important ways to influence their future activities will be to train more graduates in broad-based resource inventory and interpretive techniques. At the moment there is no land and water inventory training unit in any major university. One or more such schools, perhaps patterned after models in universities such as Davis in the United States or Wageningen in the Netherlands, are needed as national training centers. One such center, for remote sensing interpretation, has recently been established at Gadjah Mada University on a cooperative basis with BAKO-SURTANAL, the central agency for survey planning involving aerial photography. This center is critical for the successful use of the massive remote-sensing information base now becoming available. At the moment this effort is funded at a very low level in comparison to needs. It is an excellent opportunity for long-term involvement by one or more donor agencies.

The final note on resource inventory/ecological survey assistance, as part of the environmental assessment process, is one of caution. The requirement for better resource inventory before development activities commence can be met only if there are well-trained staff capable of interpreting information over the time frame relevant either to projects at hand, or for regional planning. If these efforts become routine data gathering operations meant to meet a regulation they will be a waste both of funds and of scarce manpower. There is also a danger that proliferating surveys will cover only certain elements of the natural ecosystem or resident human communities, so that critical data are missing or incompatible with some user needs.

Information Synthesis and Analysis

Information overload or, conversely, inadequate information from resource inventory studies represent aspects of the general problem of information synthesis for environmental analysis. Studies done under contract for specific agencies — whether by foreign contractors funded by donor agencies or by Indonesian university and government researchers — do not become available for general use. As previously discussed, this leads to duplication of effort, and conflicts in plans. In universities there is only limited awareness of the data base and of the rapid advancement in management knowledge. Within government the senior environmental policy staff in departments and BAPPENAS are so few in number that they can handle only selected cases such as the examples presented in this paper. The regional planning study teams were indi-

cated to have been partially successful in data integration, yet these are only beginning to establish an ongoing process of analysis.

Foreign donor agencies try in various ways to overcome these information flow and synthesis problems. For example, in 1977 British government aid project staff were required to spend a portion of their time (about one-fourth) engaged in training or other information transferrals outside the project. This may include lecturing in universities or affiliations with government training institutes. The various watershed analysis projects in Indonesia, whether funded through USAID, the World Bank, or other agencies, do bring together information so that it is at least available to project planners.

What is necessary are task force activities based on specific topics to provide both the necessary collation of available information and its analysis for policy making, for teaching, and for distribution among the relevant planners and managers. Ideally this should be a task for the universities or for staff in the Minister of State for Development Supervision and Environment. At present very few staff have the experience necessary to conduct broad-based syntheses of information. Yet it would seem possible to initiate such activities through the assistance of senior foreign environmental specialists attached to existing groups, such as those mentioned in the previous section and, possibly, in some departmental planning units. At another level, the capability of provincial or county (*kabupaten*) planners (BAPPEDA, BAPPEMKA) to assemble information and critically examine the masses of routine statistics available is still very limited. There is a tendency not to treat planning as an adaptive process but to produce, periodically, a master plan that may be comprehensive but not always realistic. The government is strongly committed to regional planning concepts and appears to be encouraging donor agencies to engage in closer interaction with local planning units than has been possible in the past.

The country is establishing training centers for regional planning in the universities as well. Some of these units are sponsored by the Ministry of Public Works and are intended to develop a basis for regional science, which, as perceived by former Minister Sutami, should be a melding of regional planning and ecological perspectives. As mentioned earlier, the desire of BAPPENAS is to place a heavier share of environmental assessment in the hands of these local policy-oriented bodies. Here then is another opportunity to improve analysis—by providing environmental specialists as part of programs related to regional planning at local governmental levels.

Another major need for environmental-information collation and synthesis exists within the developing network of institutes involved in agri-

cultural research and extension services. The Central Agricultural Research Station has a very small staff involved in socioeconomic analysis. The well-established Agro-Economic Survey conducts a considerable volume of such research. Yet the understanding of how local environments influence people's perception and use of resources is still poorly developed. Thus agricultural research proceeds somewhat in a vacuum as to whether the results will be of real value in specific settings. A USAID project to establish agricultural field stations in ecologically distinctive zones of Sumatra is one example that may be used to illustrate both the present situation and the response. These stations would provide sites for adaptive research, coordinated through the Central Agricultural Research Station. It is to be hoped that research priorities would be strongly influenced by the activities and needs of local farmers and of special characteristics of local environments. Yet there are neither the ecologists nor the social scientists available within the research structure to adequately provide these inputs. Interestingly enough, identification of the shortcoming has resulted from the social assessment process now necessary in USAID projects rather than from environmental reviews. What has been suggested as a means of overcoming this deficiency is training of specialists in secondary data analysis who can relate anthropological and socioeconomic research findings with ecological information. These scientists would be assigned to local field stations. One may predict that at least a decade may elapse before such workers could become effective, but this is clearly one very useful initiative that may be of wider interest.

Research Priorities

The commitment to environmental management in Indonesia brings with it a requirement for research on many more topics than those already discussed. It would be difficult in this report to even list all study fields. Yet certain general observations are helpful to clarify strategies that might extend donor-agency inputs.

The first matter is policy toward basic environmental studies, including fundamental ecological analysis. One may assume that for a time much of the work will be done by foreign scientists, affiliated at least nominally and, in some cases very closely, to Indonesian research institutes and universities. The receptivity of the Indonesian government and academics to such research varies case by case. In some instances receptivity would be much improved if the foreign scientists were capable of demonstrating how the basic information could be used in development planning. The use of regional agricultural centers to conduct research on

some fundamental problems is often taken as an example with implications for basic ecological research (ie, define problems of regional significance and support one national or international research facility for the research). This strategy can clearly work for some problems but not for others. Whether there should be international centers established in Southeast Asia specifically for environmental assessment is a question that deserves lengthy discussion.

The case for more involvement of foreign scientists directly with Indonesian counterparts presents several dilemmas perhaps only to be resolved in a generation's time. One is the relative scarcity of Indonesian scientists and their existing overcommitment. Second, as the ranks of the colonial-period scientists diminish, there are probably fewer foreign scientists with a good understanding of the background of scientific literature of Indonesia. Third, the record of foreign scientists actually presenting their studies in literature readily accessible to Indonesians is spotty. Finally, there are some valid concerns over who benefits most. This is true of some genetic conservation work, as one example. Yet even with these shortcomings there can be little doubt of the value of affiliations between developed-world and Indonesian scientists. Much more attention needs to be paid by development agencies to creating these linkages.

Another concern that should be highlighted involves research activities (in some cases conducted with the intention of some further direct action) on the effectiveness, social responsibility, etc. of either agencies or corporations working within a country like Indonesia. This type of activity is often best suited to independent institutions. Is there a role for increased donor-agency support to permit more thorough scrutiny of multinational corporation practices, or those of the funding agency? Such studies could be of direct use to both the Indonesian government and others, although they might well prove to be embarrassing or politically inopportune.

In establishing research priorities both the Indonesian government and donor agencies appear to be focusing objectives much better than even a few years ago. The results of such deliberations lead to ranking of needs (eg, see Appendix B) and, in the case of donor agencies, to broadened objectives such as comprehensive rural development analysis. In addition, there is an unprecedented level of outside activity creating worldwide or regional networks on key topics which relate, in one way or another, to resource and environmental problem solving. These rational processes are contributing to the development of a scientific and technological establishment which, in the final analysis, will only be effective if its recommendations or findings are adopted by the poor farmer or urban dweller, or can be implemented for their benefit.

Already there are good grounds for concern that the opposite may be happening, and that inappropriate technological changes are being introduced.²⁶ In the ongoing debates on aid it is very important that both new and existing approaches involving science and technology for development be well studied. At present there is an unfortunate lack of capacity to do so in the country. One must question whether this is a reflection of training priorities leading to good technicians and a weaker intellectual base, or whether there are other more important causes.

One problem that may contribute to the introduction and continuation of inappropriate technologies is the tendency for both Indonesian and foreign development agencies to treat most projects as rather routine undertakings, instead of as the highly experimental endeavors they actually are. Thus a proper framework for careful documentation and ongoing evaluation is rarely instituted. This type of policy-oriented case study evaluation perhaps can best be supported through carefully developed affiliations of foreign and Indonesian research teams, possibly in existing policy-oriented institutes, whether or not these are now oriented to environment.

Training

The present governmental interest in rapid expansion of management and research capacity is sometimes matched, or even stimulated, by the involvement of foreign development agencies, who can, however, also be remarkably clumsy, inappropriate, or indifferent in their responses. It is frustrating for field staff to see funds for foreign training suddenly become unavailable as a result of home office action, or to lie unused because of inadequacies in the process of candidate identification and preparation. Indonesian candidates for foreign training have an excellent record of returning to responsible positions after study. In almost every major field the number of adequately trained people is so far below need that the problems of trained manpower surplus are not yet on the horizon.

While foreign training is still regarded as necessary, it is coming to be regarded as an adjunct to advanced studies in Indonesian universities. There are also interesting combination situations, where staff from Indonesian universities engage in formal graduate degree study with the involvement of counterpart teams from outside universities in combined teaching and research training projects.²⁷ In addition there are some successful examples of innovative, within-country short-term training in specific academic and technical fields.

On the other hand, training priorities are often extremely normative — established by what has gone on in the past and therefore rooted in the existing disciplines. When agricultural research training priorities were established, for example, in a recent foreign-donor loan, the range of foreign and domestic training opportunities displayed a disappointing narrowness. Manpower needs were cast in terms of agronomists, breeders, etc. with no thought of training systems ecologists, specialists in environmental assessment, or resource economists. It is, of course, extremely difficult to set new directions. Yet if the challenge is not met now the opportunity for innovation may well be limited in the future. In environmental training it is essential to recognize roles as well as academic fields: a further complication.²⁸ Such considerations suggest that some trainees be placed in the new schools of environmental studies.

The appropriateness of most foreign training programs to Indonesian management or other needs is a problem that troubles development agency staff and trainees alike. There are good possibilities for foreign donors to support Indonesian initiatives in innovative teaching and training. Ultimately programs such as the Master of Resource Management and Environmental Studies at Bogor Agricultural University, or the land use and forestry programs in several major schools, should become superior to those of foreign institutions, especially for meeting the training needs of county- and provincial-level staff.

The capacity to administer interdisciplinary resource and environment programs is just beginning to emerge. Hence it would be all too easy to overload new programs by providing large numbers of domestic training fellowships — or to swamp Indonesian staff with foreign counterparts. Just as in other parts of Southeast Asia, however, it may be predicted that such programs in Indonesia will take hold. Therefore they deserve good levels of long-term support from aid agencies.²⁹ What appears to be almost unique about the Indonesian programs is the ease with which students and staff can be linked into policy and management issues facing government.

To provide a better mechanism for identifying candidates for either domestic or foreign training in fields related to resource and regional development — and for identifying sources of donor support — an inter-departmental training unit has been established. This unit will have the potential to greatly increase the number of candidates and to reduce the bottlenecks that now often hold them back for four or five years before their advanced studies can be undertaken. It will only be successful if full cooperation and financial support of donor agencies is available.

CONCLUDING COMMENTS

Throughout the world an evaluation of environmental assessment processes seems to be under way. It is a time when people are beginning to question the complex and often convoluted procedures that have developed over the past several years. It is logical to expect a country like Indonesia to be wary of such procedures and, in fact, it would be disastrous to subject every project to the extensive review and negotiations now common in the United States.

It is for this reason that most of the points covered in this report are not directly concerned with an environmental impact statement focus. The important environmental management opportunities in Indonesia do lie within the spectrum of project planning activities, since the largest budgets and concentrations of technical manpower are committed via projects. An adaptive assessment process must be established to provide a continuing sequence of opportunities that may become apparent only with management experience.

Donor agencies can, and will, make important contributions in this process. But it will require a prolonged and sensitive involvement with a wider range of regulatory and management agencies than in the past. It will be all too easy to spend a lot of money in the name of environmental assessment and management without a real return. It will be equally easy to be overcritical of approaches for training and experimental management projects that may demonstrate little immediate benefit but become crucial to the success of major programs. Relatively modest investments in some of the approaches Indonesian managers and scientists are following may well lead to successes of widespread interest and value.

APPENDIX A**Research Centers Relevant to Environmental Work in Indonesia****I. Governmental**

Badan Koordinasi Survey dan Pemetaan Nasional (National Coordination Body for Survey and Mapping)

Lembaga Meterologi dan Geofisika (Meterological and Geophysical Institute)

Lembaga Penelitian Tanan (Soil Research Institute)

Direktorat Geologi (Geological Survey of Indonesia)

Lembaga Geologi dan Pertambangan Nasional (National Institute of Geology and Mining)

Directorate Penyelidikan Masalah Air (Directorate of Hydraulic Engineering)

Lembaga Penyelidikan Masalah Tanah dan Jalan (Institute for Soil and Road Research)

Lemba Oseanologi Nasional (National Institute of Oceanography)

Lembaga Penelitian Laut (Institute of Marine Research)

Lembaga Penelitian Perikanan Laut (Marine Fisheries Research Institute)

Lembaga Penelitian Perikanan Darat (Research Institute for Inland Fisheries)

Lembaga Biologi Nasional (National Biological Institute)

Lembaga Penelitian Hortikultura (Horticultural Research Institute)

Balai Penelitian Perkebunan Bogor (Research Institute for Estate Crops)

Lembaga Masalah Ketenagaan (Power Research Institute)

Batan (National Atomic Energy Agency)

Lembaga Minyak dan Gas Bumi (Lemigas) (Indonesian Petroleum Institute)

Lembaga Penelitian Tanaman Industri (Industrial Crops Research Institute)

Balai Penelitian Gizi (Nutrition Research Institute)

Lembaga Nasional Hygiene Perusahaan dan Kesehatan Kerdja (National Institute of Industrial Hygiene and Occupational Health)

Lembaga Research Kesehatan Nasional (National Health Research Institute)

Lembaga Penelitian Hasil Hutan (Forest Products Research Institute)

Lembaga Penelitian Hutan (Forest Research Institute)

Lembaga Penelitian Peternakan (Animal Husbandry Research Institute)

Survey Agro-Ekonomi (Agro-Economic Survey)

Lembaga Ekonomi dan Kemasyarakatan Nasional (National Institute of Economic and Social Research)

Lembaga Research Kebudayaan Nasional (National Institute for Cultural Studies)

Lembaga Sedjarah dan Anthropologi (Institute of History and Anthropology)

Balai Penelitian dan Pengembangan Pembangunan Masyarakat Desa (Rural Community Development Research Institute)

Lembaga Kesehatan Ekologi (Institute of Health Ecology)

II. Universities

Lembaga Ekologi (Institute of Ecology), Pajajaran University

Pusat Pengelolaan Sumber Daya Alam dan Lingkungan (Center for Studies on National Resource Management and Environmental Studies), Bogor Agricultural University

Environmental Cluster, Bandung Institute of Technology

Faculty of Geography, Gadjah Mada University

Forestry Faculties of Gadjah Mada University, Bogor Agricultural University, Mulwarman University

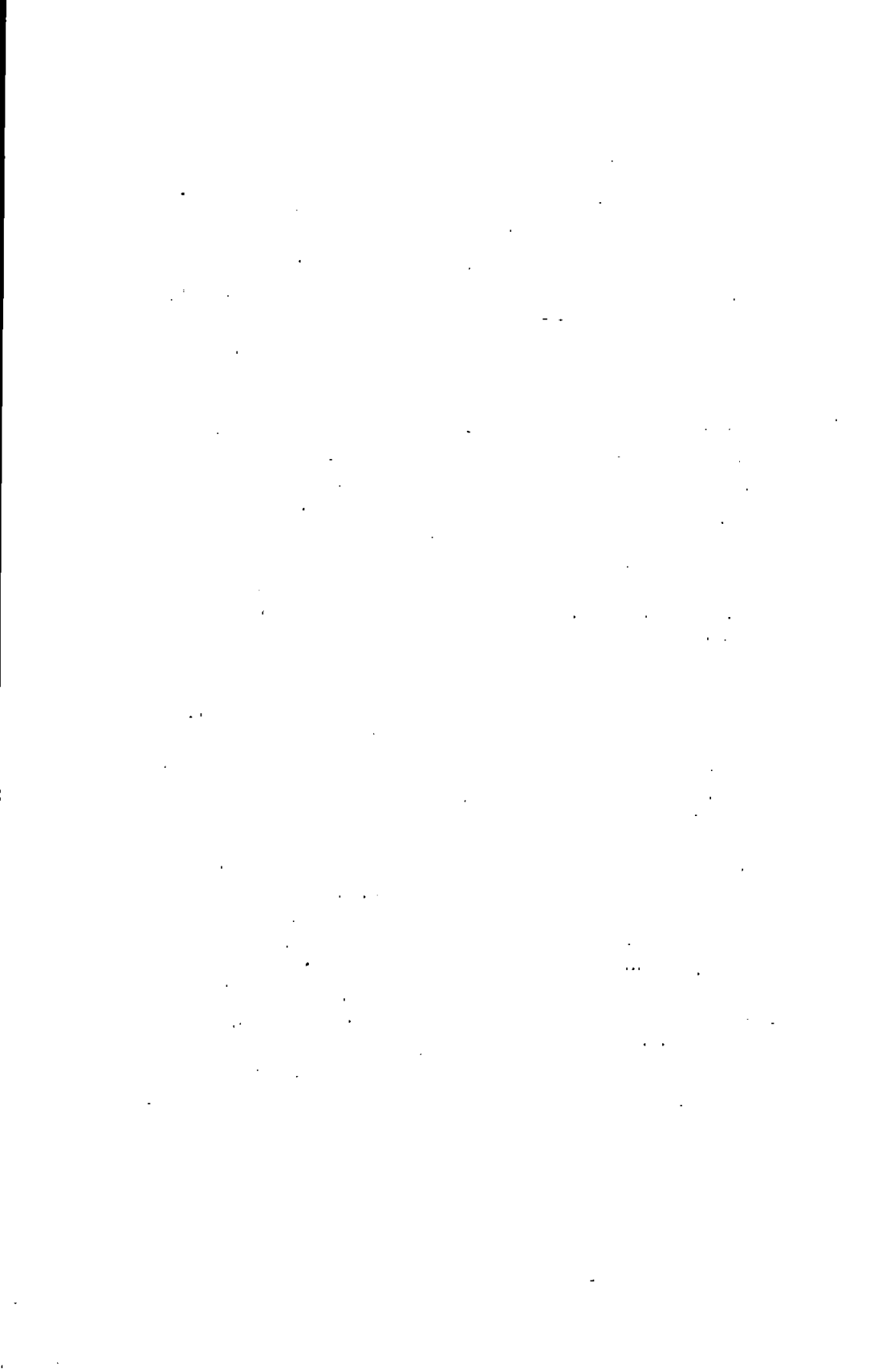
Center for Remote Sensing Interpretation and Integrated Surveys, Gadjah Mada University

APPENDIX B**Highest Ranking Research Fields for the Agricultural Sector
in Indonesia**

(Based on a list of priorities established from surveys of Indonesian scientists by the Minister of State for Research in 1974 and published in BIOTROP Newsletter No. 17.)

The topics listed are ranked 1-30 from a list which included 188 topics:

1. New fishery resources
2. Fishery productivity and ecology
3. Inventory of fishery resources
4. Land development of tidal areas
5. Conservation of fishery resources
6. Forest inventory involving species, distribution, potentialities
7. Soil fertility
8. Agricultural development planning
9. Irrigation
10. Regional development
11. Drainage
12. Types of aquaculture (inland and marine)
13. Soil conservation
14. Reforestation and greening
15. Manpower and technology
16. Rice cultivation
17. Wastes and byproducts of forest utilization
18. Weed technology and processing
19. Rice breeding
20. Groundwater
21. Rejuvenation of industrial crops (latex, fiber, and oil producing)
22. Agro-economic statistics
23. Development of commercial forest products and wood industries
24. Development of dry lands for agriculture
25. Utilization of beverage crops
26. Protection of rice plants
27. Fish catching equipment and accessories
28. Forest ecology and forest regeneration
29. Rejuvenation of sugar and oil producing crops
30. Land development in alang-alang grasslands



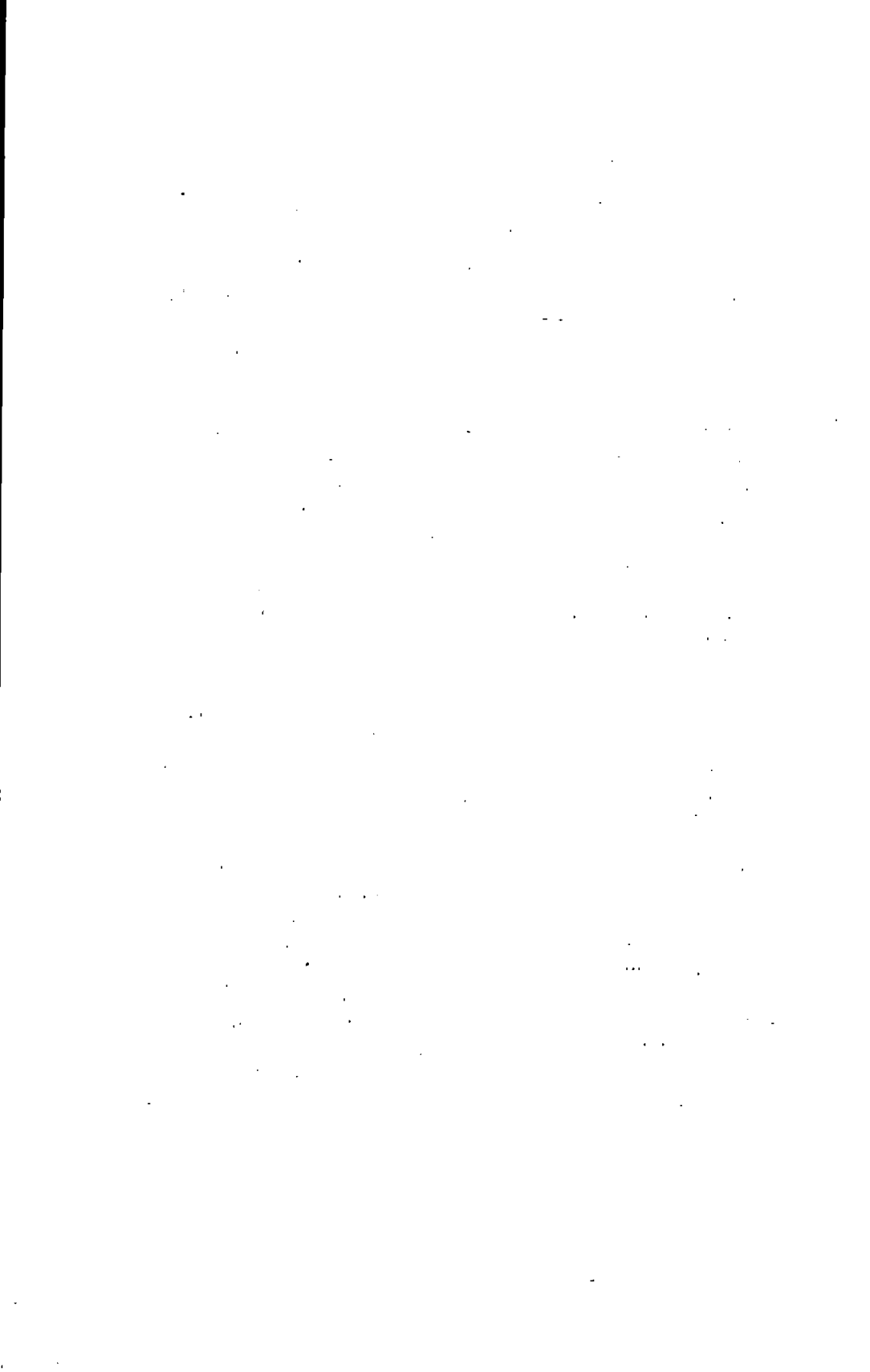
NOTES

1. The population of Indonesia is estimated at 132 million. By the year 2000 numbers will increase to at least 200 million. Problems are accentuated by the high population density (almost 600/km²) on Java. See Hull et al (1977) for a comprehensive account of the achievements of the family planning program. Per capita annual income was below US \$200 and, for most rural people on Java, below US \$100 over the period when environmental concerns emerged.
2. See Djojohadikusumo (1977) and Republic of Indonesia (1972) for discussion of these concerns.
3. The country's forest estate amounts to about 120 million ha from a 200 million ha total land area. The forest concession area is more than 17 million ha.
4. The term *Conserving Society* has been taken up by the Science Council and other government units of Canada as a phrase to describe the changes necessary to make Canada a less consuming nation. It is perhaps more relevant as a descriptive term for a country like Indonesia where low levels of consumption and careful recycling are a way of life for all but the very rich. See Meier (1976) for description of some conserving approaches in urban communities.
5. Damaged or badly endangered lands are identified as "critical areas" for priority in land rehabilitation and watershed protection. The area of such land is open to some interpretation. Damaged lands have been estimated to cover almost twice the area of the country's irrigated ricefields.
6. REPELITA is the term used to describe the National Five Year Plan. The Third Cycle since 1969 started in 1979. Environmental concerns warranted a special chapter in REPELITA II. It is difficult to estimate the overall budget allocated for resource and environmental matters since many are approached through departmental projects in forestry, land and water resource development, urban construction, and government companies such as PERTAMINA. The depth of commitment is revealed by projects like the *Reboisasi dan Penghijauan* program (Reforestation and Regreening); which now spends at least US \$50 million per year to engage in land rehabilitation.
7. The large number of river basins is in contrast to some other South-east Asian countries that depend heavily on a few very large systems. Particularly on Java and Sulawesi, water resource regulation may be the most important controllable variable to allow further increases in agricultural yield. The rapid silting in the rehabilitated streams and canals, as well as in reservoirs, has been an important

- factor contributing to increasing environmental awareness in the country.
8. The Intergovernmental Group on Indonesia (IGGI) meets each year to discuss financing priorities and total foreign aid budgets. Actual funds are then allocated by the thirteen member countries and banking institutions. Aside from IGGI agencies there are many non-governmental contributors.
 9. The International Institute for Environment and Development (IIED) has conducted a comparative analysis of environmental concerns of multilateral funding agencies (Banking on the Biosphere, July 1978) and six bilateral donor countries.
 10. Several incidents have resulted from pollution damaging fish resources and conflict between traditional fishermen and those using new gear types. In the middle of 1980 the Government took the extreme initiative of banning trawlers in an attempt to reduce such conflict.
 11. The National Committee on the Environment has been in existence since 1973. Members, who are drawn from departmental senior staff, work through subcommittees. There is a small but active secretariat which has done an excellent networking job by sponsorship of environmental meetings. The Committee works in conjunction with the BAPPENAS Bureau of Natural Resources and Environment. The budget has been about Rp 400 million per year. The National Committee on Resource Inventory is the first real effort to provide coordination in the acquisition and interpretation of perhaps US \$100 million of remote-sensing imagery for basic mapping, geological, land use, and forestry requirements.
 12. There has been considerable interest in this mangrove system from the early decades of this century. It is the largest mangrove system on Java and its semienclosed nature makes the estuary very accessible for harvesting both fish and forest products.
 13. See Republic of Indonesia, Ministry of Public Works (1974).
 14. See Booth (1977) for a review of Sederhana and other types of Indonesian irrigation studies.
 15. The unique characteristics of these lands and settlement programs are described in Andriess (1974); Driessen and Soeprahardjo (1974); and Hanson (in press).
 16. See Hanson and Koesoebiono (1977).
 17. The Natural Resource Defense Council and the National Audubon Society sued the U.S. Export-Import Bank, which had loaned Indonesia US \$1.7 million for purchase of dredges for the riceland project, to seek the Bank's compliance with NEPA. See NRDC World

Environment Alert 1/1/77.

18. Upper Solo Watershed Management and Upland Development Project (INS/72/006). Information from this project suggests a rate of dryland topsoil loss of 1.5 cm to 4 cm per year. The resulting loss of river capacity in the lower reaches of the river is of such magnitude that, near its mouth, the Solo can now accommodate only one-fourth of the water flow that it could 50 years ago.
19. Preliminary training is a series of intensive sessions of a week or longer during which these planning officers are exposed to a variety of environmental assessment techniques. They are expected to work on local environmental problems between sessions.
20. The first study was conducted by the University of Bonn and the follow-up phase by a consulting team of Robert Nathan and Associates.
21. The Eastern Indonesia study was conducted by staff mainly drawn from the Alberta provincial government. The Sulawesi study was carried out by a team coordinated through the University of British Columbia. For a listing of other regional planning studies see Ibrahim and Fisher (1978).
22. Land and Water Resources Development in Southeast Sumatra INS/69/518.
23. Soemarwoto (1977).
24. Ter Haar (1948).
25. "No new dwelling places for the 12,000 people whose homes, orchards, and ricefields had to give way to PT Krakatau Steel in Cilegon, West Java, have been provided, as promised by the enterprise about two years ago." This quote from the Indonesian Times (2 April 1976) indicates a situation, subsequently remedied, which is not without parallel in other land development sites.
26. For examples in agriculture see Sinaga (1976).
27. In Gadjah Mada University the Faculty of Geography staff have maintained a cooperative effort with a Dutch university consortium for doctoral level training in water basin analysis and for upgrading the Indonesian geography faculty curriculum. The program permits Dutch graduate students to work on the same problem sites as the Indonesians. The work is supervised by teams composed of senior Indonesian and Dutch professors.
28. See Holling (1978).
29. See Romm (1978).



REFERENCES

- Aden, J. B.
1975 The relevance of environmental protection in Indonesia. *Ecology Law Quarterly* 4:987-1006.
- Andriesse, J. P.
1974 *Tropical lowland peats in South East Asia*. Communication 63. Department of Agricultural Research, Royal Tropical Institute of Amsterdam.
- Booth, A.
1977 Irrigation in Indonesia Part 1. Bulletin of *Indonesian Economic Studies XIII* (1):33-74.
- Djojohadikusumo, Sumitro
1977 *Science, resources and development*. Institute for Economic and Social Research, Education and Information (LP3ES), Jakarta.
- Driessen, P. M. and M. Soeprattohardjo
1974 *Soils for agricultural expansion in Indonesia*. Bulletin No. 1. Soil Research Institute, Bogor.
- Goodland, R.
Indonesia's environmental progress in economic development. In the Proceedings of the 9th Conference on Indonesian Studies: Ecological Issues in Contemporary Indonesia, U. of California, Berkeley, 1980. (In press).
- Hanson, A. J.
Transmigration for marginal land development. In G. Hansen (ed.), *Agricultural and Rural Change in Indonesia* (In press).
- Hanson, A. J. and Koesoebiono
1977 *Settling coastal swamplands in Sumatra. A case study for integrated resource management*. Research Report 004. Center for Natural Resource Management and Environmental Studies, Institut Pertanian Bogor, Indonesia.
- Holling, C. S. (ed.)
1978 *Adaptive environmental assessment and management*. West Sussex, England: John Wiley and Sons.
- Hull, T. H., V. J. Hull and M. Singarimbun
1977 Indonesia's family planning story: Success and challenge. *Population Bulletin* 32 (6) 52 pp.

Ibrahim, A. M. and H. B. Fisher

- 1978 Search for strategy: regional development studies and planning in Indonesia. Paper presented at World Regional Development and Planning Conference, Japan, August 1978.

Meier, R. L.

- 1976 A stable urban ecosystem. *Science* 192 (4243):962-968.

Republic of Indonesia

- 1972 Environmental problems in Indonesia. Revised country report prepared for the UN Conference on Human Environment.

Republic of Indonesia, Ministry of Public Works

- 1974 The Citanduy River Basin development project. Feasibility report for reclamation of the Segara Anakan and its environs.

Romm, J.

- 1978 *Higher education and natural resources management in Southeast Asia*. Washington, D.C.: American Council on Education.

Sinaga, R.

- 1976 *Policy issues of agricultural development in Indonesia*. International Workshop on Accelerating Agricultural Development. Southeast Asian Regional Center for Graduate Study and Research in Agriculture.

Soemarwoto, Otto

- 1977 Nitrogen in tropical agriculture: Indonesia as a case study. *Ambio* 6(2-3):162-165.

Ter Haar, B.

- 1948 *Adat law in Indonesia*. (English translation 1962). Jakarta: Bhartara.

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