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1.0 Introduction

Our understanding of the connections between human life and other elements of nature is limited. We also have the power to destroy the natural systems that sustain us. Our capacity for destruction is illustrated through the deterioration of the ozone layer, through the extinction of species, and through mass deforestation and desertification. In many parts of the world, economic development projects directed at improving levels of material comfort have had unintended detrimental effects on people and natural resources. Water, land, and air have been degraded to the point where they can no longer sustain existing levels of development and quality of life. With inadequate environmental planning, human activities have resulted in the disruption of social and communal harmony, the loss of human livelihood and life, the introduction of new diseases, and the destruction of renewable resources. These and other consequences can negate the positive benefits of economic development. Economic development in developing countries has been focused on immediate economic gains- environmental protection has not been a priority because the economic losses from environmental degradation often occur long after the economic benefits of development have been realized.

The past failure of development planning processes to take adequate account of the detrimental impacts of economic development activities led to the advent of *environmental impact assessment (EIA)* processes. EIA was first employed by industrialized countries in the early 1970s. Since that time, most countries have adopted EIA processes to examine the social and environmental consequences of projects prior to their execution. The purpose of these processes is to provide information to decision makers and the public about the environmental implications of proposed actions before decisions are made.

1.1 Environment and Development in Asia

Asia is experiencing faster economic growth than any other region of the Earth. It is also home to most of the world's poorest people. Poverty forces people to overexploit natural resources, leading to degradation of the very forests, soil, and water upon which they depend. This perpetuates their poverty. Economic growth may alleviate poverty and lead to a higher quality of life of properly planned, it may also reduce pressure on the environment and stem to environmental degradation. However, unregulated and unplanned economic growth can have the opposite effect. Pressure on the environment may be increased, environmental degradation may occur at greater rates, and the sustainability of ecological and economic systems may be compromised. Figure 1-1 shows the interconnections between environmental degradation, poverty, and unregulated development (Jalal, 1993).

Sustainable development is the result of carefully integrating environmental, economic, and social needs to achieve both an increased standard of living in the short term, and a net gain or equilibrium among human, natural, and economic resources to support future generations. In dealing with the environmental problems of Asia as well as the promotion of sustainable development, two characteristic features of the region should be noted. First, the region contains some of the world's most ecologically productive and sensitive areas, including tropical forests, mangroves, small islands, and coral reefs. Second, both lack of development and the development process itself have caused — and continue to cause — environmental degradation. Poverty is still rampant. The region is home to over 80% of the more than one billion absolute poor in the world (people who earn less than a dollar per day). This poverty exerts tremendous pressure on the region's resources. Existing development processes continue to place a low priority on environmental concerns, viewing them as unaffordable.

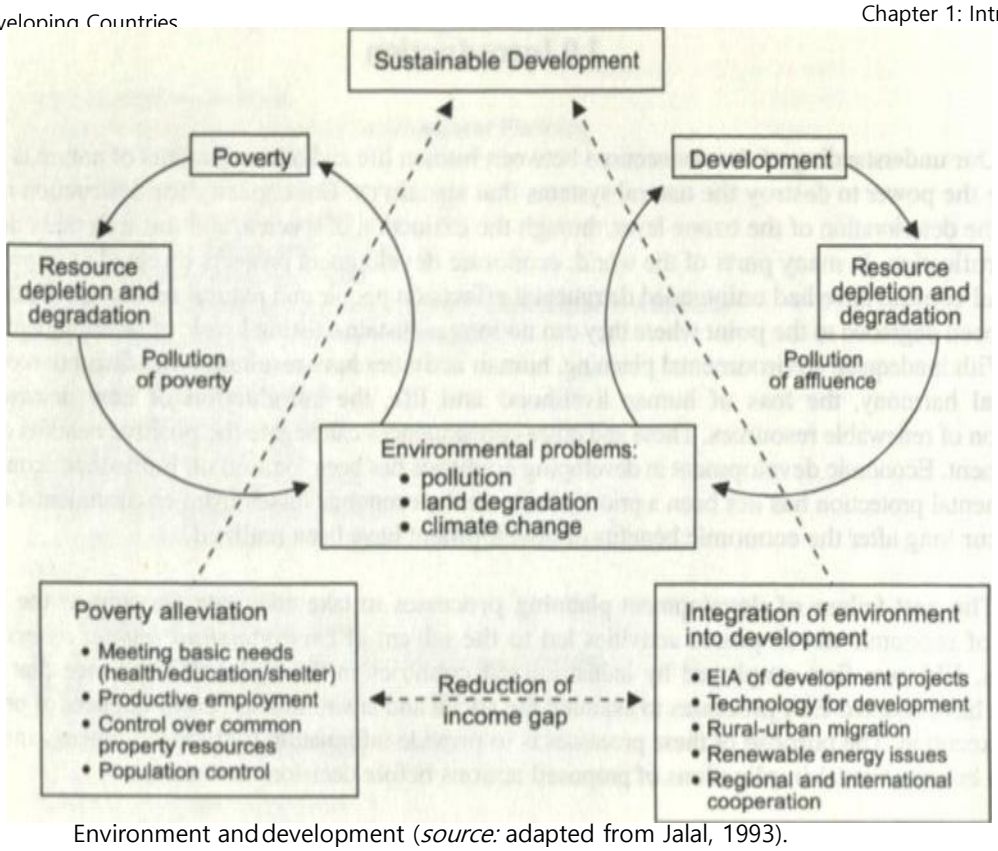

Figure 1-1: Environment and development (*source:* adapted from Jalal, 1993).

To meet the development challenge for Asia — poverty alleviation through environmentally sound development — a number of very significant and constraining problems must be overcome. These problems include land degradation and depletion of natural resources; human settlements unfit for living due to inadequate shelter, sanitation and water supplies; soil, water, and air pollution; and global issues like global warming, ozone depletion, and loss of biodiversity. Population pressure, lack of development, and the development process itself are all contributors to the existing environmental situation. Figure 1-2 illustrates the relative significance of these issues in selected developing countries in Asia.

Deforestation has reached alarming levels. Between 1980 and 1990, the average rate of tropical deforestation in the region was 5 million ha per year. At this rate, an additional 50 million ha, or about 16% of the region's remaining tropical forests, will be lost by the year 2000. Fifteen billion tons of sediment per year are estimated to be carried away by rivers due to land erosion in the region. Desertification affects more than 860 million ha of land and 150 million people in the region. Over-exploitation of groundwater has caused water yield losses, land subsidence, saltwater intrusion, and groundwater pollution in more than one third of the countries in the region (Jalal, 1993).

Figure 1-2: Relative significance of resource and environmental issues in selected developing countries in Asia (*source:* adapted from Jalal, 1993).

Rapid urbanization presents one of the most serious environmental and social challenges in Asia. The number of megacities comprising more than four million people quadrupled between 1950 and 1990, and environmental problems have grown along with those cities. Adequate shelter is also sorely lacking. Standard dwellings constitute only 17% of the region's shelter stock. Basic sanitation is needed in both urban and rural areas. Deforestation is a growing problem where wood is used for cooking. The application of agrochemicals in the region increased from 22 million tons in 1977 to 46 million tons in 1987, and pesticide consumption is growing at the rate of 5-7% per annum.

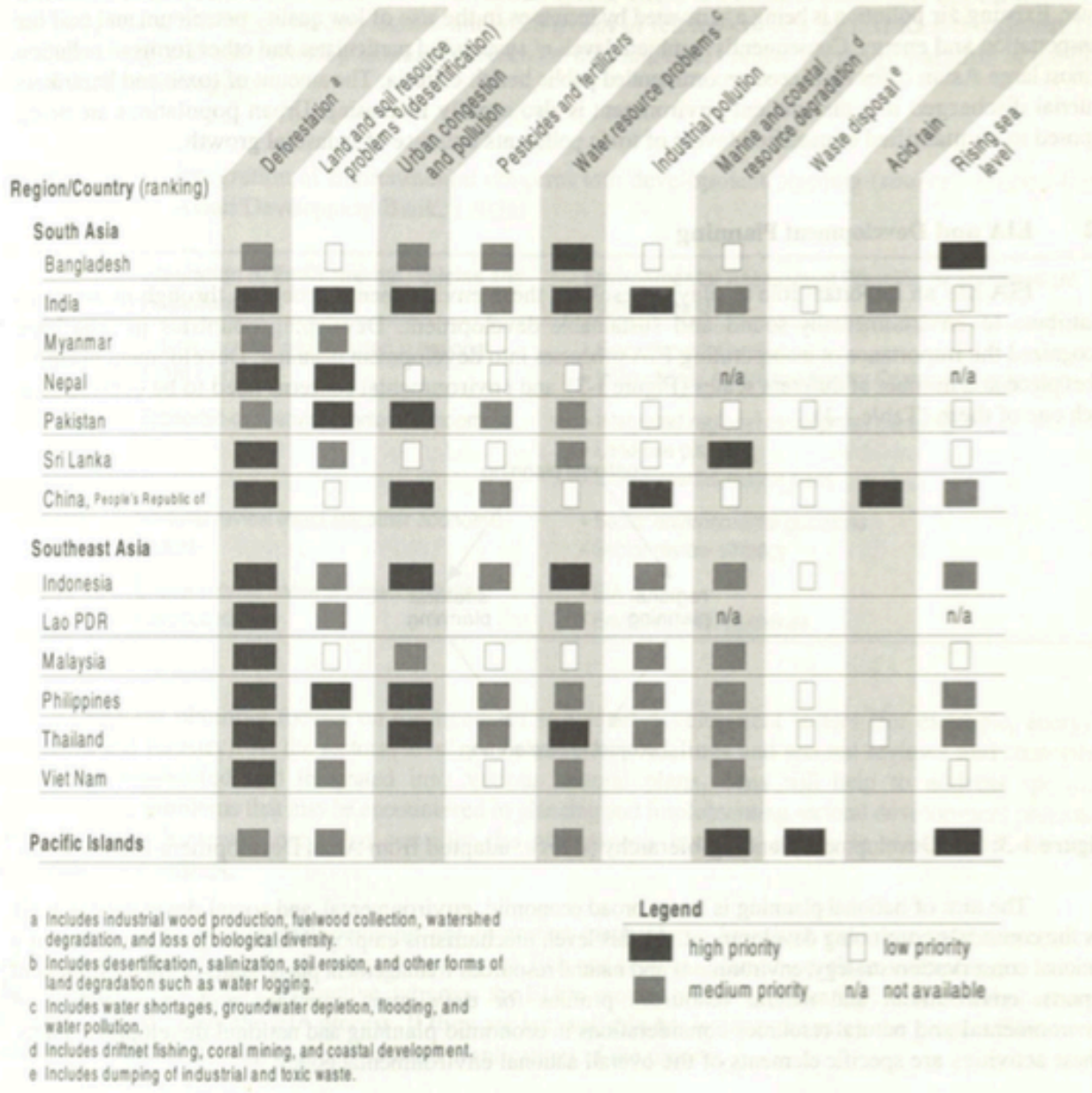

Figure 1-2: Relative significance of resource and environmental issues in selected developing countries in Asia (*source:* adapted from Jalal, 1993).

Pollution is widespread. Few countries of the region meet the recognized criteria for safe drinking water. Existing air pollution is being aggravated by increases in the use of low quality petroleum and coal for transportation and energy. Consequently, ambient levels of suspended particulates and other forms of pollution in most large Asian cities far exceed recommended public health criteria. The amount of toxic and hazardous material discharged into the ambient environment is also rapidly increasing. Urban populations are being exposed to unquantified or qualified levels of toxic pollutants because of industrial growth.

1.2 EIA and Development Planning

EIA has an important role to play in resolving these environmental problems through its ability to contribute to environmentally sound and sustainable development. Developing countries in Asia have recognized the importance of incorporating EIA processes into development planning. Development planning takes place at a number of different scales (Figure 1-3), and environmental concerns need to be considered at each one of them (Table 1-1).

Figure 1-3: Development planning hierarchy (*source:* adapted from Asian Development Bank, 1993a).

The aim of national planning is to set broad economic, environmental, and social development goals for the country's continuing development. At this level, mechanisms employed include the formulation of a national conservation strategy, environment and natural resources management plans, state-of-the-environment reports, environment and natural resources profiles for developing countries and incorporation of environmental and natural resources considerations in economic planning and national development plans. These activities are specific elements of the overall national environmental policy.

Regional planning defines broad land use allocations for a geographic region, normally at the subcountry level. At the regional level, the approach should integrate environmental concerns into development planning. Such an approach is referred to as *economic-cunt-environmental (EcE) development planning* (Asian Development Bank, 1993a). This approach facilitates adequate integration of economic development with management of renewable natural resources to achieve sustainability. It fulfils the need for macro-level environmental integration, which the project-oriented EIA is unable to address effectively. Such regional plans can set the context for project-level EIA. In considering regional plans, the environmental impacts of alternatives need to be assessed.

At the project planning level, EIA is the primary tool for integrating environmental considerations into project design and execution. Project proponents and regulatory agencies prefer to consider the environmental impacts of a single project. Ideally, EIA at the project level should take place in the context of regional and sectoral level planning; if this is not feasible, the scope of EIA reports may have to consider broad land use issues. In addition, if environmental effects are considered only at the project level, decision makers will have

Figure 1-3: Development planning hierarchy (*source:* adapted from Asian Development Bank, 1993a).

difficulty taking account of *cumulative environmental effects.* These are impacts which may appear minor for any one project, but which become significant when groups of related projects are considered together. The absence of regional and sectoral planning increases the time and cost involved in the preparation of the EIA report and project approval.

Table 1-1: Integration of environmental concerns into development planning (*source:* adapted from Asian Development Bank, 1993a).

Level	Integration of Environmental Policies and Procedures	Environmental Assessment Planning or Management Techniques Used
National	Environmental policy included in national action plan	• Environmental profiles • International Assistance Agency Country Programming
Regional	Economic-cum-environmental development	• Integrated regional development planning • Land use planning • Environmental master plans
Sectoral	Sectoral review linked with other economic sectors	• Sector environmental guidelines • Sector review strategy
Project	Environmental review of project activities EIA procedures	• EIA • Environmental guidelines

Sectoral planning focuses on the needs of individual development sectors (for example, energy, transport, and forestry). At the sectoral level, environmental guidelines and sectoral reviews and strategies should be formulated and integrated into various sectoral plans. This will help to address specific environmental problems that may be encountered in planning and implementing sectoral development projects. Sectoral plans, however, must also consider the relationships between sectors to avoid land use and infrastructure conflicts.

EIA, EcE, and sectoral planning are important mechanisms by which environmental factors are included in the development planning process level. EcE and sectoral planning evaluates development from the national or sub-country perspective, whereas the EIA is project oriented. When EcE or sectoral plans are available they simplify the EIA process. If they are not available (as is often the case), the project EIA must attempt to evaluate the regional and national implications of the project.

The integration of environmental considerations within the planning process has evolved similarly in both developing and industrialized countries. In Asia, the Asian Development Bank (ADB) and other institutions are currently assisting developing countries to establish, formulate, and apply regional EcE development plans and project EIA planning tools and methodologies. As such, EIA is being used as a tool for influencing development decisions not only in industrialized countries, but in developing countries as well.

1.3 EIA Inputs to the Project Cycle

Increasingly, Asian countries are enacting laws requiring EIAs for all major projects. Indeed, in many countries EIA must be an integral part of the feasibility study. Where these laws are enforced, they can be a powerful means of directing development towards sustainability. Another major trigger for EIA is project financing. In many cases, a review of the project's EIA is a mandatory requirement of financing. Few lending institutions and investors, whether international financial institutions or private sources of capital, are willing

to risk their funds on projects which do not meet environmental standards. These conditions have resulted in a careful integration of environmental review procedures with various stages of the "project cycle."

A generalized project cycle can be described in terms of six main stages: 1) project concept; 2) prefeasibility; 3) feasibility; 4) design and engineering; 5) implementation; and 6) monitoring and evaluation. EIA has a role to play at each stage in the cycle, as shown in Figure 1-4. Most EIA activities take place during the prefeasibility and feasibility stages, with less effort devoted to implementation, monitoring, and evaluation stages. In general, EIA should enhance the project and augment the project planning process.

Early in the project cycle, the EIA process involves site selection, screening, initial assessment, and scoping of significant issues. EIA must be an integral part of the project feasibility study. A project's feasibility study should include a detailed assessment of significant impacts, including gathering of baseline information; the prediction and quantification of effects; and review of the EIA by a review agency (by public and independent experts; see Chapter 12). Subsequent to these initial steps, environmental protection measures are identified, environmental operating conditions are determined, and environmental management plans (see Chapter 10) are established. At the last stage in the feasibility study, the monitoring needs are identified, and the environmental monitoring program (see Chapter 9) and the environmental management plan are formulated.

Figure 1-4: EIA inputs to the project cycle (*source:* adapted from Asian Development Bank, 1993b).

The *environmental management plan* is put into effect during the implementation of a project (including construction, operation, maintenance, and ultimate abandonment of a facility). This plan must include *mitigation measures* to reduce the environmental impacts that are generated throughout implementation. Environmental monitoring must be designed to provide information on the activity's actual impacts, compliance with environmental operating conditions, and the effectiveness of environmental mitigation measures. The evaluation of monitoring results is necessary to ensure that environmental objectives are achieved — and. if necessary, that project modifications or remedial measures are undertaken to address

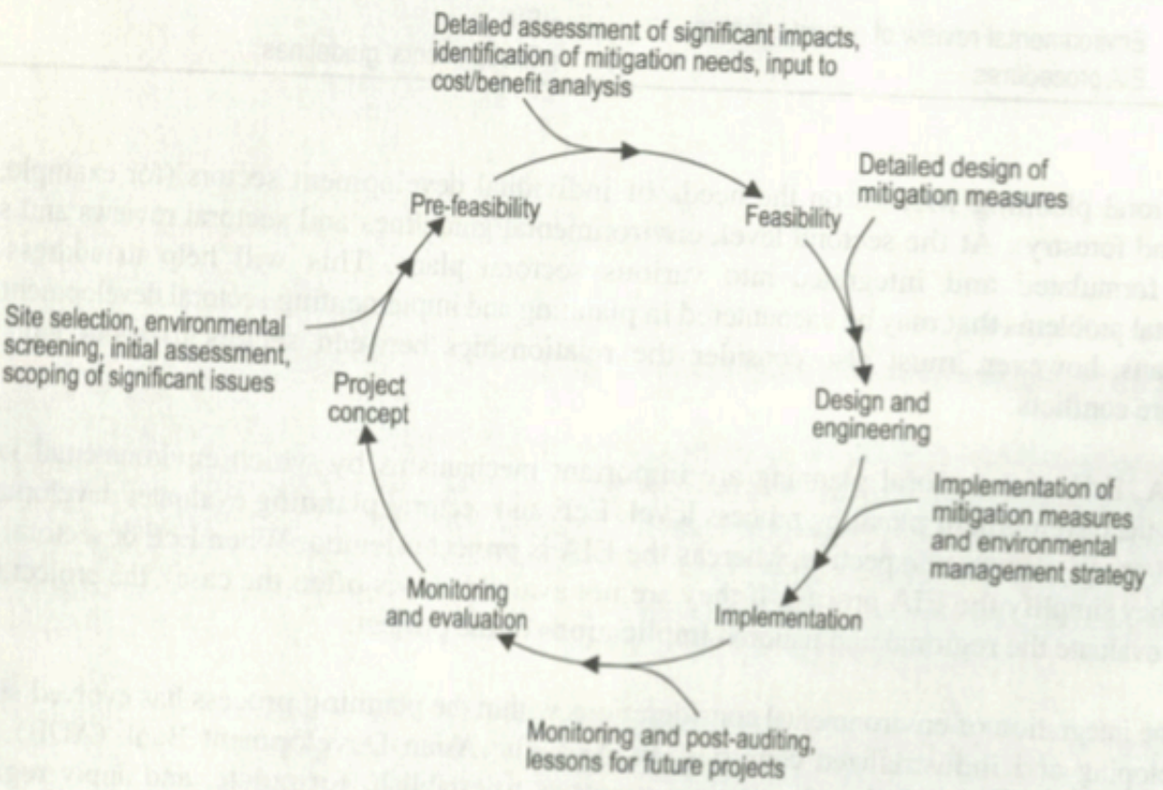

Figure 1-4: EIA inputs to the project cycle (*source:* adapted from Asian Development Bank, 1993b).

unforeseen impacts. Resources for the design and implementation of effective monitoring programs have often been inadequate. As a result, follow up work to ensure that the EIA recommendations are actually carried out has rarely been completed. Many national environmental agencies and international assistance agencies (IAAs) such as the ADB recognize the importance of follow-up evaluations, and are now increasing requirements to ensure funding for the implementation of environmental management plans and monitoring programs.

1.4 Outputs of the EIA Process

The main goal of EIA is to influence development decision-making by providing sound information on environmental impacts and the means for preventing or reducing those impacts. Three major outputs of the EIA process provide the primary means for integrating the results of a specific EIA into the development planning decision process and the concurrent environmental regulatory process: an identification and analysis of the environmental effects of proposed activities (including their probability of occurrence); an environmental management plan which outlines the mitigation measures to be undertaken; and an environmental monitoring program which outlines the data that must be collected in conjunction with the project. All three outputs are required for the EIA process to be effective. In some jurisdictions, the documentation for the EIA process requires that three separate documents be prepared, one for the impact assessment, one for the environmental management plan, and one for the environmental monitoring program. In others, all three are presented as part of the EIA document.

Environmental management is usually integrated into the project management system associated with the construction, operation, and maintenance of the project. Environmental monitoring is normally considered one of the responsibilities of the environmental management system. When successfully integrated with the environmental management system for the project, environmental monitoring can provide valuable feedback about the effectiveness of environmental protection measures. Where monitoring shows that environmental protection measures have been ineffective, corrected action should be undertaken.

1.4.1 Analysis of Environmental Effects

EIA analysis has three sequential phases — identification, prediction, and assessment. Identification involves characterizing the existing physical, social, economic, and ecological environment and identifying components of a development project which are likely to impact that environment. The impacts may be described according to the geographical extent and time period over which they are expected to occur. During the prediction phase, the project impacts are quantified using standards and by comparison with the findings of other projects. Basically, the predictive function of an EIA is to forecast the nature and extent of the identified environmental impacts, and to estimate the likelihood of the occurring impacts. The assessment phase judges the importance or significance of the predicted impacts. The results of the assessment phase, in terms of the beneficial and adverse impacts of the proposed project and its development alternatives, are communicated to decision makers. Population groups that may be directly or indirectly affected by the project are identified. The assessment determines costs and benefits to user groups and the population affected by the project. It also specifies and compares trade-offs between various alternatives.

Methods and techniques for identifying and predicting environmental impacts will be presented in later chapters. Box 1-1 presents a summary of the results of an analysis of environmental effects for the Cikampek-Padalarang Toll Road Project in Indonesia.

Box 1-1: Results of an analysis of the environmental effects of a highway project in Indonesia (*source:* Government of the Republic of Indonesia, 1992a).

The Ministry of Public Works of the Republic *of* Indonesia commissioned an EIA for the Cikampek-Padalarang Toll Road Project. The road was planned as a 56 km long, dual 2-lane carriageway connecting the Jakarta-Cikampek and Padalarang-Cileunyi toll roads, with the goal being to complete the linkage of Jakarta and Bandung by good quality highways. A 50% reduction in travel tone between the two cities was expected. Significant socioeconomic benefits to the region were anticipated, including increases in the development of industrial complexes along the corridor, increased tourism, and improved communication. Negative socioeconomic impacts include the appropriation of land, the weakening of existing community linkages through relocation, and the suppression of agricultural land. Compensation was unlikely to be sufficient to maintain preproject living standards for those who were relocated. Numerous families would likely have experienced significant reductions in income. To counterbalance these negative effects, there was to be a bias in construction work hiring in favor of local people, especially those who were subject to relocation or land-take.

Adverse environmental impacts predicted for the construction phase included increased erosion and landslipping. Impacts associated with increased traffic were anticipated on the existing main road because it was the only access for construction vehicles. Impacts on the flow regimes of natural watercourses, village water supply pipelines, and irrigation works were also expected. Deep cuttings were anticipated to affect standing water levels in wells. A variety of mitigations were incorporated into the project design to address these issues.

Increased noise due to traffic along the highway corridor was the principal negative impact anticipated for the operation phase. Noise barriers were to be erected where this issue proved to be problematic. The rate of accidents involving pedestrians was anticipated to be lower on the new road than on the existing road.

This example provides details of the operational phase of the project. Impacts were determined to fall into six categories: noise; social; water resources, air quality; traffic; and erosion and slope stability. A study of these impacts was carried out, and is discussed below.

Noise:

The planned highway was to pass through residential areas which were very quiet at night. A preliminary study was earned out using a methodology described in the UK Department of Transport manual on the calculation of traffic noise. Predictions were made for the level of traffic expected 20 years after the opening of the highway, and noise levels were calculated for those cross sections where the highway passed through or close to settlement areas. There were no data on the tolerance of Indonesian people to noise, and no guidelines on acceptable residential noise levels. Both Indonesian industrial noise limits and UK residential noise limits were used to estimate the requirements for sound insulation, and to identify the locations where noise barriers should be installed. The study estimated that a total of 8.7 km of noise barriers would be required to keep levels in settlements below the UK limit of 68 dBA. Provided the noise barriers were installed, no significant noise impacts were anticipated.

Social Impacts:

Social impacts included the interference of the highway with pedestrian traffic routes. Extensive study was undertaken to determine the appropriate placement and number of pedestrian crossing points, which were to take the form of bridges. Some were planned to accommodate normal vehicle traffic, whereas others were designed for light vehicles only, according to preproject usage. All pedestrian bridges were planned to accommodate the passage of animals. Culverts under the highway were also planned to allow the passage of pedestrians, animals, drainage, and irrigation canals. Since a large number of crossings were provided, significant negative social impacts were judged unlikely in the operation phase.

Box 1-1: Results of an analysis of the environmental effects of a highway project in Indonesia *(source:* Government of the Republic of Indonesia, 1992a).

Water Resources Impacts:

The study of the impacts on water resources was broken down into increases in flood flows and impact on water quality. While the impervious highway surface would increase run-off during and after rain, the steep gradients of the small watercourses which drain the highway would make significant flooding as a result of the highway highly improbable.

Pollution resulting from normal traffic on the highway surface would be washed into the rainwater. Dilution and oxidation would occur in the drainage streams. The receiving waters are relatively highly polluted, and the increase in pollution due to highway- derived contaminants was expected to contribute relatively little to the pollution load. The possibility of installing oil and grease separators was investigated and rejected on the grounds that they do not function well under the high flow conditions frequently experienced in this region. No statistics were available on the likelihood of highway spills. A reduced rate of spills was expected because of the better road conditions on the new highway. The study, however, also anticipated that spills would contribute to water pollution from highway run-off. Mitigation would depend on appropriate spill response through trained mobile highway patrols. A rapid response unit at the toll road headquarters was planned.

Air Impacts:

Air pollution from vehicle exhaust was not expected to become a serious problem since the terrain is very open in this area. World Health Organization (WHO) guidelines for air quality were unlikely to be exceeded, and no significant impacts were expected.

Traffic Impacts:

The impact on traffic during the construction phase was expected to be an increase in congestion, particularly at the entry and exit points, and the presence of maintenance vehicles, machinery and staff on the road. Traffic congestion was to be controlled in part by the installation of traffic lights. Traffic control measures including advance warning of road work, speed restrictions, and lane closures were to be used to prevent accidents during road maintenance.

Erosion and Slope Stability Impacts:

Erosion was expected to continue past the construction phase on embankments and cut slopes, especially where vegetation cover was incomplete. Minor landslips were expected in these areas after heavy rainfall, especially in the early stages of operation as new vegetation became established. Routine maintenance was to include inspection of earthworks and drainage systems, and remedial action was to be taken as soon as erosion or slippage became apparent. No significant impact was expected.

1.4.2 Environmental Management Plan

Environmental protection measures are taken to: 1) mitigate environmental impacts; 2) provide in-kind compensation for lost environmental resources; or 3) enhance environmental resources. One of the goals of the EIA process is to develop an implementable set of environmental protection measures. These measures are normally set out in an environmental management plan. A well structured environmental management plan usually covers all phases of the project from preconstruction to decommissioning and addresses all major environmental issues or impacts identified during the EIA process. The plan outlines environmental protection and other measures that will be undertaken to ensure compliance with environmental laws and regulations and to reduce or eliminate adverse impacts. The plan defines:

- the technical work program to mitigate this plan, including details of the required tasks and reports, and the necessary staff skills, supplies, and equipment;
- a detailed accounting of the estimated costs to implement the plan; and
- the planned operation or implementation of the plan, including a staffing chart and proposed schedules of participation by the various members of the project team, and activities and inputs from various governmental agencies.

A detailed description of environmental management plans, their preparation and execution is presented in Chapter 10. Box 1-2 summarizes the environmental management plan for the Cikampek-Padalarang Toll Road Project in Indonesia.

Box 1-2: Example Environmental Management Plan (*source:* Government of the Republic of Indonesia, 1992b).

As required by the Indonesian EIA (AMDAL) process, the Ministry of Public Works of the Republic of Indonesia commissioned an environmental management plan as part of the EIA for the Cikampek-Padalarang Toll Road Project. This plan covered the toll road right of way as well as ancillary construction areas such as quarry, borrow and spoil disposal sites and access roads, base camps, plant yards, etc. The management plan included sections on project approach, preconstruction phase issues, construction phase issues, operation and maintenance phase issues, and implementation of environmental management requirements. In each section, measures relating to environmental management were detailed. Technical, economic, and institutional approaches were used for environmental management. These approaches were described in great detail in the management plan and are summarized below.

Technical approaches included:

- selection of a route corridor and final alignment within the corridor to minimize impacts associated with housing and agricultural land;
- siting and hydraulic design of cross drainage works to minimize upstream and downstream flooding;
- design of embankments and cuttings to incorporate features such as drainage works to minimize erosion and landsliding;
- siting of noise barriers to minimize traffic-generated noise impact where the highway traverses or passes close to settlement areas;
- design of the highway vertical and horizontal alignment to minimize the quantity of spoil generated; and
- siting of pedestrian crossing points in all locations where crossings are required to maintain access to schools, mosques, agricultural land, and other communities together with design of appropriate structures, taking into account such future needs as could reasonably be foreseen.

Economic approaches included:

- financial compensation for land and property lying on the right-of-way according to established Government procedures;
- payment of compensation by the concession company for temporary use of land in connection with the development of borrow and spoil disposal sites; and
- maximization of employment of local human resources by the contractor and concession company during the construction and operation phases respectively, with those losing housing, agriculture, and employment being given preference.

Institutional approaches included incorporating various measures in the construction contract documents to control potentially damaging activities by the contractor, and developing appropriate enforcement procedures. Some of the social impacts associated with the construction phase could be controlled by improved communications with the affected communities.

1.4.3 Environmental Monitoring Program

Environmental monitoring involves the systematic collection of data to determine 1) the actual environmental effects of a project; 2) the compliance of the project with regulatory standards; or 3) the degree of implementation of environmental protection measures and success of the environmental protection measures. The information generated by monitoring programs provides the feedback necessary to ensure that

An *environmental monitoring program* plan outlines the monitoring objectives; the specific information to be collected; the data collection program (including sampling design); and the management of the monitoring program. Program management includes assigning institutional responsibility, defining reporting requirements, ensuring enforcement capability, and confirming that adequate resources are provided in terms of skilled staff, equipment, training, and funds.

A detailed description of environmental monitoring plans, their preparation and execution is presented in Chapter 9. Box 1-3 summarizes the environmental monitoring plan for the Cikampek-Padalarang Toll Road Project.

Box 1-3: Example Environmental Monitoring Plan (*source:* Government of the Republic of Indonesia, 1992c).

The Ministry of Public Works of the Republic of Indonesia commissioned an EIA for the Cikampek-Padalarang Toll Road Project. An environmental monitoring plan was prepared as part of an overall quality control measure to ensure that environmental protection measures as detailed in the environmental management plan were adopted, and to make sure that any enforcement measures needed were carried out. In addition, the plan aimed to assess the effectiveness or necessity of the environmental management measures in practice; to provide information on which to base additional environmental protection measures where necessary; and to provide feedback on the magnitude and nature of actual impacts. Monitoring was to include all areas covered in the environmental management plan as well as communities outside the right-of-way which would experience social impacts as a result of the movement of displaced people.

The monitoring plan included sections on impacts from each of the four project phases (preconstruction, construction, operation, and maintenance), and on the implementation of environmental monitoring.

The monitoring plan recognized that adverse social impacts associated with the land-take were likely to be the most important category of impacts associated with the project. Detailed social studies of eight sample settlement areas were the basis for the assessment of these impacts. Project implementation, however, had already proceeded to the point that many of the recommendations for mitigating these impacts through land acquisition, resettlement, and restoration of incomes were already underway before the environmental management plan was prepared. Monitoring was unlikely to significantly improve environmental management in this project, but could help in management planning of future toll road projects.

During the preconstruction phase notice boards were constructed to provide affected communities with information concerning the project. These notice boards were monitored to establish whether or not people were receiving up-to-date and relevant information about the project. The success in replacing public facilities such as mosques, schools, and health facilities that had to be demolished was also monitored.

Construction phase monitoring was extensive and detailed. In addition to a plan for monitoring related to the deployment of heavy plant, equipment, and materials, it included monitoring of general measures relating to environmental management (including waste disposal, public nuisance, and conservation of cultural, archaeological and fossil resources), the deployment of the contractor's work force, the base camp, land clearance, general haulage, construction of earthworks, construction of base courses and surfacing, quarry and borrow areas, spoil disposal, and the construction of bridges and other major structures.

Monitoring in the operation and maintenance phase was to be focused on noise, social aspects, erosion and slope stability, waste, and traffic.

Implementation of the monitoring plan was organized by construction phase. Organizational aspects, executive responsibilities, procedures, and financial aspects are also determined.

1.4.4 The Environmental Management Office

The implementation of the environmental management plan requires that an *Environmental Management Office* be established as a part of project management. While environmental officers may have various titles (for example, environmental coordinator or environmental supervisor), their responsibilities are clear — to see that the environmental management plan and environmental monitoring plan are carried out. Box 1-4 describes the environmental management unit established for the Cikampek-Padalarang Toll Road Project. Chapter 10 provides a more detailed explanation of the functions and responsibilities of the Environmental Management Office.

Box 1-4: Example Environmental Management Unit (*source:* Government of the Republic of Indonesia, 1992c).

A small environment management unit (EMU) was created for the construction of the Cikampek- Padalarang toll road. The EMU was managed by a senior environmental specialist (the Environmental Supervisor) who had responsibilities for those aspects of construction that had environmental implications. The cost estimate for environmental management during the construction phase was 206,000,000 Indonesia Rupiahs (approximately US$ 100,000 in 1992). For the first two years of the toll road operation and maintenance the environmental management will remain with the EMU under the direction of the Environmental Supervisor. After two years, responsibilities for environmental management will be transferred to the Maintenance Manager. The Maintenance Manager may from time to time contract environmental specialists to help with specific problems. Costs associated with the operation and maintenance phase (25 years) are 196,000,000 Indonesia Rupiahs (approximately USS 100,000 in 1992).

Environmental monitoring during construction and operation will be the responsibility of the EMU during the early years, then the Maintenance Manager in subsequent years. Incremental costs for environmental monitoring over and above the costs for environmental management were estimated at 31,000,000 Indonesia Rupiahs (approximately USS 15,000 in 1992). These costs assume that monitoring will only be necessary during the first five years of operation.

1.5 Challenges for the Practice of El A in Developing Asia

Developing countries in Asia have generally incorporated EIA into development planning processes. EIA implementation in Asia faces severe limitations, however, including: 1) insufficient procedural guidance; 2) inadequate baseline data upon which to base analyses; 3) the cost of EIA study preparation; 4) potential delays in project implementation; 5) the lack of expertise for assessing impacts; 6) inefficient communication of EIA results to decision makers; 7) lack of inter-agency coordination; 8) limited capacity for review of EIA reports; and 9) insufficient commitment to follow up on the implementation of environmental protection and monitoring requirements. Of these constraints, one of the most significant is the lack of effective communication of EIA results and recommendations to decision makers. This may be the result of a lack of EIA skills in staff of national EIA agencies — if they had the skills, they likely would discover a way to get their findings to decision makers. Another serious shortcoming which often negates high quality EIA is the insufficient commitment to follow up; resulting in no action in spite of the EIA findings and recommendations.

Developing countries often have limited technical and social databases for making impact projections. As a result, extensive baseline data must be collected. This is perhaps the single most expensive and time-consuming endeavor in the conduct of an EIA. The expense can be considerably reduced, while maintaining quality and accuracy, if the essential baseline data/information is available. In the absence of baseline data, project-level EIAs should not be substituted for higher level environmental planning (that is, regional development planning, sectoral development planning) because these plans do not adequately address the needs of specific projects.

Comprehensive environmental planning generates information that becomes critical to the rational use of renewable natural resources. Regional and sectoral development planning, national and regional conservation strategies, and environmental profiles provide much of the baseline information for EIA. An EIA may then be used to correct environmental deficiencies at the project level.

Since developing countries face a shortage of EIA experts, relevant capacity building in Asia is a priority. Increasing needs for EIA and environmental management programs should provide employment opportunities and career prospects in the field. IAAs such as the ADB and the World Bank are providing technical assistance to help build EIA capacity.

The lack of inter-agency coordination is another problem. Many agencies are involved at various stages of development projects and EIA assignments — often with no clear demarcation of responsibilities. Thus in addition to general guidelines for the preparation of EIA reports, there is also a need for specific guidelines for development sectors. Such guidelines should be comprehensive, thorough, and relevant to the specific needs and realities of each developing country. Greater discussion of sectoral guidelines is presented in Section 3.1. The EIA guidelines should also provide for monitoring programs that determine the effectiveness of environmental protection measures incorporated into development activities. The primary factor in the successful use of EIA is the capability of project proponents and the national environment agency to initiate and coordinate environmental management efforts, competently review reports to ensure that environmental plans and management measures are adequate for their intended purposes, and ensure that the EIA findings are considered by the country's decision makers. Successful environmental management is much more likely when project proponents and environmental agencies clearly understand their respective responsibilities. To accomplish these tasks, EIA training programs should be initiated whenever possible for proponents and review agencies.

1.6 References and Further Reading

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