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Leonard Ortolano & Anne Shepherd

ARTICLES

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*Leonard Ortolano and Anne Shepherd*[1]

Environmental impact assessment (EIA) is required, in one form or another, in more than half the nations of the world. This paper examines how EIA requirements have influenced projects, programs, and organizations. EIAs have had far less influence than their original supporters had hoped. This paper provides organizational and methodological reasons for this disparity and indicates ways in which EIA might be used more productively in the future.

## ALTERNATIVE CONCEPTIONS OF EIA

Perhaps the most common conception of EIA is as a 'planning tool': assessments are done to forecast and evaluate the impacts of a proposed project and its alternatives. This perspective of EIA as a planning tool has been referred to as the 'technocratic paradigm,' since it is a view widely held by engineers and scientists who conduct EIAs (Formby 1990: 191).

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[1] Leonard Ortolano is UPS Foundation Professor of Civil Engineering, and Anne Shepherd is a postdoctoral researcher, Civil Engineering, Stanford University, Stanford CA USA. A version of this article will appear in *Environmental and Social Impact Assessment*, to be published by John Wiley and Sons (UK) in 1995.

According to this technocratic paradigm, EIA is an element of the 'rational model' of planning and decision making. In the rational model, objectives and criteria for evaluating alternative projects are identified at the outset. Engineers and planners then design alternative projects and do studies (including cost-benefit analyses and EIAs) to predict impacts and evaluate the alternatives. The information generated is then used to select one project from among the alternatives.

As a planning tool, EIA serves largely to inform interested parties of the likely environmental impacts of a proposed project and its alternatives. It illuminates environmental issues to be considered in making decisions. Generating and circulating information on impacts has salutary effects: it forces a 'hard look' at the environmental effects of projects, and it facilitates coordination among those affected by the proposed project.

This technocratic paradigm for EIA has been criticized because it ignores politics and models decision making in an unrealistic way (Formby 1990). As noted by Culhane (1993: 74), "The critical literature on EISs [environmental impact statements] has consistently documented the failure of EISs, written both in the United States and abroad, to meet basic tests of the rational-scientific model." Decisions on significant public or private development projects are not, in fact, made following the logic of the rational model. Instead, decisions are influenced by 'nonscientific' factors, such as agency and corporate power, and interest group politics. Courses of action are often determined more by the project sponsor's narrow goals, intra-organizational politics, and interorganizational rivalries than by scientific studies of environmental impacts. As Formby (1990: 193) adds, "[The] disadvantage of the technocratic view of EIA is that it can blind those concerned to the political realities of the EIA process and the need to take account of these." He argues that "while EIA continues to be carried out, it becomes decreasingly related to actual decisions."

A more realistic conception of decision making embraces political realities and recognizes that "the ultimate purpose of EIA is not just to assess impacts; it is to improve the quality of decisions" (Formby 1990: 193). EIA is placed in a political context: requirements to conduct EIAs can influence the attitudes of top officials, the strategies of project opponents, and the standard operating procedures of organizations proposing projects. Using this broader conception of EIA, the focus is not just on scientific studies or environmental impact statements, it is on improving decisions.

The scope of the term 'environment' as commonly used in EIA work is clarified to show its links with other types of impact studies. The early literature on EIA (in the 1970s) sometimes was equivocal on whether 'environment' meant only the biophysical (or natural) environment. However, by the 1990s, the normative literature on EIA generally used the term 'environment' in a broad sense, and EIAs were meant to include all nonmonetary impacts (i.e., impacts not included in a benefit-cost analysis). Thus, social impact evaluations, risk assessments, visual impact studies, cumulative impact analyses, etc., are all viewed herein as elements of an environmental impact assessment. In practice, EIA is often narrowly focused on biophysical impacts, in part because social impacts and other nonbiophysical effects are not fully included in environmental impact assessment legislation.

## ORIGINS AND EVOLUTION OF EIA

The origins of EIA have been so well told by others (e.g., Caldwell 1982) that only a brief note on the subject is offered here. Although predictions of how human actions affect the environment are as old as recorded history, the contemporary usage of 'environmental impact assessment' has its origins in the U.S. National Environmental Policy Act of 1969 (NEPA). The impetus for that law was the widespread recognition, in the late 1960s, that some significant environmental problems in the United States resulted from actions of the government itself. The appetites of large infrastructure agencies in charge of water resources projects, highways, and energy facilities appeared to be unquenchable, and the mission statements of those agencies did not force them to account for the adverse environmental impacts of their actions.

NEPA changed that; with a single act of Congress, all federal agencies were required to consider the environmental impacts of their decisions. The act included 'action-forcing provisions' to ensure that agencies gave more than lip service to their new responsibilities. The most widely known of these provisions is in § 102(2)(C), which states that "all agencies of the Federal Government shall include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official" on the environmental impacts of the proposed action and its alternatives. This detailed statement came to be called an 'environmental impact statement' (EIS), and the activity of preparing and distributing the

statement became the 'NEPA process'. This process, which was formalized by regulations (U.S. Council on Environmental Quality 1986), includes preliminary assessments to determine if an EIS is necessary, a 'scoping process' to identify the main environmental issues to be examined, provisions for the public and agencies to comment on a draft EIS, and opportunities for citizens to sue federal agencies that fail to meet their responsibilities under NEPA.

As summarized in a later section of this paper, NEPA has influenced significantly both federal projects and federal agencies. NEPA has also influenced, indirectly, the decision-making processes of hundreds of other political jurisdictions. For example, many of the 50 U.S. states have programs calling for EIAs; the laws setting up these programs are often referred to as 'little NEPAs'.

The influence of NEPA has not been limited to the United States. By the early 1990s, over 40 countries had EIA programs (Robinson 1992). Some, like the EIA program in the Philippines under former president Ferdinand Marcos, included language similar to § 102(2)(C) of NEPA. Others (e.g., the Chinese EIA program) were quite different and reflected well-thought-out efforts to tailor requirements for environmental impact statements to the local political context. Some countries set up their EIA programs using laws, while others (e.g., Taiwan) relied on executive actions and administrative orders. In addition to national-level programs, the states (or provinces) in some countries (e.g., Brazil, Canada, and Australia) have established their own EIA requirements. Not surprisingly, there are enormous variations in the scope and quality of EIA among and within countries.

Requirements for EIAs are even imposed on countries that have no formal programs because bilateral and multilateral aid agencies often call for EIAs on projects they fund. Although aid agencies have spotty records in implementing their own EIA requirements, they have been under pressure to improve the ways EIAs are conducted for projects they fund. Some aid agencies have embraced EIA to ensure that their projects contribute to 'sustainable development'.

## IMPACT ASSESSMENT METHODS

The early 1970s witnessed much activity on the development of 'EIA methodologies' as government agencies and consultants struggled to figure

out what constituted an EIA and what methods could be used to conduct one. Attempts to discover a single, applicable methodology were creative, but they did not yield a widely agreed-upon algorithm. While these attempts generated information helpful in conducting EIAs, the results are not usefully termed a 'methodology'. (Many reviews of what are called 'EIA methodologies' exist; see, for example, Jain et al. 1993.)

For this discussion of methods, the impact assessment exercise is viewed narrowly; it involves the identification, prediction, and evaluation of impacts. The identification of probable impacts worthy of study is aided by the scoping process: technical specialists, individuals from agencies and non-governmental organizations (NGOs), and citizens potentially affected by a project give their views on types of impacts likely to be important. Scoping is enriched if the technical experts know the impacts typically associated with the type of project being considered. To assist in impact identification, there are manuals and computer programs that characterize the impacts generally expected with certain types of projects (see, e.g., Fedra 1991). Some agencies requiring EIA issue checklists that guide the process of identifying impacts.

The second part of the impact assessment exercise involves prediction. For example, an EIA for a proposed new highway in an urban area would routinely call for predicting changes in noise levels. Unless that forecasting exercise were simple, it would be conducted by an acoustics specialist. The same is true of other predictions in an EIA. Thus, groups that conduct EIAs often consist of specialists from different disciplines. Methods used for impact prediction are not unique to the EIA process; they are based on engineering, natural science, and social science methods.

Surveys of the methods used to predict impacts in EIAs (e.g., Leon 1993 and Culhane 1987) find that technical specialists often rely heavily on professional judgment to forecast environmental impacts, and predictions are often so vague they cannot be validated. Mathematical models are also used in making predictions; this practice is sometimes criticized because models are presented as 'black boxes', and the bases for predictions are not made clear. Indeed, because EIAs generally contain so little information about models and their assumptions, "errors that are inherent in this approach are not readily traceable, and the results are not subject to scrutiny" (Leon 1993: 657).

Perhaps the most difficult aspect of environmental impact assessment involves *evaluating* predicted impacts. Attempts have been made to develop algorithms which combine predictions and the subjective values of affected parties to create an overall index to rate individual projects. While these algorithms are sometimes employed in preparing EIAs, they are not universally embraced and their use is controversial (Lawrence 1993). For example, Tu (1993) reports on a major political battle over the validity of applying Battelle's 'environmental evaluation system' (Dee et al. 1972) to appraise a proposed dam on the Liwu River in Taiwan. This project would have destroyed a treasured scenic resource in Taiwan, and the application of the Battelle approach attempted to evaluate the loss of visual resources using a numerical rating. Public criticism of this approach was intense and project opponents ridiculed the effort. After a second, independent EIA was conducted and the economic aspects of the dam were reevaluated, the project was halted and the project area was made into a national park.

In some contexts, consultants preparing EIAs deal with impact evaluation by presenting impact predictions without evaluative judgments or rankings. Regardless of whether an evaluation of impacts is attempted, the amount of information presented in EIA documents can sometimes overwhelm even the most persistent reader. This has prompted the search for clearer formats to display EIA results, for example, network diagrams and matrices to compare the environmental impacts of project alternatives. Some formats display qualitative descriptions of impacts or ordinally scaled ratings, while others show results as quantitative, weighted impact scores.

In summary, EIA practitioners use a variety of methods for involving citizens and agencies in planning and for identifying, predicting, and evaluating impacts. Each project requires a set of methods tailored to the local situation and the time and budget available. There is no single, universally applicable EIA methodology.

## INFLUENCE OF EIA ON PROJECTS AND ORGANIZATIONS

What has all the effort in setting up policies and programs to implement EIA led to? Unfortunately, most of the resources devoted to EIA have gone to the day-to-day work of preparing environmental documents and administering programs, and relatively little has gone to investigating systematically what

EIA has accomplished. While there have been few systematic studies of how a government's EIA program has affected the organizational structures and decision-making procedures of project proponents, much case study work has been done on how EIAs have been conducted for particular projects. Case studies suggest that, in many instances, EIA is not yielding all the benefits it could because the process is undertaken too late and project proponents are concerned primarily with meeting administrative requirements. (Of course, there are exceptions.) The discussion below provides a perspective on what are generally considered as positive effects of EIA. Subsequent sections highlight what many view as shortcomings of EIA.

## Effects of EIA on Projects

While EIAs sometimes amount to nothing more than exercises in pro forma compliance with legal requirements, there are many cases where EIA has significantly influenced projects. For example, in a candid evaluation of the EIA system in the Netherlands (van de Gronden 1994), the range of positive influences of EIA on projects included (1) withdrawal of unsound projects, (2) legitimation of sound projects, (3) selection of improved project location, (4) reformulation of plans, and (5) redefinition of goals and responsibilities of project proponents. Another positive influence of EIA, one that is more difficult to document than those treated in the Dutch consultants' appraisal, is that a requirement for an EIA may discourage project proponents from proposing an environmentally damaging project for fear that it would not survive a review of its environmental impacts.

The delineation of positive influences above is neither exhaustive nor typical. Based on case studies in the literature, the most common positive outcomes of EIA are suggestions for measures needed to 'mitigate' the adverse effects of a proposed plan. In EIA work, it is common to use 'mitigation' to describe one or more of the following:

- Dropping environmentally damaging elements of a proposed project
- Minimizing adverse effects by scaling down or redesigning a project
- Repairing, rehabilitating, or restoring those parts of the environment that are adversely affected by a project
- Creating or acquiring environments similar to those adversely affected by an action

The types of mitigations listed above are in order of their desirability for attenuating adverse effects. Acquisition of environments to compensate for those destroyed by a project is generally considered the least desirable form of mitigation.

A result of a project EIA is usually suggestions for mitigation measures, rather than changes in fundamental decisions concerning the types of alternative actions considered or the size or location of a proposed project (see, e.g., Hill and Ortolano 1978). The reason mitigations (in contrast to changes in project scale and location) are the most common positive outcomes of EIAs is that EIAs are often conducted after important decisions are made, and in some cases, after proposed construction has started (Brown, Hindmarsh, and McDonald 1991). While it is widely agreed that EIA should be done early enough to influence fundamental decisions, there are reasons why this is not often done, and they are reviewed in the section below on 'Perennial Problems in EIA Implementation'. Even though many EIAs suggest measures to mitigate adverse environmental impacts, few EIA programs require that mitigation measures be implemented, and few systematic studies have been done to determine if mitigations agreed to by project proponents were carried out. As elaborated later in this paper, lack of follow-up on implementing mitigation measures is a common shortcoming of EIA programs.

## EIA as an Impetus for Administrative Change

In some countries, EIA has reformed public decision making by giving information on project impacts to citizens, NGOs, and agencies interested in a proposed project. Indeed, the NEPA process in the U.S. is often hailed as a program of administrative reform because it opened the decision processes of federal agencies to public scrutiny. And in the U.S., citizens and non-governmental organizations have sued government agencies frequently to ensure the full disclosure of impacts required by the NEPA process.

Administrative changes effected by EIA in the U.S. are somewhat unique for at least three reasons: (1) EIA implementation is heavily influenced by court actions brought by NGOs; (2) freedom-of-information laws make it relatively easy for citizens to obtain copies of documents in the files of government agencies; and (3) the NEPA process encourages citizen participation in agency decision making. In many countries, citizens are neither accustomed nor encouraged to participate in agency decision making. Thus, EIA may not

always increase citizen involvement, as in the U.S. Moreover, even in countries with strong democratic traditions and a highly informed citizenry, implementation of EIA does not necessarily translate into increased citizen participation in government decision making. This is demonstrated by EIA in France. The French EIA program requires an explicit consideration of environmental factors in decision making for a large number of projects and plans. However, the decision process is dominated by technical specialists and civil servants and not heavily influenced by public participation in EIA (Sánchez 1993). This appears to be changing, however, as NGOs have made increased use of appeals to administrative tribunals to ensure that France's EIA requirements are implemented carefully.

EIA programs often influence administrative processes by enhancing inter-agency coordination. Many EIA programs require that environmental assessment documents be reviewed by an environmental protection agency (or ministry) and, possibly, other governmental bodies. These reviews help disseminate information about proposed actions and their impacts, which is generally viewed as an administrative improvement.

Another influence of EIA programs on administrative processes concerns power relations between ministries. These effects can be notable. For example, in the Philippines (under Marcos), the environmental agency in charge of EIA upset the traditional power balance among national ministries. When the environmental unit attempted to influence decisions normally made by economic development-oriented ministries, those ministries impeded implementation of the EIA program (Abracosa, 1987). A similar outcome was reported in Kenya where the concerns of development-oriented ministries were so great that the environmental unit was incapable of promoting an EIA program, except for private industrial projects unconnected to the ministries (Hirji 1990).

Sometimes the introduction of an EIA program enhances the influence of environmental protection agencies or environmental review boards or both. As an example, the Ministry of Environment for the province of Ontario, Canada, was granted significant authority when legislation establishing the provincial EIA program was passed. Gibson (1993: 18) reports that in Ontario, "Reviews and decision making on cases subject to full individual assessment requirements are the responsibility of the minister of the environment, and in controversial cases there is usually a referral to an independent administrative tribunal, the Environmental Assessment Board, which carries

out public hearings and makes the final decision (subject to Cabinet revision or reversal)." In most cases, independent environmental review boards (e.g., the EIA Commission in the Netherlands) do not make final decisions; they offer advice to government decision-making authorities. However, in the cases that the Environmental Assessment Board in Ontario reviews, it *is* the decision maker.

## Effects of EIA on Project Proponents

Few studies have investigated the influence of impact assessment programs on organizations that propose projects subject to EIA requirements. Organization theory suggests that if an EIA program were to threaten the autonomy or survival of a project proponent, it would cause an organizational reaction. Sometimes the reaction involves efforts to avoid the EIA requirement entirely or to comply with it in a pro forma manner. These responses are demonstrated in Abracosa's (1987) study of EIA in the Philippines and Hirji's (1990) investigation of EIA in Kenya.

Sometimes project proponents react by changing how they do business. Consider, for example, Hydro-Québec in Canada, which faced strong resistance to some of its enormous hydroelectric power schemes during the 1980s. It responded by making substantial organizational changes to accommodate the new forces opposing its projects and the new EIA requirements it faced. As reported by Gariépy and Hénault (1994), these organizational changes included coopting project opponents by allowing them to participate in some decision processes; expanding programs of public consultation; restructuring the planning process to conduct EIA in parallel with (not after) other planning activities; and elevating the status of environmental activities within the organization. For instance, during the late 1970s, EIA was introduced as a project planning task at Hydro-Québec; an environmental unit produced EISs that were primarily 'add-ons' to projects that had already been planned. By the early 1990s, EIA's status had risen—a full vice presidency focused on 'environment' and integrating EIA into both corporate- and project-level planning activities. All of these changes reflect the organization's efforts to learn from its experiences and expand its EIA activities in the face of new environmental constraints.

The U.S. Army Corps of Engineers is another organization that was much affected by EIA requirements and public opposition to its projects (Mazmanian and Nienaber 1979, and Taylor 1984). During the 1970s, more

than 35 Corps district and division offices were each augmented by creating new environmental units to meet EIA and related requirements. Several hundred environmental professionals were hired. For the first time, specialists with disciplinary training in environmental science and environmental engineering were integrated (at some level) into the Corps' project planning and decision-making processes. While many of the new environmental specialists were hired to produce EISs, some learned how to influence the engineers responsible for project design. For example, some environmental specialists were able to engage in internal politicking to derail or modify environmentally insensitive proposals. In addition to creating new units and hiring environmental specialists, the Corps rewrote its planning procedures to (1) enhance the importance of environmental quality as a planning objective, (2) accommodate requirements for EIAs under the NEPA process, and (3) facilitate the direct participation of citizens in some aspects of project planning.

Changes in organizations due to EIA requirements and public opposition have also been reported outside of North America. For example, Tu (1993) documents changes similar to those reported above for the Taiwan Power Company and the Electricity Generating Authority of Thailand.

## PERENNIAL PROBLEMS IN EIA IMPLEMENTATION

This section details problems that have been associated with EIA since the early 1970s. It proposes that some of these problems are systemic and will persist because many project proponents do not view EIA as useful. Rather, project proponents often view EIA as a requirement to be completed, a hurdle to be jumped along the way to project implementation. This particular hurdle imposes risks on project proponents because EIA often forces a public disclosure of impacts, and the information on impacts can strengthen the hand of a project's opponents.

### EIA Requirements Are Often Avoided

Some countries leave the decision on whether an EIA is required for a proposed project up to either the government unit responsible for deciding on the project or an environmental agency. When the decision is left to the responsible government unit, the unit's exercise of administrative discretion can lead to situations in which EIAs are not conducted, even though the

environmental impacts of proposed projects are significant. This is illustrated by EIA programs in Australia, where a relatively small fraction of development projects are subject to EIA procedures. Critics argue that this is a result of the discretionary nature of the various programs. For example, in analyzing the Commonwealth of Australia EIA program between 1975 and 1985 inclusive, Formby (1987) found that fewer than 10 EISs per year were called for. This constituted only 4 percent of the proposals considered significant. The small number of EISs resulted because the decision to initiate the commonwealth EIS process was in the hands of the minister proposing an action, not the minister responsible for environmental affairs. In addition, citizens not directly harmed by the project were unable to gain standing to sue government agencies in the courts of the commonwealth.

Sometimes pure politics leads to efforts to get around EIA requirements. An illustrative case is the Linha Vermelha, a highway in Brazil that connects the airport serving Rio de Janeiro with downtown Rio. As reported by Ortolano (1993: 356), the agency responsible for environmental assessments in the state of Rio de Janeiro was put under substantial political pressure to exempt the project from EIA requirements. The exemption was granted. Ironically, political pressure to build the highway in time to serve the 1992 United Nations Conference on Environment and Development was partially responsible for the short-circuiting of EIA procedures. Other examples of political maneuvering to avoid EIA requirements are given by Abracosa (1987) and Hirji (1990).

## EIA Is Often Not Carefully Integrated into Planning

In the more than 20 years since NEPA's enactment, the law has been criticized for establishing "little more than a bureaucratic exercise that requires federal agencies to complete paperwork they subsequently file and ignore" (Fogleman 1993: 79). Similar comments have been made about EIA programs in other countries (see, e.g., Abracosa 1987 and Hirji 1990). The argument is often the same: EIA is not well integrated into decision making; and EIA occurs at the project level, but not generally at the policy or program level where decisions are made that foreclose some types of alternatives. (For example, a program-level decision to build dams or enlarge channels to control floods rules out the consideration of flood-proofing structures or floodplain zoning as ways to reduce damages caused by floods.) Even at the project level, EIA is typically done after planners and decision makers begin advocating a particular proposal, and EIA serves largely to

suggest mitigations for a project already selected. As Ensminger and McLean (1993: 48-49) have pointed out, "major decisions, including the action to be carried out and its location, are often made before the EIS is prepared and . . . the EIS is then drawn up to support those decisions." This use of EIA as an *ex post facto* rationalization for decisions reflects a failure to integrate EIA into project planning and is termed herein 'the integration problem'.

The integration problem persists because, in many contexts, a project proponent will not undertake an EIA until after a project is well-defined and there is a high likelihood that it will be funded and approved (Nelson 1993 and Hirji 1990). Many project proponents would deem it irrational to do otherwise. Why use resources to conduct an EIA if the proposed project is not likely to go forward? Another cause of the integration problem is that many project proponents don't give the same weight to environmental objectives as they give to economic performance measures such as the internal rate of return. If project proponents gave environmental impacts the attention they give to economic performance measures, the integration problem might not exist.

What explains the cases where EIA *is* integrated effectively into project planning and decision making? According to Ortolano, Jenkins, and Abracosa (1987), these cases involve a 'control mechanism' that causes project proponents to conduct an EIA. An example of a control mechanism is an EIA program that gives environmental protection agencies (or citizens acting through courts) the ability to block projects with inadequate EIAs or with adverse effects that could be mitigated. (For other examples of control mechanisms and their relationship to EIA effectiveness, see Ortolano 1993.)

While control mechanisms can make project proponents take EIA requirements seriously, they don't necessarily force project proponents to consider environmental factors early or continually as the conception of a project evolves. Ridgway and Codner (1994: 4) elaborate on this point: "One major criticism of EIA is that it occurs at only one point in time whilst a project changes over time—the process fails to recognize, or allow for, the iterative nature of engineering design."

## EIA Doesn't Ensure Environmentally Sound Projects

An issue related to the integration problem is that EIA does not ensure that projects with significant adverse effects will be stopped. In many contexts,

this point is moot: officials often promote environmentally damaging projects if the economic benefits outweigh their negative environmental impacts.

A manifestation of the problem is the debate over whether the U.S. National Environmental Policy Act imposes substantive (as opposed to procedural) obligations on federal agencies. There is no question that NEPA imposes procedural obligations on agencies to conduct environmental assessments and, where impacts are significant, to prepare and circulate environmental impact statements for comment by governmental bodies, NGOs, and individual citizens. Many legal scholars believe that NEPA imposes both procedural *and* substantive obligations (Yost 1990). They feel that substantive obligations are set out in § 101 of NEPA, which declares, ". . .it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other considerations of national policy," to improve and coordinate its actions to fulfill substantive objectives (e.g., "assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.") U.S. Supreme Court rulings through the early 1990s held that NEPA imposes *only* procedural obligations.

In sharp contrast to the situation in the U.S. (and other countries) where EIA has often been reduced to a an exercise in producing legally adequate assessment documents, some jurisdictions have mandated EIA procedures to ensure environmentally sound projects. The Environmental Assessment Board in Ontario, Canada, provides a notable example. Except for the possibility of an intervention by the provincial cabinet, the Environmental Assessment Board's decisions on the acceptability of projects are final.

The issues of whether and how EIA can be used to yield environmentally sound decisions have taken on increasing significance as governments attempt to use EIA to foster sustainable development. Many analysts and some organizations (for example, the World Bank) have embraced EIA as a principal tool for ensuring the sustainability of development. However, there are many instances in which EIA has proven seriously deficient as a mechanism for attaining environmental policy goals. Those who see EIA as a linchpin in the quest for sustainable development may be disappointed. (See Lélé (1991) for details on challenges in defining 'sustainable development'; and see Gibson (1993) for information on decision-making criteria to ensure sustainable development.)

## EIA Is Done Primarily for Projects, Not Programs or Policies

The influence of EIA could be far greater if it were applied at the level of programs; i.e., collections of individual projects, such as a coordinated series of dams, or an integrated set of research investigations. Some have even argued that EIAs should be done for proposed policies and legislation. The term 'strategic environmental assessment' (SEA) has been introduced to mean the application of EIA in strategic planning and policy making. (The terms 'programmatic EIA' and 'strategic environmental assessment' are sometimes difficult to distinguish, since EIA specialists have only recently started using the latter term. As Rosario Partidario (1993: 37) explains, the concept of strategic environmental assessment "still lacks a practical conceptualization."

Although a number of program- and policy-level EIAs have been completed (see, e.g., Sadler 1994), programmatic EIAs (or SEAs) are not done as frequently as many feel they should be. This is problematic inasmuch as taking decisions one at a time makes it easy to miss the cumulative effects of a series of decisions. An EIA for programs or policies would provide an opportunity to mitigate or abandon environmentally unsound concepts before they were turned into projects. In addition, programmatic EIAs can enhance interagency coordination and yield efficiencies. If an EIA were done for a program (e.g., a future set of land development projects), then any future project consistent with the program could proceed without having to redo the analysis of environmental impacts already accounted for in the programmatic EIA. This approach is demonstrated by the Chinese practice of preparing EIAs for industrial development zones. If a factory chooses to locate in an industrial development zone that has an EIA for the entire zone, the factory's EIA requirements are minimal. If the factory locates in the same city but outside the zone, it must generally do a complete EIA (Sinkule 1993).

If programmatic EIAs have such advantages, why are they not conducted more frequently? One reason is that program and policy decisions often evolve over time, making it difficult to identify what constitutes 'the program'. The scope of a program may be difficult to define, both spatially and temporally, and this makes assessing impacts even more uncertain than usual. Even when spatial boundaries can be delineated, the land areas involved may be huge and involve many decision-making authorities. In addition, agencies or private developers trying to promote an entire program may be wary of giving potential opponents a complete perspective on program impacts. Project proponents who view EIA as an administrative

hurdle would resist a requirement that arms opponents with information on the effects of an entire program. In many countries, the absence of top-level commitments to programmatic EIA—from either legislative bodies or agency leaders—has led to their underutilization. (For an example of a case where high-level commitments to programmatic EIA have been made, see Gibson's (1993) analysis of EIA in the province of Ontario, Canada.)

## Cumulative Impacts Are Not Assessed Frequently

Cumulative impacts have been defined as the "result of additive and aggregative actions producing impacts that accumulate incrementally or synergistically over time and space" (Contant and Wiggins 1993: 341). Using this definition, "additive actions are repeated similar activities," such as a series of small dams to generate hydroelectric energy; and "aggregative actions are groupings of dissimilar activities," such as a collection of demonstration projects to improve the commercial feasibility of using oil shale to produce energy. (See Contant and Wiggins (1993) for more complex characterizations of cumulative impacts; the definition above suffices for this discussion.)

One reason cumulative impacts continue to be, in the words of Ensminger and McLean (1993: 53), "consistently underassessed" is that the programmatic EIA is one of the few workable approaches for dealing with them. For reasons mentioned above, programmatic EIAs are not performed frequently.

In addition to methodological difficulties in assessing cumulative impacts, there are institutional impediments. For example, Contant (1984) developed a procedure for the U.S. Army Corps of Engineers to account for the cumulative impacts of Corps decisions permitting land development projects affecting navigable waterways. Contant's approach required the Corps to influence land use explicitly by using a carrying capacity analysis to propose limits on waterfront development. The Corps chose not to implement Contant's procedure, in part because the agency was wary of encroaching on the prerogatives of local governments to control land use. Examples presented by Irving and Bain (1993) demonstrate that when there are appropriate institutional arrangements for addressing cumulative impacts, an analysis of those impacts can yield beneficial results.

## Public Participation in EIA Is Often Inadequate

Many, but certainly not all, countries with EIA programs have mandated some level of public participation in EIA. A continuing problem plaguing many EIA programs is that public involvement occurs too late to take advantage fully of information that citizens can contribute concerning values, impacts and alternative projects.

Consider, for example, the NEPA process in the United States, which has had formal requirements for public involvement since its establishment, and is frequently lauded for involving citizens in decision making. Public involvement opportunities in the NEPA process allow citizens to be informed and to influence the scope of an EIA. However, those opportunities are limited since, by the time they occur, agency decision makers have often become attached to a particular course of action. Public involvement is often reduced to public relations or defending a decision that has (with the possible exception of mitigation measures) already been made. In many cases, the influence of citizens opposed to a plan is limited to attempts at either halting a project or forcing the inclusion of mitigation measures.

In many countries with democratic political traditions, opportunities for public involvement in EIA typically consist of making environmental assessment documents available to the public and, in some cases, conducting public hearings to discuss the EIS. Although some project proponents (e.g., the U.S. Army Corps of Engineers and Hydro-Québec) sometimes conduct more elaborate citizen participation programs, those programs are not required by EIA regulations. In countries where governments are not elected, public involvement in EIA, as would be expected, is not a priority.

## Proposed Mitigations May Not Be Implemented

It is common for an EIA to recommend actions to mitigate adverse impacts of a proposed project. What is far less common is to have assurances that a proposed mitigation will be implemented. Indeed, in some cases, the mitigations recommended in an EIA consist of actions that the project proponent has no authority to implement (for example, a measure that calls on residents near a proposed road to install double glazed windows to offset increased traffic noise). Moreover, there are many cases in which project proponents completely ignored mitigations (in an EIA) which they could implement (see, e.g., Hirji, 1990).

The degree to which proposed mitigation measures are ignored is significant. For example, many EIA specialists surveyed by Ensminger and McLean (1993) felt that the "lack of guidelines and action-forcing mechanisms" to ensure implementation of impact mitigations was an important deficiency of the NEPA process in the U.S. Moreover, several Congressional proposals to amend NEPA in the early 1990s (which were not passed) would have *required* that "environmental mitigation and monitoring measures and other conditions discussed [in the context of an agency's NEPA process for a project]. . . shall be implemented by the appropriate agency" (Bear, as cited by Smith 1993: 83).

Some political jurisdictions have put in place mechanisms to enforce the implementation of mitigations that government decision makers call for in the course of approving a project. For example, in New South Wales, Australia, the final EIS (which includes any required mitigations) becomes a legal document and citizens have the right to take a project proponent to court if mitigations agreed to by the proponent are not implemented (B.M. Ridgway, Monash University, Australia, private communication, July 12, 1994).

## Post-project Monitoring Is Rarely Conducted

The general absence of follow-up to check on whether mitigation measures were implemented is part of a broader problem—few investigations are conducted to determine the impacts caused by projects after they are implemented. Culhane (1993: 69) characterized the status of post-project monitoring succinctly: "Relatively few post-EIS audits have been conducted by anyone."

There have been calls for extensive post-project environmental impact monitoring since the 1970s. Two propositions in support of post-EIS audits are usually advanced: one concerns enhancing forecasting capabilities and the other is based on improving project outcomes.

The argument based on enhancing forecasting capabilities considers an EIA as containing a set of predictions of how the environment will change if a proposed action is implemented. Under the circumstances, the process of conducting an environmental impact study can be viewed as part of a scientific experiment in which predicted impacts constitute a hypothesis that can be tested by gathering data on impacts that occur after the proposed action is taken. In this way, the process of doing EIAs "provides an opportunity. . .

to contribute to scientific advances" (Caldwell, 1982, as interpreted and cited by Culhane 1993: 69).

The second argument supporting post-project monitoring concerns opportunities to ameliorate adverse impacts and evaluate the effectiveness of mitigation measures. The state-of-the-art of impact prediction is such that unanticipated impacts occur often. Monitoring provides an opportunity to identify adverse impacts and intervene with mitigation measures if impacts are unacceptable. This is a strategy that was advocated during the 1970s by Holling (1978) and his colleagues as 'adaptive environmental management'. Holling's arguments are no less compelling today. (For examples of cases in which effective post-project monitoring has been conducted, see Canter (1993).)]

## Assessments of Risk and Social Impacts Are Often Omitted from EIAs

Social impact assessment and risk assessment have long been considered an integral part of EIA in the normative literature on impact assessment. However, they are frequently left out of EIAs for projects in which either social impacts or risks to human health and the environment are significant.

Sometimes social impacts are left out of EIAs because the legislation establishing EIA requirements defines 'environment' narrowly with an emphasis on the biophysical environment. Beckwith's (1994) analysis of how 'environment' is defined in the EIA program in Western Australia illustrates this point: the environmental agency interprets the Environmental Protection Act of Western Australia to restrict the range of social impacts to be included in an EIA. However, even when social impact assessments are required by law, they are often not conducted. An analysis of the institutional factors contributing to the underassessment of social impacts has been given by Rickson et al. (1990).

Although risk assessment has advanced considerably as a field over the past few decades, these assessments continue to be left out or inadequately treated for many projects that pose major risks to human health and the environment (see, e.g., Arquiaga, Canter, and Nelson 1994). Examples include industrial projects where explosives and toxics are stored, and offshore oil drilling facilities. While there are challenges in integrating risk assessments into EIAs, the benefits can be substantial. In addition to alerting decision makers

of possible dangers, a risk assessment can focus attention on risk reduction activities such as minimizing the amount of waste generated in production processes, and it can also lead to the delineation of emergency response procedures in the event of accidents.

## NEW CHALLENGES: EIA AND INTERNATIONAL ENVIRONMENTAL PROBLEMS

During the past decade, efforts have been made to expand EIA beyond the confines of country-specific decision making and into the arena of international environmental problem solving. These efforts are considered below in three categories: problems involving the global commons; the use of EIA by development assistance organizations; and the potential for EIA to inform decisions on international trade agreements.

### Problems Concerning the Global Commons

There is increased use of EIA to help identify how proposed projects will influence global climate change, depletion of the ozone layer, loss of biological diversity, and other international environmental concerns. Cumulative impacts are of central importance in this context, since even moderately scaled domestic projects can, collectively, have dramatic effects on the global commons.

Difficulties in using EIA to identify effects of domestic projects on global environmental problems are illustrated by considering, for example, requiring an EIS to examine how a proposed project affects biodiversity (Henderson, Noss, and Ross 1993). This raises many complex questions: How should biodiversity be defined? What indicators should be used to measure it? And what guidance can be offered on how to include impacts on biodiversity in EIAs? These questions notwithstanding, some agencies have made a solid start towards using EIA to examine a proposed project's effects on biodiversity (Hirsch 1993).

Attempts have also been made to use environmental impact statements to analyze how proposed actions influence production of 'greenhouse gases', such as carbon dioxide and methane (Cushman et al. 1993). In 1989, the U.S. Council on Environmental Quality issued draft guidance to federal agencies on how to consider global climate change in the context of EIAs.

Even those who advocate increasing the scope of EIAs to include global climate change are troubled by the "technical difficulties in making accurate predictions" (Cushman et al. 1993: 460). There is also concern that the NEPA process has a minimal influence in reducing emissions of greenhouse gases since NEPA applies to a limited set of actions (typically those involving federal agency projects, permits, grants, or loans), and it has no influence on past actions that have contributed to the climate change problem.

## EIA and Development Assistance

Some of the first applications of EIA in foreign aid were made by the U.S. Agency for International Development (USAID). The agency did not embrace EIA voluntarily; it was forced to as a result of court actions brought by an environmental NGO in 1975. The reluctance of USAID to use EIA for its foreign assistance projects is not surprising: foreign affairs personnel, like staff in other bureaucracies, typically resist infringements on their autonomy (Robinson 1992). In response to the aforementioned court actions, USAID now routinely assesses environmental impacts of its overseas development activities.

During the late 1970s, many bilateral and multilateral aid agencies were pressured by NGOs to do EIAs for their projects. The need for EIAs for development assistance projects was compelling; it was increasingly evident that development aid organizations, such as the World Bank, were supporting projects with disastrous impacts on the environment (see, e.g., Payer 1982). As detailed by Kennedy (1988) and Mikesell and Williams (1992), multilateral and bilateral aid agencies (e.g., the Asian Development Bank and Japan's Overseas Economic Cooperation Fund, respectively) now require EIAs for many of the projects they fund.

Now that environmental assessment is required for much development assistance, the challenge is to implement the new EIA requirements in a way that is both productive and sensitive to the local context. There are numerous examples in which EIAs for development projects have turned into meaningless efforts only to satisfy procedural requirements (Hirji 1990). These EIAs did not affect decisions and only squandered time, resources, and hopes that EIAs could be applied productively to development aid projects. For EIAs to work well in development assistance, project lending officers of organizations like the World Bank need to give more attention to environmental

factors in making their decisions. The World Bank's past failure to implement effectively its own EIA requirements suggests that getting project lending officers to consider environmental impacts will not occur quickly.

## EIA and International Trade

Relationships between environmental protection and trade policy have recently increased in importance. As of 1991, there were 19 separate international agreements that concerned the environment and included measures affecting trade (U.S. International Trade Commission 1991).

Debates in the United States on the environmental impacts of the North American Free Trade Agreement (NAFTA) demonstrate the need for EIA in reaching international trade agreements. The debates often lacked defensible predictions of environmental impacts, since no EIS was prepared. Confusion dominated. Anti-NAFTA environmental NGOs argued that Mexico should raise environmental standards and improve enforcement before any agreement was finalized. At the same time, pro-NAFTA environmental NGOs posited that the agreement would make Mexico wealthy enough to be able to afford investments in waste treatment facilities and other environmental protection measures. Citizens and Congress were served a steady diet of rhetoric, and analyses of environmental impacts were conspicuously absent.

In contrast with the position of recent presidential administrations in the U.S., the government of Australia has decided that its trade policies "will be subject to environmental assessment." This policy decision was discussed at the 1993 Fenner Conference on the Environment in Canberra. At that meeting, it was announced that environmental assessment for trade policies would be carried out jointly by the Department of Foreign Affairs and Trade and the Department of Environment, Sport and Territories. Although it would take time to work out details on how to conduct environmental assessments for trade policies, the 1993 Fenner conference report (Anon. 1994) reflected strong government support for use of EIA in this context.

The momentum for free trade is increasing and the number of international agreements that involve both trade and the environment will probably increase in the future. Unfortunately, since trade policy is so politically charged, it is not clear whether countries will take advantage of the

opportunity to use EIA to ensure consideration of environmental consequences in trade agreements.

## CONCLUSIONS

Environmental impact assessment programs have changed the way project proponents and government agencies charged with approving projects do business. These changes have occurred in both projects and organizations. The most evident change is the inclusion of measures in project proposals to mitigate adverse environmental effects. A less common, but significant project-level change is where EIAs have affected project type, size and location.

What is arguably more significant but less widely studied is the influence of EIA on project proponents. While many project proponents have been marginally affected, others have changed fundamentally. These changes result from proponents hiring environmental specialists in order to meet requirements for EIA and in response to pressure for environmentally sound projects. Although many agencies have an initial tendency to meet EIA requirements with pro forma compliance, this sometimes changes to a situation where EIA is embraced as a standard operating procedure.

The shortcomings of EIA in practice are of two different types. One set of shortcomings stems from a systemic problem: EIA is typically conducted as a one-time exercise, whereas the process of project design is cyclical and iterative. Moreover, the EIA exercise is often conducted late in planning, often long after project proponents have become attached to a particular design concept. Under these circumstances, it is difficult to expect an EIA to affect fundamental decisions regarding the types of alternative projects given serious consideration or project scale or location. More typically, outcomes are either suggestions for mitigation measures or, far less frequently, outright rejection of projects.

A second set of shortcomings is less fundamental and thus more amenable to solution. These concern beneficial analyses and activities that could be more frequently conducted. Among these are strategic (or programmatic) EIAs, cumulative impact analyses, risk assessments, social impact studies, public involvement that is timely and meaningful, post-project monitoring, and follow-ups to ensure that proposed mitigations are implemented.

Although these have been problematic areas in practice, there are numerous case examples in the literature demonstrating that progress can be (and is being) made.

In recent years, the potential applications of EIA have increased, particularly in the context of international environmental problems. Efforts are being made to apply EIA to a new range of problems, including the loss of biological diversity and global warming. In addition, many development assistance organizations view EIA as a linchpin in their efforts to facilitate development that is environmentally sound and sustainable. Finally, there are significant opportunities for EIA to ensure consideration of environmental consequences in trade agreements.

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