EVALUATING ENVIRONMENTAL IMPACTS OF RURAL DEVELOPMENT PROJECTS

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ABSTRACT

Discussions of "sustainable development" call attention to various dimensions of human well-being to be considered concomitantly with traditional financial and economic measures. The challenge of environmental impact analysis (EIA) is to encourage re-design of projects so that net benefits are maximized over some weighting of economic, environmental, and other criteria.

To date, development organizations have been under attack by environmentalists for ignoring or conveniently overlooking environmental damages of development projects. Explanations for this include inadequate institutional commitment to link resource conservation with economic development, short time horizons, narrow evaluation criteria, problems of monetary valuation, and problems with implementation of EIAs.

The future of EIAs will see a number of changes to correct for these deficiencies. Evaluation of project impacts in isolation may yield to a more comprehensive environmental assessment for entire regions. Projects will not be funded without the assurance of specific policy conditions for environmental management. The technology of EIA will advance with the assistance of geographic information systems and related tools for data management. Cost-benefit analysis of development projects will continue to integrate the work of project economists with engineers, agronomists, and other specialists with knowledge of environmental issues. Methods of multiple criteria evaluation represent an advance over the partial approaches of EIA and cost-benefit analysis. There is considerable support for moving towards longer project cycles and extended planning periods within the total cycle, meaning that EIA can be more extensive and continuous than in the past. Within the development organizations, reconsideration of personnel accountability and reward systems is one of the strategies to raise the prominence of environmental issues. Each year presents more case studies, videos, and other didactic materials for training in EIA. Finally, the question of improving EIA is a matter of demanding stronger institutions for proactive planning, technical analysis, and policy reforms favorable to environmental protection.

CONTENTS

RECONCEPTUALIZATION OF ENVIRONMENT AND DEVELOPMENT

Where once economic growth and environmental protection were considered conflicting, increasing numbers of analysts and decisionmakers now see them as complementary. The financial means to secure environmental protection derive from the generation of expanding national income. In turn, economic growth -- particularly in developing resource-based economies -- draws on inputs of environmental goods and services in the production process. The complementarity of environment and development forms a central theme in the Brundtland Commission's "Our Common Future" (World Commission on Environment and Development 1987), and represents a recent reconceptualization now accepted rather widely.

The Many Dimensions of Human Well-Being

Even if environment and development are complements in principle, we confront unmistakable field evidence that development projects often generate adverse environmental impacts. However, this evidence is not necessarily inconsistent with the complementarity thesis. On the contrary, environmental degradation underscores that negative impacts jeopardize both economic growth and environmental management. The challenge of environmental impact assessment (EIA) is therefore to predict impacts, estimate their magnitudes, and encourage re-design of projects so that net benefits are maximized over some weighing of economic, environmental, and other criteria. Hence an evolving view in project analysis advocates:

1) multiple criteria for project evaluation,

2) a correspondingly broad definition of project efficiency, and

3) integrated use of EIA along with other dimensions of project assessment as an enabling tool to provide positive information for decisions.

Indeed, many discussions of "sustainable development" call attention to various dimensions of human well-being to be considered concomitantly with traditional financial and economic measures. Attributes such as environmental enhancement and ecological balance are part of a deliberately widened perspective on the ends and means of sustainable development (Davis 1991). While many such attributes have been discussed in development projects through the decades, it is only in recent years that they are argued as explicitly. Hence, we have before us substantially expanded visions of missions to be accomplished and socio-political processes to be realized as new development projects are proposed and debated. Incorporation of environmental aspects is fundamental in this expanded project framework, and environmental considerations appropriately are interjected at numerous places within the project cycle (Dixon "et al." 1988: 3-5).

Flaws in Standard Economic Accounts

The achievement of rising levels of national income is a central goal of virtually all governments, but we increasingly question how national income is measured. Specifically in the present context, conventional measures of gross national product (GNP) and gross domestic product (GDP) ignore losses to societies because of environmental damages and uncompensated depletions of natural resources.

The framework for a new approach is one in which environmental services and natural resources are regarded as "nature's capital," providing a foundation of inputs for primary economic activity. Depletion or degradation of nature's capital runs down the productive capacity of an economy, jeopardizing future income streams. Income is sacrificed when this capital is depleted or badly impaired, and development is revealed to be unsustainable. This is particularly serious in the developing economies for which a large proportion of output derives from fishing, farming, mining, forestry, hydropower, tourism, and other sectors heavily dependent on natural resources.

To date, only a few countries have been experimenting with natural resources additions and depletions in national income accounts. This means that measures of "true" income (the amount available for consumption after setting aside the sum required to maintain capital) are rare if non-existent. Yet to be clearly defined are measures of "environmentally adjusted" GNP as

indicators of economic performance. As currently conceptualized, these adjustments should include (Jacobs 1991):

1) subtraction of defensive expenditures for preventing or cleaning up environmental problems;

2) subtraction of residual environmental damages not prevented or corrected by defensive expenditures; and

3) depletion allowances for consumption of nature's capital.

These accounting issues add to the debate on classical political economics (Henderson 1988). The omission of environmental measures from economic accounts is indeed a major issue among Reformists who critique reductionist economics ("e.g.," Daley and Cobb 1989; Daley 1991).

However, others contend that environmental variables are less useful in measures of national income than in "satellite accounts" (separable physical indicators of environmental condition). Norway and France, for example, have been constructing relatively comprehensive environmental accounts on this basis. No monetary valuation of nature's capital is required, thereby avoiding difficult estimation problems. However, challenging issues remain in defining environmental performance by means of physical indicators, combining these indicators into composite indices, and interpreting the result for national policy (Jacobs 1991).

The implications of environmental accounting for Environmental Impact Assessments (EIA) could be trivial or profound, depending upon the number and strength of links between macroeconomic and microeconomic considerations. Simply stated, the purpose of an EIA is to "address the constraints and opportunities that the natural environment brings to the success of development" (Carpenter and Maragos 1989: 15). This roughly parallels the aim of environmental accounting at a macroeconomic level. The links between environmental accounting and EIAs are in the definition and gathering of baseline information ("e.g.," the identification of fragile areas and endangered species), the construction of national economic and environmental profiles, and the formulation of multi-year plans which include individual development projects. Other links between the project level and macro level may occur when technical assistance projects focus on environmental management, so that projects later lead to national policies which account for environmental quality (Carpenter and Maragos 1989: 13).

Environmental Failures, Externalities, and Resource Commons

The reconceptualization of relations between environment and economic development places considerable emphasis on market failures as a reason for environmental degradation. Individual

producers and consumers do not purposely deplete fisheries, destroy rain forests, foul beaches, or pollute rivers. Rather, environmental degradation is explained by either negative externalities and/or unrestricted use of natural resources by many private persons ("tragedy of the commons").

Externalities occur when individuals advance their own private interests in ways which impose costs upon others who have no mechanisms through which to seek compensation. The complex off-site impacts of rural development projects pose dozens of different examples at local, regional, and global levels.

The problem of the commons is familiar in fisheries, open grazing, and fuel wood collection. The adverse impacts of tropical deforestation on climate warming and biodiversity likewise are predicaments of a commons, although defined globally rather than locally. Whether defined at local or global levels, continued exploitation of commonly-held resources is rational for each individual user but may be disastrous for all.

Frequently, the difficulty is less that of common ownership than of unclear or disputed ownership. In these instances, remedies tend toward physical restrictions, pricing policies, and/or revised property rights (tenure and leasing arrangements). Other indirect interventions, such as taxes and subsidies, alter costs and benefits of production alternatives (Schramm and Warford 1989: 17).

Because negative environmental impacts of development projects are often explained by externalities and common resources, the identification and correction of an environmental problem may include policy issues. EIAs can effectively bridge environment with policy in a context far more comprehensive than engineering analysis alone.

IMPACT ASSESSMENTS: A CRITIQUE

For several years, multilateral and bilateral development organizations have been under attack by environmentalists of several persuasions for ignoring or conveniently overlooking environmental damages of development projects. The list of suspect projects includes road building, ranching, and logging in tropical forests; resettlement of agricultural colonists on what are often fragile lands; construction of large, grandiose dams; construction of shrimp ponds by altering natural systems in sensitive coastal zones; and financing of agricultural mechanization and irrigation on lands which cannot long sustain such technologies (Ascher and Healy 1990).

From the viewpoint of an environmental impact assessment, it is worth examining the reasons why such projects have been approved and funded. The explanations include inadequate institutional

commitment to link resource conservation with economic development, short time horizons, narrow evaluation criteria, problems of monetary valuation, and problems with implementation of EIAs.

Inadequate Institutional Commitment

A critique of impact assessments in development projects begins by considering staffing and procedures in the world's leading development banks and aid agencies. Up until the 1970s, there were few environmental specialists in these organizations. Rather, staffs were dominated by agronomists, engineers, and economists. Today, most project officers are generalists who depend on contracted technical experts for project design, implementation, and evaluation.

These generalists interact with small cadres of environmental professionals to pass judgment on the environmental impacts of projects, often with the assistance of various checklists and guidelines. However, relationships between project officers and environmental officers have grown up in an adversarial climate. Environmental officers have been branded as anti-development because they characteristically focus almost exclusively on negative impacts, often just before a project is otherwise ready for approval. As a conditioned response, the process for project approval sometimes deliberately avoids environmental staff when officials in the recipient country--anxious to have a project started--state that there are no environmental implications requiring study.

Even now, professional staff capable of understanding environmental dimensions of development projects are relatively few. In many aid agencies, career paths in this area are not well defined. Institutional frameworks to link environmental specialists with overall project design, implementation, and evaluation are still young and experimental. Recent restructuring to create environmental units within the World Bank and other development organizations is explained at least as much by attempts to defuse outside pressures as by achievement of internal consensus on environment as a priority (OTA 1991: 78-79).

Short Time Horizons

The development banks and aid agencies operate under pressures of time-driven goals to obligate projects and move funds, usually in annual cycles. In agencies like USAID, allocated monies have to be used in a given year or be "lost" in following years. For the World Bank and the regional development banks, pressures to commit funds come from client countries and from organizations providing capital for jointly financed projects. Hence, massive

amounts of development assistance flow through funding pipelines on relatively tight time schedules. Project personnel are rewarded for meeting deadlines and for spending allocated funds. Also, projects are looked upon favorably if they show early measurable results.

This tyranny of time works against sound environmental planning and evaluation. During project design, there may be little time to establish environmental baseline studies, make natural resource inventories, and conduct EIAs. Moreover, end-of-project evaluations frequently are scheduled long before environmental impacts are identifiable and measurable. Typical project "completion reports" are written after just five or seven years, a time frame too short to adequately assess environmental aspects, or to even begin addressing sustainability issues.

Narrow Evaluation Criteria and Inadequate Use of Feedback

Especially in the development banks, the criteria for project success have been dominated by financial and economic rates of return. Social and environmental aspects have been accorded far less attention, although this appears to be changing in view of current external pressures for social and environmental accountability.

Insufficient focus on environmental impacts (both positive and negative) produces misleading perspectives on desirable versus undesirable investments, obscuring true pictures of project worth. While assessment of environmental impacts is constrained by valuation problems and other technical complexities, the main obstacle is not applying what we know. That is, we could be doing much more to use approximate tools and estimates derived from present knowledge (Laarman and Contreras 1991).

Even when reliable evaluations are available, it is not clear that they generate lessons learned. In the first place, negative evaluations tend to disappear or be rewritten due to political pressures, deliberate delays, and underlying unwillingness to admit project failures. Other constraints in establishing a learning process include too little time for project personnel to study evaluation reports from other projects. Such reports often have only limited distribution and suffer from lack of editing. Failure to truly learn from project evaluations -- including their environmental aspects -- means that development organizations continue to reinvent successes and repeat mistakes (OTA 1991).

Problems of Monetary Valuation

Given the central role of benefit-cost analysis in project preparation and assessment, environmental attributes must be

quantified in monetary terms if they are to be made commensurable with marketed goods and services. Yet the attempt to place monetary values on environment runs up against both technical and philosophical challenges.

Economists have been making reasonable methodological progress in inferring implicit environmental prices from revealed preferences and hypothetical preferences. Many analytical approaches have emerged, and an increasing number of case studies illustrate various applications ("e.g.," Sinden and Worrell 1979; Dixon "et al." 1988; Bojo "et al." 1990).

Yet the problems of monetary valuation will not be overcome easily. The difficulties encompass limitations of statistical techniques, many types of bias in survey methods and contingent valuations, and the argument that to contrive monetary value where none exists is to make a mistake in logic. (Elements of nature and environment have no exchange value for many people in both Western and non-Western cultures.)

Also, monetary valuations through tests of willingness-to-pay are highly prejudicial against the poor. For instance, the monetary value of rain forests by subsistence tribal groups is far below the amount that can be paid by commercial developers for mining, farming, and logging. Hence unequal incomes between rich and poor make a critical difference for generation of valuations and thus, in some cases, cannot be either fair or efficient for assessing environmental aspects of development projects (Jacobs 1991: 212).

Implementation Issues

The industrialized countries have 20 years of experience in conducting EIAs, and much has been learned about good and bad implementation in terms of timing, procedures, and reporting (Carpenter and Maragos 1989: 4-6). This implementation experience is well worth summarizing.

One of the most critical issues has been timing. Typically, an EIA comes late in the sequence of project feasibility, often after the major decisions about project design have been made. At this late stage, an EIA is perceived as causing unnecessary delays. Also, the ideal role of an EIA as always contributing information for project management is not fulfilled if the EIA is a one-time event at the time of project feasibility. Missing, in many cases, is a continuous role for the EIA all the way through the project cycle in project monitoring and evaluation.

Regarding procedures, the EIA process, as presently conceived, often hides many assumptions and avoids explicit treatment of uncertainties. Moreover, project-by-project EIAs can be expensive and not helpful to overall land-use planning. To be efficient, an EIA must consider a wide range of project strategies, technologies, and sites. Finally, integration of

EIAs into the project planning process may require administration by decentralized environmental units rather than by centralized agencies.

Regarding reporting, EIA recommendations are often discredited simply on the basis of inflammatory tone and language. Another problem is that EIA reporting formats can be so voluminous that no one has the time or desire to read them. Perhaps most importantly, various EIAs recommend mitigative measures which are unaffordable for the income of a particular region or unrealistic in terms of operating and maintenance costs. An unfortunate but frequent response is to discard or ignore the entire analysis.

NEW DIRECTIONS

The future of EIAs will see a number of changes, some rapid and others more gradual, in response to the issues just described. It is necessary to be both pragmatic and speculative with regard to the view ahead.

From Project Impacts to Comprehensive Environmental Planning

We are learning that environmental impact assessments cannot be confined to the project level alone. Rather, the most useful project EIAs are integrated, both vertically and horizontally, with environmental issues in regional and national planning. This is witnessed by increased attention to environmental assessment in regional master planning, "economic-cum-environmental development planning" (ADB 1988), and other macro-level analyses.

It will not be surprising if the development banks and aid agencies increasingly require environmental assessments at the macro (regional) level as a condition for future project loans and grants. This can have the beneficial consequence of generating large amounts of information for the conceptualization and design of additional projects at the micro level. Additionally, increased emphasis on comprehensive environmental planning encourages different national agencies and authorities to communicate with each other and to discuss sometimes sensitive matters of jurisdiction.

The Asian Development Bank (ADB) and the Organization of American States (OAS) are examples of institutions which have taken important steps towards promoting complete regional master plans with environmental components (OAS 1984; ADB 1988). Beginning with macro-scale issues and working towards specific objectives for smaller areas, the master plans ultimately help provide siting information for individual projects. At this point, an

EIA is simply an additional step of comparing and choosing project technologies. It can be expected that, as more regions complete master plans with environmental dimensions, the need for ad hoc EIA will substantially diminish.

No Projects Without Policies

Through the last 10-15 years, we have learned that environmental problems and policy problems are closely related. An otherwise good project cannot be made to work in a bad policy environment. Thus we are familiar with exhortations to get prices right, to reconsider fiscal incentives and tax structures in light of economic and environmental distortions, and to internalize externalities by reorganizing resource ownership and by shifting institutional boundaries. These themes command a high profile in the major development organizations, and policy conditionality is a tool to leverage policy reforms from countries receiving external assistance.

A likely future direction for project EIA is environmental prediction under a range of contingencies with respect to economic and social policies. For ecosystem analysis, the EIA retains its base in engineering and the natural sciences but responds to alternative project circumstances framed by policy sciences. To the extent that development institutions perceive that environmental impacts are policy-driven, they will insist that mitigative actions and effects be discussed with reference to specific policy conditions.

Technology for Data Management

A frequent complaint in the past has been inadequate physical data to conduct an EIA, especially in developing countries. The absence of inventories on soils, water, flora, and fauna has presented serious information voids, made worse by lack of analytical connections to social and economic considerations. However, recent improvements in geographic information systems (GIS) permit not only better environmental assessments but also sharpened projections of future environmental conditions under alternative scenarios of demographic and economic changes.

Hence it should be clear that progress in EIA will be closely tied to progress in GIS. The use of remotely-sensed data from space offers a comprehensive and systematic way of generating broad regional data. For smaller regions and project sites, this data can be integrated in GIS systems with other physical and socioeconomic data ("e.g.," land tenure, household income) collected by traditional methods. This integration truly links environmental assessment with project design.

These efforts may be awkward and primitive in the beginning but

will steadily advance with accumulating experience, data, and improved GIS software. Constraints on the process are shortages of GIS skills and facilities in the developing countries and time and expense required to obtain and integrate the data for any particular development project. The development banks and agencies are advised to carefully assess these bottlenecks, to consider ways in which the bottlenecks can be relieved, and to reach conclusions on required technical assistance in relation to expected payoffs from the spread of GIS systems.

Modifications of Cost-Benefit Analysis

The basic tool for assessing project desirability in a development context continues to be cost-benefit analysis (CBA), despite decades of criticisms about its inadequacies. Skeptical economists argue that CBA should have less future importance as a decision model for environmental matters ("e.g.," Jacobs 1991: 218-221). An opposite school of thought contends that the handling of environmental problems within CBA is becoming more attractive as we develop greater confidence in measurement concepts and applications ("e.g.," Schramm and Warford 1989: 20-22). However, this optimism does not deny huge challenges (conceptual, empirical, and persuasive) in making CBA fit the new environmental agenda.

The future of CBA with respect to environmental issues and development projects is open to broad speculation. Project economists are increasingly asked to work with engineers, agronomists, foresters, biologists, and other technical specialists to define and predict environmental impacts. It is fairly certain that this emphasis on multisectorial and multidisciplinary analysis will continue. Less clear is the direction and limit of various techniques to assign monetary values to environmental outputs, the acceptability of these techniques within the development establishment, and the integration of CBA with EIA and other assessment models ("e.g.," see following discussion of "multiple criteria evaluations").

Multiple Criteria Evaluations

On both philosophical and pragmatic grounds, it has been argued that neither CBA nor EIA is completely adequate for integrating environmental dimensions into development projects. The use of CBA inconveniently forces all environmental considerations into or peripheral to market models. The use of EIA often focuses too narrowly on the defense of nature while neglecting human utility. Both are partial approaches evolved for different purposes (Archibugi 1989). Thus a central question for improved development practice in the future is: where and how should CBA integrate with EIA?

Among the many responses to this question are those which emphasize methods of "multiple criteria evaluation" (Nijkamp 1989). This refers to a whole class of computer models designed to reflect the many dimensions of decision tradeoffs: sectoral, regional, temporal, economic, and environmental. The objective is to model the impacts of different economic activities ("i.e.," development projects) so that changes in income and employment can be scaled directly against changes in indices of environmental quality. Moreover, the tradeoffs are shown spatially (by regions) and through time. The result is explicit treatment of the opportunity costs of alternative development paths, an advance over the partial approaches of either CBA or EIA. In this expanded framework, the use of EIA is less a field-based study than a computer simulation.

As applied in countries like France and the Netherlands, models of multiple evaluation criteria provide considerable decision support for environmental management. Advantages are the large number of development alternatives which can be compared, the interactive learning which is accomplished when policy variables are varied in a stepwise approach, and the presentation of the outcomes in terms of tradeoffs (Nijkamp 1989). There should be little doubt that models of multiple criteria evaluation will be constructed for the developing countries in increasing numbers with similar advantages stemming from their application.

Project Planning and Flexibility

Various factors explain why project cycles are as short as five to seven years, even in projects depending on complex natural resource systems. Development banks and aid agencies often expect results within the terms of current project officers, and short projects generate pressures to move ahead rapidly with implementation. However, the penalty for short projects is risk of not being able to adjust technologies in response to unanticipated obstacles and little time to achieve or even assess environmental and social soundness ("i.e.," the sustainability dimensions).

In view of these deficiencies, there is considerable support for moving towards longer project cycles and extended planning periods within the total cycle. Ideally, each project has a gradual phasing-in period, during which the fit between technology and physical environment can be adjusted incrementally. Moreover, total length of the project should be commensurate with expected results, even after midterm project corrections. Especially when the project has experimental components, the ratio of investment in project design to investment in project implementation should be substantially increased beyond current levels. The objective is to produce new generations of projects which are highly flexible, adaptive, and socially and environmentally sound.

To the extent that this framework is achieved, EIA will tend to

be more extensive and continuous than in the past. Greater investments in project planning and design will permit and encourage increased attention to environmental baseline studies. Additionally, the lengthening of project cycles will favor expanded approaches in environmental monitoring and evaluation that cannot be considered in shorter time periods. It is debatable whether the development organizations are truly working towards longer project cycles, but progress in this area should be quite significant for EIA.

Personnel Motivation and Accountability

Reconsideration of personnel accountability and reward systems is one of the strategies to raise the prominence of environmental issues within the development organizations. The objective is to provide positive incentives for individuals and bureaucratic units which consistently produce "quality" projects, including projects giving appropriate emphasis to environmental protection and management. To the extent that environmental criteria might factor more heavily in the definition of project success, it is conceivable that the mix of personnel (both in-house and contractual) will gradually shift to include greater numbers of environmental specialists. At present, the continued low numbers of environmental staff indicate that their importance is not yet appreciated by high-level decisionmakers. Thus a change in accountability for environmental matters implies a change from the top.

Admittedly, it is difficult to agree upon criteria for project success, including success in environmental management. However, this should not stop the development banks and aid agencies from experi-menting with a few possible methods on a trial basis. Much will be learned in the process even though conservatism in the development bureaucracies mitigates against bold departures from current practices. Assuming that at least incremental progress is possible in recognizing project quality, successful units could be rewarded in some way such as through increased funding (OTA 1991).

Education and Training

Already in the 1970s, spokespersons for development agencies were arguing the case for education and training of environmental specialists in the developing countries to build indigenous capacity for project design and implementation (Printz 1978). This is the longer-range and more difficult goal beyond simply contracting outside environmental consultants.

Despite two decades of progress in training environmental specialists in the developing world, the adequacy of the effort remains open to question. A valuable inquiry would

systematically survey recent development projects to learn the extent of local professional participation in EIA and related environmental analysis. This would reveal both accomplishments and gaps by country, sector, and technical area.

Future education and training in environmental analysis will likely see more variations and imagination than in the past. Projects having major environmental components or aspects will budget for special courses, seminars, and other instructional programs. Some efforts might be exclusively oriented to environmental training, while most other training (including EIA) will be funded within the context of individual projects. Each year will present more case studies, videos, and other didactic materials available for use. Nevertheless, the adequacy of training infrastructure should not be taken for granted. Rather, the development banks and aid agencies are advised to evaluate training opportunities and constraints on a regular basis to help define appropriate corrections.

Institutional Reform, Institutional Will

At its heart, the question of improving EIA in development projects is a matter of demanding stronger institutions for proactive planning, technical analysis, and policy reforms favorable to environmental protection. This has organizational dimensions but also penetrates deeply into institutional will.

In various countries, the sectoral and geographical organization of agencies place constraints on environmental assessment. In matters of environmental management and policy, new institutional structures might feature the creation of environmental bodies with wide-ranging authority over functional agencies. Although such structural changes will be extremely difficult to define and implement, they comprise one of the most important potential reforms of public sectors.

Additionally, we have to consider institutional will or the commitment of development banks, aid agencies, and related organizations to move forward where the way ahead is conceptually clear. Often there is less need to invent new procedures than to implement what we already know. In many cases, administrative processes and analytical methods for evaluating environmental impacts are well defined, but progress in linking environment and development requires that institutions truly desire to achieve this linkage. In the final analysis, this critical issue hinges on attitudes, motivations, and behaviors within the development community.

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