Aid to Developing Countries: The Technology/Ecology Fit

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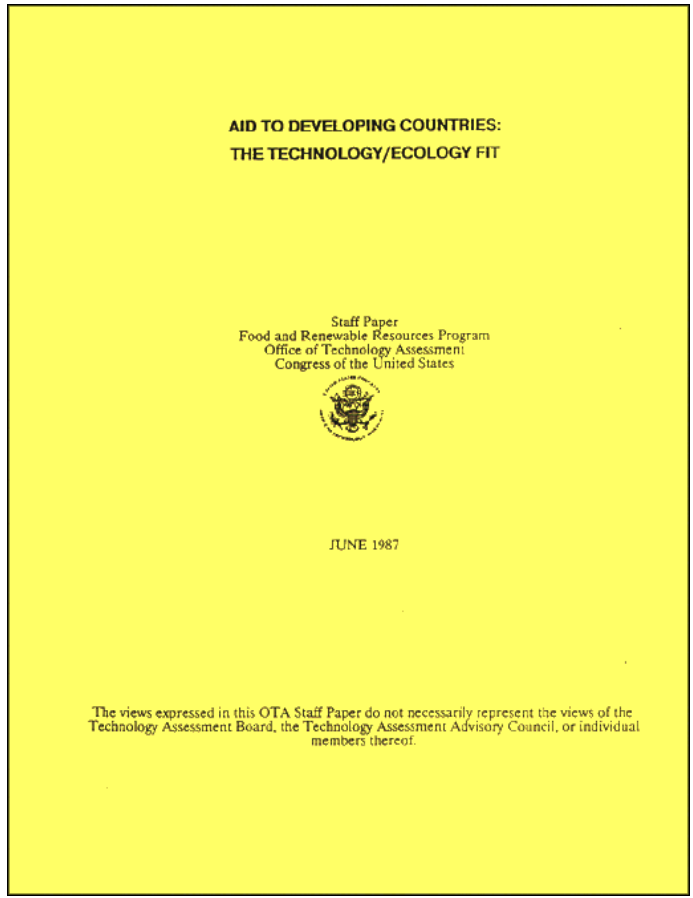

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FOREWORD

The U.S. Congress influences development assistance most directly through the U.S. Agency for International Development (AID) and five multilateral development banks (MDBs): the World Bank[1], the InterAmerican Development Bank, the Asian Development Bank, the African Development Bank, and the Caribbean Development Bank. Congress also influences development assistance through a number of Federal civilian and military agencies, bilateral programs (e.g., the Peace Corps and the Overseas Private Investment Corporation), and multilateral organizations (e.g., United Nations' agencies).

The Chairmen and Ranking Minority Members of the House Committee on Science and Technology and its Subcommittee on Natural Resources, Agriculture Research and Environment requested the congressional Office of Technology Assessment (OTA) to investigate how aid agencies might improve their capability to match technologies to local environmental conditions of recipient developing countries (Appendix A). The request grew out of an earlier study conducted under the auspices of the Environmental and Energy Study Institute (EESI) and ten Members of Congress. The EESI study identified the mismatch of technologies with developing country environments as a common contributing cause of development assistance project failures. One of the EESI report's

[1]The International Bank for Reconstruction and Development, the International Development Agency, and the International Finance Corporation comprise the World Bank.

[2]The Committee was renamed the Committee on Science, Space, and Technology at the beginning of the 100th Congress.

explicit recommendations (see Appendix B) for congressional and aid agency action was to conduct a study addressing this aspect of development assistance failure.[3]

The House Science and Technology Committee staff, and staff of several other interested committees, suggested that this OTA paper might serve as a resource for oversight and reauthorization hearings of the Foreign Assistance Act, which provides the framework for U.S. development assistance. To enhance the report's utility, questions are included (set off in boxes) that committee Members and their staffs might use in hearings or informal conferences with development assistance personnel.

This paper focuses primarily on AID and to a lesser extent on the World Bank. AID and the World Bank have made the most observable efforts to integrate environmental and development concerns. Other multilateral and bilateral organizations tend to emulate their environmental policies and procedures to various degrees. Today, the World Bank is undergoing major reorganization in part to enhance its environmental capability. It is not clear at this time what the magnitude of these changes will be, although the President of the World Bank, Barber Conable, has stated his environmental goals for the Bank's reorganization (Appendix C). Once the reorganization is complete and the

[3] OTA and the World Resources Institute (WRI) initiated similar studies. This report presents only the results of OTA's study. Release of the WRI study is expected in mid-1987.

the success of this effort in achieving the stated environmental goals could be examined through the congressional hearing process.

This paper is based on information derived from: 1) a series of interviews with personnel of development assistance organizations, certain Executive and congressional agencies, nongovernmental organizations involved in development assistance, and development consultants; 2) an OTA workshop; and 3) study of selected aid organization reports (many of which are not intended for specific citation). By agreement with persons interviewed and workshop participants, observations are not attributed to particular individuals (Appendix G lists persons interviewed and workshop participants).

OTA greatly appreciates the contributions of the workshop participants, interviewees, and reviewers. As with all studies, the content of the Staff Paper is the sole responsibility of OTA.

Contents

1 Conclusions

Ecological compatibility of technologies with local site conditions is fundamental to success of development assistance: Development assistance organizations know that the specific sociocultural, political, economic and ecological conditions of a development site create the framework into which their efforts must be integrated. Each of these will affect the sustainability of the development project. Regardless of the cause of resource degradation or damage, developing countries generally cannot afford even a temporary decline in food or foreign exchange derived from their natural resources, and they lack sufficient economic resources to implement reclamation or restoration activities. Thus, selection of ecologically appropriate technologies becomes imperative.

Why unsustainable technologies may be chosen: Most developing countries are located in tropical latitudes where, at many sites, few if any sustainable technologies exist to satisfy development needs. So technologies that worked elsewhere under different conditions are chosen and some of these prove unsustainable. When technologies developed for temperate areas are transferred without appropriate modification to tropical areas, they tend to disrupt ecosystem functions beyond natural regenerative capabilities, thus reducing the land's current and future productivity y. Sustainable technologies, in other cases, do exist and have been demonstrated, but are rejected in favor of approaches that are

expected to achieve other, overriding goals. Finally, no single individual is likely to have adequate technical knowledge to assess thoroughly whether a proposed technology will be compatible with the political, cultural, economic, and ecological conditions of the development site. Experts responsible for informing decision makers sometimes are unable to recognize which technologies will be sustainable. Thus, technologies may be promoted based on "best guesses," which sometimes are wrong.

Need for continued congressional oversight: Selecting technologies expressly to fit ecological conditions is becoming an important component of development assistance strategy at the U.S. Agency for International Development (AID). Similarly, the multilateral development banks (MDBs) have strengthened their capabilities to foresee and mitigate adverse environmental impacts from the projects they sponsor. These changes largely are reactions to pressure from Congress and other concerned organizations. Several initiatives at AID, and the environmental goals recently articulated by the President of the World Bank, suggest that the importance of ecological sustainability is becoming an accepted value for development assistance professionals. However, bureaucratic inertia seems to work against substantial improvement in the agencies' abilities in this regard. Therefore, continued pressure from Congress is needed to assure progress towards a goal of ecologically sustainable development.

Congress has a direct and profound influence on AID. Indeed, changes in AID's authorizing legislation and appropriations have contributed to a proliferation of high priority goals so numerous that they

are widely perceived as a serious constraint to the agency's effectiveness. Thus, Congress is faced with a dilemma. "Micromanaging " AID by increasing the specificity of development objectives in the Foreign Assistance Act and earmarking shrinking development assistance appropriations for specific purposes--may inhibit the agency's ability to develop and carry out efficient development assistance programs. Without pressure, on the other hand, AID may be slow to progress in integrating an environmental perspective in agency activities.

An alternate solution may be modified use of congressional oversight. This could include enhancing the capabilities of committee staff by adding additional personnel experienced in development assistance and technology development, and fostering improved collegial and informal working relationships between committee staff and AID personnel. Congress or AID could undertake a study of how congressional pressures are perceived within AID, and what mechanisms could improve productive interaction.

Attitudes at the top: Improvements to assure that promoted technologies are ecologically appropriate seem unlikely to occur on the scale needed without high-level management personally committed to this goal. Thus, congressional confirmation hearings--in which a candidate's capabilities and views are assessed--are an important mechanism to influence AID activities. Confirmation hearings provide an important opportunity for Congress to raise issues and to discern the depth of a nominee's knowledge of and concern for matching development projects and technologies to local conditions in developing countries, and are an

appropriate place to reinforce the guidance given in oversight hearings and legislation. Careful attention should be focused on the personal knowledge and attitudes of a proposed AID Administrator, and on his/her criteria for selection of Assistant Administrators. Agency recruitment policies and practices, that ultimatley affect the agency's ability to perform its mandate effectively, largely are determined at the Assistant Administrator level.

Congress does not formally influence the choice of officials in multilateral development banks, but it does approve appointments of Treasury Department officials who represent U.S. interests to the banks. Members of Congress probably can have a significant impact on selection of the top bank officials through informal communication with the Administration.

Having enouph of the right people: Environmental science is a technical field based on scientific principles, knowledge, and tools that cannot be used effectively by persons without appropriate training and experience. Neither AID nor the World Bank has a sufficient number of environmental officers to assure agency-wide guidance. Just as a development agency needs the right set of economists to design a commodity pricing intervention, it needs the right set of specialists to design and execute a successful intervention in the use of natural resources. Further, periodic accountings of natural resource conditions and environmental quality indicators to accompany reports of recipient

country economic indicators prepared by development assistance organizations could provide a way to motivate these people to address carefully the match of technologies with ecological conditions.

Organizing technical skills: In addition to having an adequate number of people with needed technical expertise and fostering their collaborative work, it is necessary to ensure that these staff occupy appropriate positions in the organization so that they can provide needed expertise at the right times in the project cycle. Although environmental and natural resource expertise is integral to all stages of project development and implementation, particularly important stages are:

1) problem/opportunity identification,
2) contractor identification and selection for project design, and
3) project monitoring and evaluation.

Thus, interdisciplinary teams might be established in AID to link the U.S. science and technology community with field activities, and to serve as a technical filter assuring that AID would be unlikely to select and transfer unsustainable technologies to developing countries. Each team would be charged to assist with evaluation, redesigning, or designing agency activities in one of several ecological zones common to developing countries (e.g., hot wet lands, arid/semiarid lands, and high altitude lands). This would increase the likelihood that technologies chosen would fit the ecological setting of the development site.

Interdisciplinary analysis: The systems in which AID projects intervene are complex and changes are likely to result in cross -pectoral conflicts. Thus, the tasks of pre-project analysis and project evaluation usually require the knowledge of several types of specialists--such as sociologists, ecologists, and soil scientists--as well as the experience and knowledge of local people who represent the sector to be affected. The analytical methods for bringing this information together for presentation to engineers, economists, and decision-makers is the specialty of environmental analysts. Thus, adequate planning often necessitates use of interdisciplinary teams guided by environmental analysts. However, teams of consultants and staff fielded by development assistance agencies too seldom accomplish this. Project officers generally have neither the correct technical backgrounds nor ready access to sufficient in-house technical personnel to facilitate adequate interdisciplinary environmental analysis.

Interdisciplinary cooperation seems unlikely to occur without staff incentives and an organization structure explicitly designed to encourage such teamwork. The development assistance organizations might increase their support for development of interdisciplinary planning and analysis expertise, and expand support for development of techniques that might facilitate and streamline interdisciplinary planning.

Improve project planning and increase project flexibility: Assistance projects that intervene in a developing country's natural resource base require careful and perhaps extensive planning. In most cases, the scientific knowledge base is from temperate regions whereas the

development site often is tropical. Further, the recipient culture and economy tend to differ substantially from those of the project designers, making it difficult to predict what types of projects are likely to be adopted, Most development projects, then, are at least in part experiments and must be designed to accommodate unidentified changes.

Risks to natural resource systems and development assistance recipients may be reduced where projects include an extended technical planning phase, a gradual phasing-in period for adaptation of technology to the site's ecological and social conditions, and have a length commensurate with achievement of results despite likely mid-term project realignmen t. However, internal organization goals, to keep funds moving and to achieve measurable results quickly, operate against these approaches. Further, short project duration makes it difficult to introduce technologies or implement projects gradually, and presents a serious obstacle to making mid-term corrections in response to monitoring and evaluations. Instead of today's common three- to five-year AID projects, durations of 10 to perhaps 20 years seem more appropriate.

Improved use of project evaluations: Midterm and final project evaluations are little used to improve AID and World Bank technology decisions. Even when evaluations are broad enough to observe external effects, and are conducted long enough after project completion to determine ecological sustainability, evaluations seldom address faults with the original problem identification and project design. Yet, this is the time when, with the benefit of hind-sight sharpened by project experience, important lessons can be learned.

Analysis of existing evaluation reports could identify important environmental and cultural interactions that determine whether technology interventions will be maintained after the project is completed. Evaluation procedures could be modified to improve identification of causes of development project success and failure and to assess effectiveness of environmental mitigations proposed during project planning and midterm evaluations. In addition, evaluations could be designed to create a feedback system for project officers and design teams.

2 Introduction

The question posed by Congress and addressed by this study may be stated as follows:

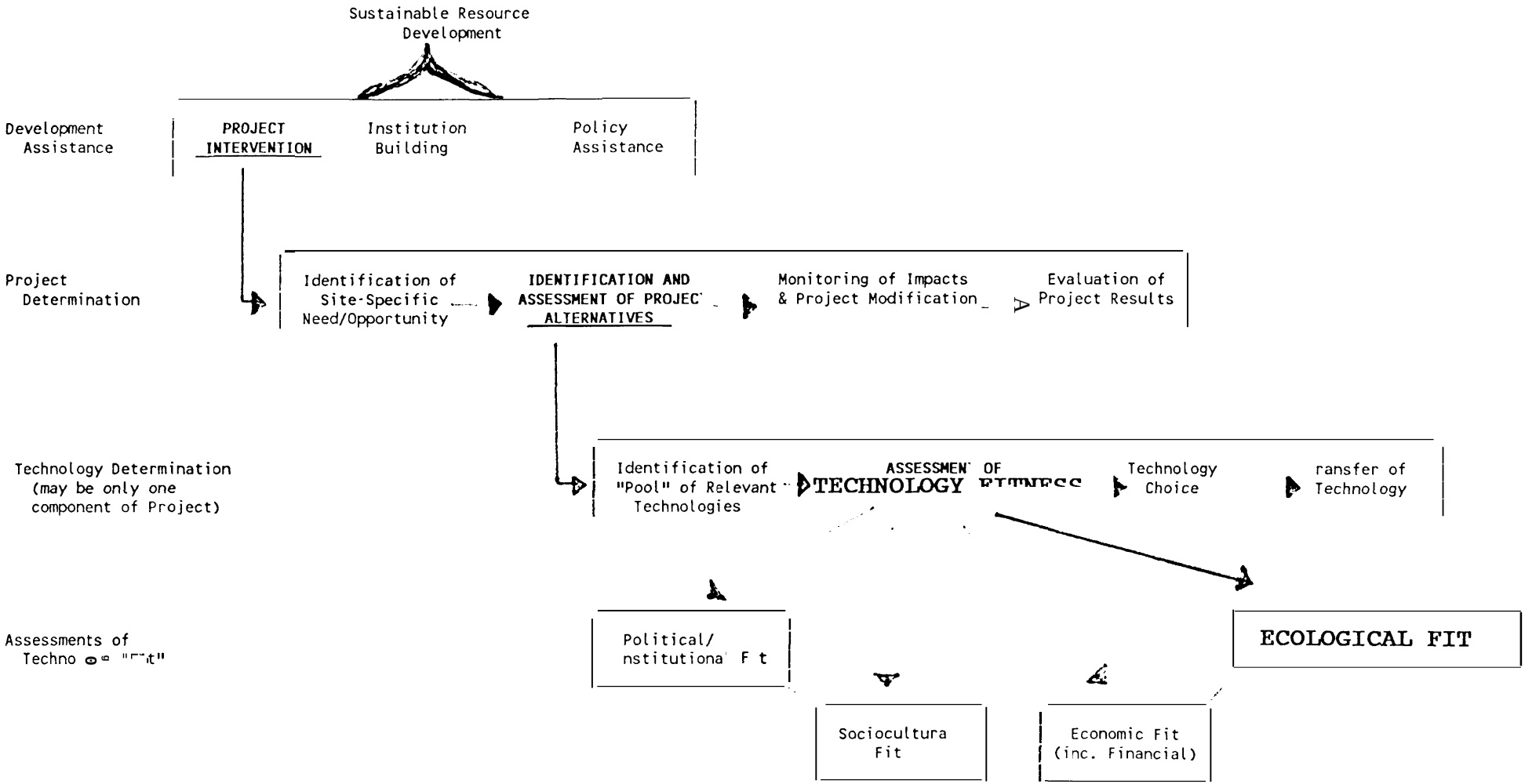
> *How can international development assistance agencies improve their ability to choose technologies that are compatible with biological and physical conditions at the sites where the technologies are to be implemented?*

For the purposes of this study, technologies will be considered compatible with biological and physical conditions if they support and prolong the contributions of local natural resources to the provision of goods and services for human consumption. Such technologies will be called "ecologically sustainable technologies."

Finding an answer, and instituting the solution or solutions, does not imply eliminating or even minimizing the potential for adverse environmental impacts from development assistance projects. These can occur from the failure to transfer the technology to the practitioners, and from failure of the development projects for reasons other than the ecological sustainability of the chosen technology (see figure 1). Even when choosing a particular technology, further questions are relevant, such as:

- Are the eventual practitioners likely to have cultural aversions to the technology?;

Figure 1: THE ROLE OF TECHNOLOGY / ECOLOGY "FIT" IN DEVELOPMENT ASSISTANCE



- Is the technology within the means of these practitioners?; and
- Will governmental or other institutions provide the necessary support to ensure continued operation of the technology in a manner appropriate to local conditions?

Thus, to minimize the possibility of adverse impacts from development assistance activities in general, one must address a considerably broader arena of issues than just technological/ecological fit. Such a study, however, is beyond the request at hand, and the resources for this Staff Paper.

The ecological underpinnings of development assistance

Development assistance interventions commonly are designed to facilitate development of human and natural resources in recipient countries. Three general modes of intervention are 1) tangible project in-tervention, 2) local institution building, and 3) policy assistance (figure 1). In aggregate, these interventions are designed to assist developing countries to establish institutions for orderly improvement of the quality of life, to effect policy changes needed for satisfactory project performance, and to undertake investments that are properly engineered, financially feasible, and economically and environmentally sound.

Views of the relative importance of the three types of development assistance are mixed. The Environmental and Energy Study Institute (EESI) study and the Science and Technology Committee's request to OTA indicates that the primary focus of development assistance--projects and programs--can visibly, tangibly affect the quality of life and environment in developing countries. These activities also

have important interactions with developing country environments. However, project interventions can beneficially or adversely affect how renewable resource systems are used, the benefits derived from them, and the impacts of their use on other communities or future populations. Thus, while such activities probably should continue to be a major focus, they should be designed specifically to minimize the potential for adverse impacts.

A second view is that development assistance can contribute only mar gin a 11 y to the damage or conservation of n a t u r a 1 resource systems, because the scope of resource system abuse generally is so much greater than the scope of development assistance projects and programs. Therefore, to promote resource conserving technologies effectively, assistance agencies must use their influence to encourage governments to design and enact policies that will reward resource-conserving development and discourage resource-wasting development. The extent of influence is usually related more to the level of general support funding an agency provides than to the specific development assistance projects it sponsors. Support for the second view is growing at the U.S. Agency for International Development (AID) and the World Bank, where it is thought to have a potential at least equal to that of improving the environmental soundness of site-specific projects.

The third approach is based on the perception that, while project interventions and support for policy development can have substantial impacts, the only means to ensure that development be widespread and appropriate to the local needs and conditions is for development activities

to be defined, planned, and implemented by the assistance recipients themselves. Thus, proponents argue that ensuring local participation in all phases of project assistance and emphasizing local institution building projects is fundamental to long-term development. Support for this approach is well-based in U.S. nongovernmental organizations, and is growing in development assistance organizations.

In practice, no clear lines can be drawn between the three types of assistance: developing local institutional capabilities may require and be accompanied by policy assistance grants and loans, and projects may have institution-building components. Indeed, institution-building itself can be seen as a project. Thus, the three types are complementary and the balance among them in development assistance can only be determined on a case-by-case basis.

The purpose of the tangible project interventions usually is to improve the well-being of some target population by causing a prolonged increase in production of goods or services. Thus, many of these projects are related directly to resource use and include activities such as agricultural intensification or expansion, dam-building, etc. Such interventions often include introduction of new technologies or improvement and expansion of existing ones.

Clearly, selection of appropriate development interventions must be based on a number of development site conditions. Development assistance organizations have identified that the specific sociocultural, political, economic and ecological conditions of a development site create

the framework into which their efforts must be integrated. Regardless of the cause of resource degradation or damage, developing countries generally cannot afford even temporary decline in the food or foreign exchange derived from their natural resources, and lack sufficient economic resources to implement reclamation or restoration activities. Thus, selection of ecologically appropriate technologies becomes imperative.

Successful interventions depend on the existence of the conditions necessary to support the new, improved, or expanded technologies. Compatibility of the technology with local ecological conditions is prominent among these (see Appendix D for an elaboration of the necessary conditions for successful technology transfer). Development interventions sometimes have failed because ecological compatibility has not been assured. Consequences have included irrigation canals filled with silt, range lands degraded by expanded cattle herds, or settlements abandoned because of declining soil fertility. Thus, the *problem is to develop technologies that are ecologically sustainable under the political, social and economic conditions that will prevail when assistance has ended.*

The agencies' response

Over the past decade, the U.S. Agency for International Development (AID) and the World Bank have developed procedures designed to incorporate certain environmental considerations in their assistance activities. Despite progress, however, the agencies' abilities to identify ecologically sustainable resource development interventions still are frequently criticized.

A 1975 lawsuit brought against AID by the Environmental Defense Fund, Inc. cul minated in Agency compliance with the National Environmental Policy Act (NEPA). As a result, AID established well-defined environmental procedures and a small cadre of environmental officers to screen projects for significant environmental effects and to focus planning attention on likely negative impacts of development projects (Appendix E).

Amendment of the Foreign Assistance Act in 1977 mandated that AID increase investments in projects and programs explicitly intended to conserve as well as develop the productivity of developing countries' renewable natural resources. AID responded with numerous programs designed to enhance client country abilities to manage resource development, and projects addressing some immediate symptoms of resource deterioration. Examples include the AID Country Environmental Profiles program, and the numerous AID projects that sponsor distribution of tree seedlings and technical assistance to farmers on "fragile lands."

The World Bank also developed a process to focus planning attention on projects likely to have significant environmental impacts (e.g., construction of large dams, roads that penetrate forests, and extractive industries). The Bank has had a small environmental office since 1970 to screen proposed projects and alert project officers when detailed scrutiny of environmental impacts seems warranted.

Recently, Bank officers have begun to evaluate the relationships between economic policies and resource-use practices in certain countries. If these analyses reveal how national policies could be changed to enhance ecodevelopment, the Bank then may promote such changes in its policy dialogues and offer support through sectoral loans for natural resources. Finally, the Bank's current reorganization is expected to strengthen the bureaucratic status of its environment operations while establishing positions for natural resource professionals in regional offices, thus giving them a more direct role in project identification and design.

3 Why Ecologically Inappropriate Technologies May be Selected

Introduction

Mismatches between ecological conditions and technologies promoted by assistance organizations is currently receiving the attention of Congress and a number of public interest groups. This concern is expressed in the EESI report (Appendix B) and summarized in the Committee's request letter (Appendix A). Therefore, no detailed review of evidence for the problem is included here. In OTA's interviews, no one denied that the problem existed, although opinions differed on its relative importance. The evidence, in fact, is largely anecdotal: few recent cause-effect analyses of development project successes and failures have carefully investigated the issue of matching technologies to environment t.

Interviews for this study and the relevant literature indicate that at least three broad factors contribute to the use of ecologically inappropriate technologies. These are:

- Few, if any, sustainable technologies exist to satisfy development needs at many sites. So technologies that worked elsewhere under different conditions are chosen and some of these prove unsustainable.
- Sustainable technologies, in some cases, do exist and have been demonstrated, but unsustainable technologies still are implemented.
- Experts responsible for informing decision makers sometimes are unable to recognize which technologies will be sustainable.

Where sustainable technologies may not exist

Most developing countries are located in the tropical latitudes. Here, the common problems of rainfall extremes or irregularities, high temperatures, and lack of seasonal reduction of insects and parasites make natural ecosystems highly susceptible to self-reinforcing cycles of degradation.[1] Such vicious cycles are easily triggered by attempts to develop and use the local natural resources. Most technologies used to get high yields of goods and services from soil, vegetation, animals, and water resources have been developed in temperate regions where natural systems are generally more resilient. However, when transferred without appropriate adaptation to tropical areas, they tend to disrupt ecosystem functions beyond natural regenerative capabilities, thus reducing current and future productivity.

Further, many technologies that could be ecologically sustainable commonly require resources not readily available in developing countries. For example, the Near-East and Pakistan have, although not tropical, harsh environments for which ecologically sustainable technologies are few. Although much western U.S. agriculture and water management

[1] Degradation of ecosystems involves physical, chemical, and biological processes set in motion by activities that foster reduction in the system's inherent productivity y. For example, hillside deforestation in the humid tropics commonly leads to accelerating soil erosion, decreasing soil fertility, and disrupted hydrologic cycles. These changes, in turn, can promote further reduction in ecosystem productivity through decreased natural plant regeneration, establishment of weedy plants that displace more desirable plant species, and increased hazards to public health.

experience is relevant to development in these areas, U.S. technologies often are not suitable within their political, social and economic framework.

Similarly, principles of science and logic often can be used to make marginal improvements in long-sustained traditional technologies or to adapt technologies that have worked elsewhere. If the design is good and appropriately applied, such technologies can conserve the natural resource base. However, such adaptations of technology can become unsustainable if cultural or financial factors prevent correct application.

In cases where ecologically sustainable technologies suitable to the sociocultural framework do not yet exist, development assistance options include: 1) support for research to develop ecologically sustainable technologies, 2) definition of development goals that can be met with technologies known to be ecologically sustainable (e. g., reducing risk or improving distribution of goods and services may be more appropriate goals than increasing production), and 3) gradual technology modification with careful monitoring to reduce the risk to affected people and natural resource systems. In practice, however, project time frames and objectives often preclude such gradual development.

Where unsustainable technologies are chosen

Sustainable technologies, in some cases, are rejected in favor of approaches that are expected to achieve other, overriding goals. Thus, technologies may be chosen for which sustainability is unproven, or those known to be ecologically, culturally, or financially incompatible with local

conditions. For example, although many traditional technologies are ecologically sustainable, production gains from these may not seem adequate to resolve the identified development problem.

A variety of other reasons are given for support of projects known to deplete renewable resources rapidly. For example, an emergency condition may seem to necessitate immediate action using technologies which do not fit the local environmental conditions. Similarly, short-term economic or political goals may override ecological goals. Examples include forests cleared for timber and cattle exports to meet short-term foreign exchange requirements, and settlements established to curtail nomadism or to secure boundaries.

Choice of technology also can be skewed by economic analyses which value immediate, although perhaps only temporary, benefits more highly than distant costs and benefits.[2] For example, the present value of temporary production gains (e.g., from a reservoir) can be shown to be higher than the worth of an unending stream of modest benefits from current resource uses (e.g., subsistence agriculture). Or, for highly subsidized projects, the rationale is either that the temporary effects will resolve a significant development problem, or perhaps that foreign-source subsidies can be continued indefinitely.

[2] The Congressional Research Service ice recently conducted a workshop reviewing the state of the art in incorporation of environmental considerations into benefit-cost analyses. The draft proceedings are under review.

Such decisions in favor of unsustainable technology can seem rational. However, great care must be taken to assure that:

1) the development problem has been correctly identified;
2) the benefits and costs, including cross-sectoral conflicts, are fully accounted;
3) the lifetime of the project has been correctly estimated;
4) the project will be subsidized long enough to achieve its intended objectives; and
5) the project include a monitoring component to ensure that recipients are protected from adverse impacts.

Where sustainability is not determined

No single individual is likely to have adequate technical knowledge to assess thoroughly whether a proposed technology will be compatible with the political, cultural, economic, and ecological conditions of the development site. However, development assistance projects often have relied on technology choices made without adequate interaction among all the necessary types of experts.

World Bank and AID consultants now used for planning generally are members of a multidisciplinary group.[3] But whether such groups perform interdisciplinary analysis[4]--identifying the interactions between

[3] Multidisciplinary planning implies that specialists of several disciplincs contribute to the completed plan. However, it does not imply that they work together to identify and resolve cross-sectoral conflicts between their separate analyses.

[4] Interdisciplinary planning and analysis implies that the specialists of several disciplines interact within the framework of a tested method (see Appendix F for examples) to assure that the overall analysis is internally consistent and *that* foreseeable conflicts are identified and resolved. Typically such analysis requires a team member trained in interdisciplinary analysis techniques.

environment, technology, culture, and financial conditions--is less apparent. Without interactive, interdisciplinary analyses, it is unlikely that predictions of compatibility with local site conditions can be made with assurance, Thus, technologies may be promoted based on ‘best guesses, ’ which by definition sometimes will be wrong.

4 Conditions Internal to Development Assistance Organizations that Perpetuate Inappropriate Technology Choice

Introduction

Some causes for inappropriate technology choices are perpetuated by development assistance agencies themselves. Other, generally more powerful causes for poor technology decisions are problems of values, personnel resources, economic and bureaucratic structures, and economic/financial constraints that exist in developing countries. However, technical, financial, and analytical assistance profoundly influence policies and technology decisions in developing countries. Thus, conditions internal to development assistance agencies can be significant contributing causes of development success or failure.

Although perceptions differ as to appropriate modes of development assistance, a remarkable consensus exists on the major internal factors that constrain an assistance organization's ability to match technologies to development site environmental conditions. A major constraint has been a lack of internal commitment to the concept that renewable resource conservation is a necessary condition for development success. AID, the World Bank and other multilateral development banks (MDBs), and Federal agencies with international activities, have individuals strongly committed to the importance of integrating conservation and development However, for most development officers this has not been a high priority. Policies and procedures addressing

environmental soundness generally have not come from intellectual consensus within the agencies, but rather have been formed in reaction to outside pressure, particularly from Congress. Internal factors inhibiting an aid organization's ability to consider fully environmental conditions in carrying out development assistance are summarized in Box 4-1.

Box 4-1: General Internal Constraints that Inhibit Full Consideration of Environmental Conditions in Development Assistance (Source: Interviews)

- Agency policies shift often (AID).
- Agency has too many high priorities (AID).
- Few projects last long enough to accomplish significant development goals (AID).
- High staff turnover (AID).
- No career path exists for environment and natural resource professionals (AID).
- Heavy and increasing bureaucratic workloads are compounded by inadequate staff support services (AID).
- Too few in-house staff have knowledge about how technologies interact with ecological and cultural conditions (AID; World Bank),
- Inadequate numbers of staff are professionally trained in environment and natural resources (AID; World Bank).
- Existing in-house expertise in environment and natural resources is underused because of inappropriate assignments and job descriptions (AID).
- Selected contractors often lack strong expertise which facilitates linking technology and environment in developing countries (AID; World Bank).
- Agriculture and environment are not clearly linked by agency structures, procedures, and practices; agencies provide little incentive to 1 ink them (AID; World Bank).

Conflicting goals

Several time-driven goals of development agencies operate strongly against allocating the planning time necessary to determine which

technologies are compatible with ecological conditions of the development site. Prominent among these is the need to keep funds moving. For AID, pressures to spend money come from the Department of State, Office of Management and Budget, and from the annual budgeting process--where large amounts of money have to be obligated each year or else they are "lost." For the World Bank, pressure comes from client countries and from organizations providing capital for jointly financed projects.

The goals that influence personnel activities the most are those with deadlines for clearly discernible achievements. Thus, the goal to commit and spend money within a given year can be expected to receive greater attention than the goal to develop a project likely to be successful within the complex workings of the natural resource base, the host economy, and the host society.

Another time-driven goal for development organization personnel, and as a result for their contractors, is to achieve measurable results quickly. For multilateral bank personnel, the pressure arises from the fundamental fact that banks must operate as banks. Even when loan rates are highly concessionary, benefits from investments made with borrowed capital must soon begin to match debt costs. Final evaluations ultimately focus on a project's economic success as measured by the direct economic rate of return.

Even though project officers are strongly aware that their performance on achieving the above-mentioned goals largely will determine their career progress, related goals also are important. In AID,

for example, many officers believe that career rewards accrue to those who can design and initiate numero projects each of which outwardly addresses many of the agency's many priorities. Part of these motivations are perceived to come from Congress, because AID personnel frequently are requested to enumerate projects with objectives that match current congressional and constituency interests. The officer who designs and initiates a project seldom sees it through to completion and is unlikely to be recognized for the ultimate success or failure of the project. Little incentive exists for recognizing mistakes and learning from them.

The time-driven goals can directly preclude sound technology choices. For example, because the ecology of tropical estuary ecosystems is poorly known, sustainable interventions for port development usually cannot be designed without preliminary investigations covering an entire yearly cycle of seasons. But the time-driven goals seldom allow such lengthy preliminary studies, so decisions must be made with incomplete i n formation, Commonly, these decisions are based on the personal experience of the engineer or other technical planner in charge. That experience too of^en is inadequate to assess correctly how the technology, environment, and local society will interact.

Potential Oversight Questions:

* Increased interdisciplinary planning might result in more successful development projects. But it might also slow obligation of an agency's budget. What do you perceive as the possible beneficial and adverse impacts on your agency if your actions to improve the number of project successes result in funds remaining at the end of the year?

* To what extent does your agency use the environmental plans developed under the auspices of the Organization of American States (or other similar organizations) in your project planning process?

* What other mechanisms allow you to carry out adequate planning without hindering timely expenditure of your budget?

Narrow evaluations and poor feedback

-Development assistance banks' criteria and procedures for evaluating projects also tend to perpetuate the causes of poor technology choice. The overriding bank criteria for project success are narrowly focused financial and economic measures of project benefits and d irec costs. External costs may be noted in evaluation documents, but se l d o are they weighed against benefits.

The World Bank has been a leader in development of careful financial and economic post-project evaluations. Project sustainability is assessed in financial terms: will necessary continuing investments be made after the funding period ends? In this regard, the Bank's evaluations seem to be thorough, with a significant proportion of projects frankly assessed as either not sustainable or dubious at the time of the final evaluation.[5] However, Bank evaluations seldom include thorough

[5] The economic implications of unsustainable projects for the client country, which remains liable for the debt, usually are not addressed.

consideration of environmental or social impacts. Recently, Bank evaluations have been self-critical in this regard. In addition, project impacts on natural resource sustainability commonly are not recognized in World Bank evaluations. A current review of completed Bank-supported dam/reservoir projects may bring increased attention to this issue, as many of the reservoirs are reported to be deteriorating rapidly.

AID objectives and criteria for project evaluations are specified early in the planning process and commonly are broadly stated in terms of institution building processes (e. g., number of extension-agent visits, number of students educated), *or* direct measures of accomplishment (tree seedlings distributed, gains in farm income). Thus, evaluations are not narrowly financial and economic. However, the evaluations seldom are broad enough to identify external effects, or conducted long enough after project completion to determine ecological sustainability. Further, final evaluations seldom address faults with the original problem identification and project design. Yet, this is the time when, with the benefit of hind-sight sharpened by project experience, important lessons can be learned.

In spite of their shortcomings, evaluation procedures are institutionalized and the reports generated contain many potentially valuable lessons which could be applied to improve future projects. Also, end-of-project evaluations could be used in a motivation system that would reward development success and provide accountability for development failure. Even so, aid agencies have not learned to use these evaluations effectively. Indeed, negative evaluations tend to disappear due to political pressures and delay.

At the World Bank, post-project evaluations are conducted regularly by an office separate from the project implementing office, Annual summaries of these evaluations are widely distributed in the Bank and used to train Bank staff and client country trainees. Summaries are available for official use in donor and client countries, but are not widely distributed outside of the Bank. A rationale for strictly limiting circulation of evaluations is that, written as frankly as they are, they might embarrass clients or donor country individuals. This, in turn, could hinder efforts to foster policy improvements in client countries or willingness to participate in development assistance. However, distributing the reports more widely might improve the quality of guidance that non-governmental organizations offer the Bank, directly and through Congress.

Nevertheless, feedback from the Bank's evaluations to its project design process seems to be inadequate; similar types of project failure sometimes are identified in subsequent years. Livestock project failures in Africa are an example. Contractors and client country nationals who design Bank supported projects may not be encouraged to study reports from past projects or warned of the economic consequences of project failure to the recipient country.

End-of-project AID contractor reports, written by the organization that implemented the project, commonly contain a wealth of technical detail and often include description of social and environmental causes of project success or failure. Commonly these technical end-of-project reports are short on the analysis and synthesis needed to derive

lessons for future projects. Report drafts are critiqued by the Agency's project officers and other interested parties, and may be revised accordingly. The reports then are filed with other project papers. Technically they are available to host country personnel and outsiders in addition to AID personnel and contractors involved with current projects and preparing for future ones. In practice, they commonly are distributed among technical managers of similar AID projects within the country where they are written, but otherwise are an underused resource. Their shelf-life is far shorter than their potential utility because of narrow distribution, unwieldy length, unattractive format, and lack of editing.

AID's Program and Policy Coordination office (AID/PPC) tracks agency projects, the nature of technologies used in various geographic regions, and many other evaluation parameters. It produces syntheses of project evaluations, drawing lessons from multiple experiences. The number of these syntheses now available not only within AID but to the broader government and non-government community is increasing steadily. However, these are another underused resource. Contractors and host country counterparts generally have little time to study evaluation reports or the unsynthesized end-of-project technical reports for projects in which they are not personally involved. Thus, the agency continues to reinvent some successes and repeat some mistakes. Finally, AID has no formal program for re-evaluating completed projects at a time long enough after completion to learn the real determinants of sustainability y.

Potential Oversight Questions:

* Does your agency conduct post-hoc evaluations of its development assistance projects? If so, for what kind of projects are such evaluations conducted? How long after project completion does such evaluation occur? What have such evaluations revealed about how to change development assistance to increase the likelihood of interventions being ecologically, culturally, and financially sustained?

* How would an analysis of your existing evaluation reports benefit your agency and Congress' ability to cooperate in development of foreign assistance policy?

* Does your agency conduct generic program evaluations? On what subjects has it completed these evaluations (e. g., irrigation; rural development)? What changes have been made in subsequent programs as a consequence of lessons learned?

Inappropriate staffing

Development assistance agencies' technical staffs were comprised mainly of agronomists and engineers during the 1950s and 1960s. By the mid- 1970s, technical specialists decreased in number on agency staffs and, especially at the Banks, economists began to dominate. Mo re eneral types of development assistance began to compete with technica project assistance.

Awareness of the potential for environmental conflicts also arose in the early 1970s. Subsequently, the World Bank and AID established small cadres of environmental professionals and retained some technical specialists despite the continuing trend towards hiring generalists for staff positions. While project officers often function as generalists, technical experts are contracted for project design, implementation, and evaluation. The generalists, with some support from the small cadre of resource professionals, are expected to have sufficient knowledge to assure

recruitment of appropriate specialists, who in turn will develop the technical and social information and conditions needed for development success.

To enable generalists to carry out this function, detailed guidelines and checklists for environmental evaluation have been developed at the World Bank, other MDBs and bilateral aid agencies. In AID, a sign-off procedure to assure scrutiny of potential environmental effects of projects considered likely to have negative impacts culminates with approval by an environmental officer. AID and World Bank environmental officers further provide advice to project officers on consultant selection and review contractor reports to identify significant environmental issues. However, neither organization has had a sufficient number of environmental officers to assure agency-wide guidance.

Potential Oversight Questions:

* In your entire professiona staff, what are the percentages of officers with degree-level academic training in each discipline, such as economics, agriculture, ecology, forestry, geography, anthropology, medicine, public health, civil engineering, etc.?

* How frequently have your officers been retrained in the advances of their discipline or cross-trained to learn about scientific advances in biological or physical sciences?

* What percentage of each of these professional groups are assigned to positions where most of their time is spent applying their special training?

* Can you provide a list of personnel assigned to environment or natural resource functions that briefly indicates each person's responsibilities and technical qualifications for that position?

Structural and procedural constraints

The primary concept of "environmentalism" during the 1970s was that negative impacts of resource development should be avoided. Thus

AID, the World Bank, and other development agencies did not organize their environmental offices to identify resource development opportunities. Rather their function was primarily to determine which of the planned interventions were likely to have harmful environmental impacts, and to insist on design changes that would mitigate such impacts. Given the compelling time-driven goals motivating most activity in these organizations, it was probably inevitable that the environmental officers would be widely viewed as adversaries and their involvement would be avoided when possible.

Most project or loan officers generally work within well-established time constraints, and thus, various methods have evolved to avoid the in-house environmental officers. For example, a project officer may not find time to cooperate in detailed review of a project's environmental aspects. Environmental staff input can be avoided when recipient country officials, desirous of getting a project started, signify that there are no environmental implications requiring study. In the World Bank, the environment office has had the responsibility to review all project documents, but that office has operated from the sidelines with a minuscule staff compared to its task. It has often not been in a position to provide constructive input to project design and operation.

Potential Oversight Questions:

* The heavy workloads of your project officers, the deadlines for processing large amounts of money, and the pressures from Congress and others to reach objectives quickly must all discourage full investigation of the likely environmental impacts of projects. Are the kinds of projects likely to need full environmental evaluation avoided to save time?

* What steps has your organization taken to encourage officers responsible for project identification, design, and implementation to seek participation of in-house natural resource specialists and environmental analysts?

Environmental procedures in AID, being a legal requirement, have had significantly more force than has simple policy at the World Bank. Avoidance of environmental concerns today is difficult in AID. Some years ago a simple statement denying that adverse impacts were likely often could suffice. But the gradual increase in environmental officers with professional expertise has discouraged this practice.[6]

AID officers having environmental charges are located in each geographical bureau and in missions abroad as well as in the central Science and Technology Bureau (AID/S&T). Professional environmental personnel in AID/S&T carry out a number of programs designed to raise environmental awareness among AID personnel and host country decision makers, and to encourage officers in AID bureaus and missions to use environmental analysis early in the formation of development assistance

[6] To avoid environmental regulations, some AID bureaus and missions are reported to have reduced investment in the types of projects that intervene in resource use, such as irrigation development. This results in increased funding for projects such as research and institution building, that are not required to include detailed consideration of environmental effects. Such reactions to environmental regulations, though difficult to document, could have significant adverse impacts on activities needed to address certain natural resource problems.

strategies. Country Environmental Profiles sponsored by AID (see section 6), for example, go beyond the impact assessment level of environmental concern to promote integration of development and resource conservation. Still, with the present structure, AID's continuing progress in integration of conservation and development depends on:

1) the extent to which staff exhibit a commitment to environmental analysis and programmatic investment in environmental management as a necessary condition for development project success, or

2) AID being "micromanaged" by Congress to force it to consider the environment.

AID activities now seem to focus increasingly on incorporating natural resource considerations into regional and sector strategies, suggesting that AID personnel are adopting the premise that environmental analysis is a necessary element of economic development. The AID/S&T Agriculture Office is leading an effort to develop a new focus for AID agricultural assistance, which explicitly includes maintaining the productivity of the natural resources on which agriculture depends. Another S&T program promotes a cooperative effort among missions in Latin America to focus development efforts on fragile lands. AID/PPC is revising its guidelines for economic and financial analysis of projects to take environmental impacts into account. Finally, the Africa Bureau is working intensively on a development assistance strategy focused directly on natural resources. While some of this activity may be

a reaction to a perceived threat that appropriations will be further earmarked for environment and natural resource purposes, the activties seem largely to be internally motivated.

The causes of poor technology choice are perpetuated not only by structure but also by agency procedures. The weak feedback links between project evaluation and design already have been noted. Other internal constraints on sound technology decisions include:

- too little permanent staff involvement at the development site;
- use of consultants and organizations with inadequate technical expertise; and
- bureaucratic procedures that discourage interdisciplinary collaboration.

Too little permanent staff involvement at the development site

At AID, the size of the bureaucracy is limited strictly in order to control overhead on development assistance spending and in response to a keen awareness of congressional and public concern regarding “bloated” bureaucracies. Thus, each project officer typically manages several projects. These officers design development assistance strategies, oversee project design, manage cash and paper flows to and from contractors or host-country organizations, and assure that evaluations and other procedural steps for each project are on time and complete. These heavy workloads typically prevent their active involvement at the sites of development projects.

Further, AID project officers generally have weak administrative support and restricted travel funds. AID project officers stationed in Washington D.C. cannot use project funds for project management activities, such as travel or secretarial support. These constraints may be less severe in AID's missions, but the existing bureaucratic requirements of managing several projects can keep an officer at his/her desk most of the time. Thus, the amount of time project officers can spend on-site usually depends more on their ability to capture office resources and personal willingness to go into the field than on the management needs of the project.

Potential Oversight Question:

* How would your organization's efficiency be affected if expenses for staff management of projects, such as direct-hire staff travel to project sites, could be charged against the budgets of the projects?

Use of consultants and organizations with inadequate technical expertise

The procedures and workloads that severely restrict the on-site activities of AID staff increase the likelihood of project failures. Most technology decisions ultimately are made either by contractors or host country personnel. Even where technology decisions rest with host country personnel, contractors often have substantial indirect influence through the options they present. Staff officers write terms of reference for contractors, influence the choice of contractors, modify the terms (or decide not to do so) per suggestions from contractors or host country officials, and approve the contractors' activities. However, with inadequate opportunity for field level involvement, the staff are unlikely to be fully competent for these functions.

The World Bank uses many consulting teams for project identification, design and evaluation, and Bank officers provide lists of potential contractors to client country officials for project implementation. The World Bank maintains a formal consultant roster which can be searched to develop lists of individuals and organizations who seem to meet various criteria of disciplinary and geographic area expertise and development project experience.[7] AID/S&T has established similar computerized rosters of environment and natural resource specialists appropriate to design or implement projects for developing countries.

In practice, World Bank and AID consultants probably are chosen more often from informal systems based on project and loan officers' experience than from rosters. No mechanical system can be relied upon to judge the all-important personality factors that will determine whether a consultant successfully completes the terms of reference. From the project officer's perspective, the selection of contractors who will complete project design and evaluation jobs on time is critically important to achieving bureaucratic goals. Coupled with the project officer's heavy workload, this usually means using consultants whom the officer or his/her close associates have used previously, and ones that are not likely to cause unexpected delays in moving the project forward.

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[7] World Bank consultant rosters favor individuals and firms in OECD countries. This does not seem to be in keeping with Bank policy or with congressional guidance regarding the need for an increased developing country role in the development assistance process.

Officers without appropriate technical backgrounds for selecting technical consultants need to have ready access to in-house technical experts. In AID, this expertise is provided by technically trained AID personnel, in-house contractors, and technical experts loaned to AID by other government agencies through Participating Agency Service Agreements (PASAs. Further, officers are required to seek assistance from the agency's environmental officers where off-site environmental impacts are an issue. World Bank officers also have used expert assistance routinely to choose consultants, but have not been required to seek such assistance from the environmental office. The Bank's reorganization is intended to increase the availability of in-house natural resource and environmental specialists (see Appendix C).

Often, local institutions can be identified and funded to carry out planning and evaluation tasks. International programs through which developing country nationals with ecological qualifications can be located have been sponsored by the United Nations Education, Science, and Cultural Organization (particularly the Man and the Biosphere Program), by the United Nations Environmental Programme, and by such non-governmental organizations as the World Wildlife Fund (U.S. and International), International Union for the Conservation of Nature and Natural Resources (IUCN), and the Nature Conservancy. Some of these, such as IUCN's onservation Data Centers have rosters of experts in developing countries sorted according to skills needed for particular types of development activity. But these mechanisms are now used mainly by European (principally Scandinavian) bilateral agencies.

Bureaucratic procedurcs that discourage inerdisciplinary co11abortion

Interdisciplinary planning seems necessary for improved matching of technologies to the natural resource, social and economic conditions at development sites. This depends first on the agency choosing the right group and writing adequate terms of reference, and secondly on the team leader's capabilities. Integration of disciplines often is not achieved because the team leader and project officer have not been trained or lack experience in techniques of interdisciplinary team management and analysis (see Append ix F). Wrong consultants are chosen in some cases, and their interaction is not facilitated; for example, the anthropologist, the agronomist and the economist of a multidisciplinary team may each visit the development site separately.

The need to develop interdisciplinary teams applies just as much to development assistance agency staffs as to consultants. Workloads, bureaucratic structures, and procedures all discourage integrated analyses of development problems and projects. Thus, for example, cooperation between agricultural and environmental personnel largely is inadequate.

This is not just a problem of agriculturalists or economists having learned to view environmentalists as adversaries. University training in natural resource and environmental sciences typically produces technical experts who cannot speak the language of economists and who have only superficial knowledge of agriculture and engineering issues. Thus,

interdisciplinary cooperation seems unlikely to occur without staff incentives and an organizational structure explicitly designed to encourage such teamwork.

Experience with AID's Country Environmental Profiles, with Organization of American States' (OAS) environmental studies, and with development of national conservation strategies in several countries indicates that interdisciplinary teams often can be recruited in the host country. However, a shortage of persons trained in the techniques of interdisciplinary team management, and in cross-sectoral assessment methods (other than economics) is likely to be a significant constraint as development assistance agencies seek to increase use of interdisciplinary techniques.

Potential Oversight Questions:

* OAS, AID, and other organizations supported by U.S. foreign assistance have developed techniques for interdisciplinary, cross-sectoral analysis of development problems, intervention options, and technology soundness. What part of your organization's assistance strategies, projects, and programs arc designed by using these new interdisciplinary techniques?

* What Participating Agency Service Agreements that are intended to enhance AID's environmental expertise remain in force? How has the usefulness of these PASAs been evaluated? Is AID investigating creation of similar PASAs ith agencies not currently participating with AID? Which might be most beneficial and why?

5 How to Change--Piecemeal Approaches

Introduction

Congress and aid organizations could make broad institutional changes to foster sound technology decisions. A second alternative would be actions to incrementally eliminate the constraints to sound technology decisions that are internal to the development assistance organizations. Such piecemeal approaches include:[8]

- relieve the overriding pressure to move money;
- improve project planning and ensure project flexibility;
- increase personnel motivation and accountability;
- hire enough of the right people;
- improve use of in-house expertise; and
- improve selection of consultants.

Relieve the overriding pressure to move money

Congress normally requires AID funds to be spent within one fiscal year. However, other approaches have been tried. For example, Congress has already has acted to make funds "available until expended" for the Sahel Development Program. Reportedly, the experiment has been only somewhat successful. Some agency personnel still believe that, even though unspent funds from the current year will not be "lost," the next year's funding is likely to be reduced by at least the unspent amount.

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[8] The following potential changes in development assistance agencies are not presented in order of priority or as a suggested strategy. All seem likely t improve aid agency abilities to match technologies to the ecological conditions of development sites.

Legislation has now been introduced to broaden the experiment by keeping other development assistance appropriations for Africa available until expended.

To reduce the force of AID's "spend the money" syndrome, Congress might have to complement such legislation by extending the budget cycle for development assistance. However, evaluation of this topic is beyond the scope of this paper.

Potential Oversight Questions:

* How has keeping project funds available until expended affected project quality in AID's Sahel Development Program?

* Remembering that MDBs are banks, and that the first function of a bank is to assure timely return on its capital, how does one manage the tradeoff between cautious decisionmaking and expediting the scale-up of technology interventions to get the flow of benefits started?

Improve project planning and ensure project flexibility

Assistance projects that intervene in a developing country's natural resource base require careful and sometimes extensive planning. In most cases, the scientific knowledge base is from temperate regions while the development site often is tropical. For example, U.S. experts in soil and agriculture may be unfamiliar with the behavior of certain developing country soils or with local crops and cultivation practices necessary to ensure their satisfactory growth. Further, the recipient culture and economy tend to differ substantially from those of the project designers, making it difficult to predict what types of projects are likely to be adopted. Most development projects are, in part, experiments.

Projects that rely heavily on the technology/ecology fit, therefore, must be designed to accommodate expected but unidentified changes. Short project duration makes it difficult to introduce technologies or implement projects gradually, and presents a serious obstacle to making mid-term corrections in response to monitoring and evaluation. And, too, measurement of the project's ecological and social soundness may take much longer than AID's typical three- to five-year project allows. Where the research element of a project is particularly prominent, adequate project length is essential.

Risks to natural resource systems and development assistance recipients may be reduced where projects include an extended technical planning phase, a gradual phasing-in period for adaptation of technology to the site's ecological and social conditions, and a length commensurate with achievement of results despite mid-term project realignment. Yet, many constraints work against these approaches. Means to address these needs include:

1) lengthened budgetary cycle and legislative language fostering improved project planning;
2) increased investment in development of resource development planning techniques that can be used by project officers to ensure consideration of technology/ecology fit;
3) increased projects with natural resource assessments and resource development plans as their goals; and/or

4) longer project periods with gradual technology introduction and increased project monitoring fostering mid-term corrections in objectives and methods as necessary.

A major constraint to increasing investment in planning is the impatience of client country governments, the U.S. Congress, and other donor country institutions. Already, many developing country officials perceive development assistance project planning as too lengthy and costly. Such critics probably are not aware that the standards of haste common to industrial countries may be inappropriate in developing countries. The annual budgeting process further inhibits extended planning: the need to move money commonly requires that project planning be substantially shorter than one fiscal year, while determining ecological compatibility may require an understanding of natural system behavior over at least an entire cycle of seasons.

Similarly, contractors and aid organization staff are keenly aware of the urgency for each project to produce substantial, quantifiable results by the end of its period. Production targets stated at the beginning of three- to five-year projects often necessitate rapid scale-up of technology interventions and, therefore, major project realignments may be viewed as counterproductive. Further, managers of short projects cannot easily accommodate major unexpected changes in their projects. Instead of today's common three- to five-year AID projects, durations of 10 to 15 or perhaps 20 years seem more appropriate.

These problems exemplify the drawback of piecemeal approaches. If more projects were designed specifically to produce resource development plans for target areas but the plans do not become the basis for subsequent development assistance projects, nothing has been gained. Similarly, if projects were given longer periods for planning and implementation, but continued to move rapidly into full-scale operation and disallowed mid-term corrections, then damage from ecologically unsustainable technologies still might result.

Potential Oversight Questions:

* What is the average length of your projects? Are projects generally expected to be self-sustaining after this period? Which kinds of projects are appropriate for gradual development and phase-in of technologies and which are appropriate for rapid scale up of operations?

* What is the typical ratio of investment in project planning to investment in project implementation for various kinds of projects (agricultural, industrial, institution building, research, etc.)?

* What would be the advantages and disadvantages of increasing:
  a) the general lengths of projects?
  b) the ratio of project planning expense to investment in project implementation?

Increase personnel motivation and accountability

The World Bank and AID have few mechanisms to reward officers responsible for developing successful technology interventions, or to induce improved decision making for those who have made poor technology choices. Project officers commonly move on to new projects or geographic regions prior to the termination of the initial project. This management prob em will become more difficult, particularly in AID, as they shift incres ngly to policy and economic support interventions where cause and effect may be obscure. In these, technology suitability is

even less likely to become apparent before the officer responsible has moved out of range of accountability.

Nevertheless, the level of effort invested in developing information for sound technology decisions could be made a prominent feature in periodic personnel evaluations. The World Bank, AID, and other development organizations could experiment with methods for assessing quality of development work. Such factors could be given at least equal weight to quantity of tasks accomplished and total funds obligated in personnel evaluations. Determination of adequate criteria for evaluating and attributing development success, however, is problematic.

Individuals generally behave so as to perpetuate their bureaucratic unit. Thus, it should be possible to facilitate good technology decisions by monitoring the technology development success/failure ratio for the various bureaus, departments, and offices, and then by rewarding successful units of the bureaucracy, perhaps with increased funding.

The World Commission on Environment and Development has recommended that periodic accounting of natural resource conditions and environmental quality indicators accompany reports of host country economic indicators prepared by development assistance organizations. This could provide a way to motivate the development assistance community to address the match of technologies with ecological conditions more carefully.

Potential Oversight Questions:

* How is quality of work weighed against quantity of tasks accomplished in your personnel evaluation procedures?

* How does your project evaluation procedure give feedback to a reward/accountability system that gives officers or offices credit or blame when projects are or fail to be sustainable?

Hire enough of the right people

Development organizations need to include increased numbers of staff trained and experienced in the development and management of natural resources as well as staff with expertise in the techniques of environmental analysis. This conclusion has been stated repeatedly at Congressional hearings. Gradually, 'the aid organizations have responded. Most of them now have some foresters and ecologists or environment planners in positions that employ their technical expertise. Still, most aid organizations seem to add environmental professionals only in reaction to outside pressures. A substantial part of new personnel could be selected from people having demonstrated expertise in natural resources development or environmental analysis at the direction of high-level AID and MDB management. The continued low numbers of such experts on agency staffs indicate that their importance is not yet appreciated by high-level agency personnel.

Currently, development assistance organizations rely on consultants and contractors for nearly all technical expertise needed to develop sustainable projects. Meanwhile, evidence favors hiring and placement of natural resource and social science experts where they will form

development strategy, identify project, program, and policy interventions, and support project implementation and evaluation. Each development organization could analyze its past evaluations and project records to obtain clearer evidence for or against this proposition.

Potential Oversight Questions:

* Over the past decade, what has been the trend of the ratio of numbers of positions for technically trained staff to numbers of positions for generalists in your organization?

* What evidence exists, or could be developed, to indicate whether your organization's current reliance on consultants for technical expertise is sufficient for successful development assistance operations?

* What is your organization's current policy on recruitment and hiring of personnel with training and experience in natural resource versus personnel with training in economics?

Improve use of in-house expertise

The World Bank and AID operate in countries having a wide variety of cultures and environments. These organizations regularly rotate personnel among country and regional assignments to foster broad experience and career development. Few officers probably would be satisfied with an entire career tied to one country.

Concurrently, however, the AID rotation system constrains development of in-depth staff expertise on the cultures, languages, and environments of the recipient countries. This is compounded by lack of incentives for staff to investigate local people's knowledge of development opportunities and constraints, by heavy bureaucratic workloads, and by project funding procedures that inhibit staff participation in field activities.

The MDBs and AID have staff who have technical knowledge developed through academic training, professional experience, and self-education. Considerable knowledge--particularly regarding ecological conditions--remains relevant long after staff have rotated out of an assignment. Yet these people often are placed in positions which make little use of their expertise.

Without abandoning the rotation system, procedures for assignment of personnel could be adjusted to facilitate improved usc o existing in-house technical expertise. For example, computer database techniques similar to those used to manage consultant rosters could be used to match staff technical backgrounds to agency assignment opportunities. (A broader approach to the problem of developing in-house expertise is discussed in section 6).

Further, AID and the World Bank could improve project design by developing in-house review boards made up of personnel experienced in the given geographic area. At present, few officers are called on to assist in designing projects that will be implemented at their previous posts. Some of these individuals probably would be interested in tracking proposed new projects and serving as a member of ad hoc review boards. Abstracts of proposed new projects could be sent to the boards for critical evaluation of likely impacts. Their reviews would be used by project officers to confirm or revise their technology choice. Through such a procedure, in-house expertise could be expanded without adding new

positions. However, in AID at least, this is unlikely to be feasible without broader changes to streamline project design procedures and reduce agency workloads.

Potential Oversight Question:

* Recognizing the good reasons for rotating staff among country assignments, how do your organization's assignment and communication procedures assure best use of the technical and geographic area expertise of your staff?

Improve selection of consultants

Donor agency consultants and personnel of host country organizations probably will continue to provide most of the technical information and technical decisions for project design, implementation, and evaluation, even with expanded in-house expertise. AID consultants commonly are recruited in the United States or other industrialized countries. However, U.S. academic and government institutions generally have not encouraged development of expertise relevant to tropical developing countries. Similarly, consultants experienced in managing interdisciplinary teams to analyze development problems and interventions are scarce. Consequently, the combination of developing country experience and interdisciplinary technical expertise is rare; recruiting technically competent consultants for such teams will be difficult.

Therefore, it seems appropriate for the MDBs and AID to focus a significant part of their in-house training on methods of interdisciplinary analysis. AID has supported programs in U.S. universities and other institutions to develop in-house expertise relevant to its needs. For example, AID/S&T Forestry, Environment, and Natural Resources Office

has supported development of interdisciplinary planning methods at the International Institute for Environment and Development and elsewhere, and has held seminars to train in-house staff in their use. Other S&T Offices similarly could increase support for development of interdisciplinary expertise. This might be particularly relevant to the Bureau's Agriculture office as part of its new focus on conservation of agriculture's natural resource base.

A longer-term approach may be to increase the pool of U.S. technical expertise in the development and management of tropical resource systems. For example, certain Land and Sea Grant institutions are located in tropical U.S. areas and conduct research and development activities relevant to tropical developing countries. However, these institutions are few and generally have small numbers of personnel and financial resources for such research. Development of a significant tropical component in other such institutions could increase the pool of U.S. experts from which development organizations could choose consultants, and concurrently assist resource development efforts in tropical U.S. areas. Congress could explicitly identify development of tropical resource system curricula in certain Land and Sea Grant institutions as a goal, perhaps in the Foreign Assistance Act. Additional institutions that have developed specialized programs related to temperate resource systems may be induced to follow this example and enhance their own curricula in tropical resource development and management.

6 How to Change--- Holistic Approaches

Introduction

Budget cuts, declining technical staff, shifting priorities, and a proliferation of congressional mandates may adversely affect the likelihood of development successes. Thus, without clear expression of Congress' recognition of the importance of matching technologies to local conditions, piecemeal efforts may have only short-term beneficial effects.

Make technology/ecology fit an expressed priority

Congressional concern about transfer of inappropriate technologies can be expressed in new or modified legislation, and at hearings convened for oversight, authorization, appropriation, or confirmation. Through these mechanisms, Congress can identify ecological compatibility as a priority, or even a necessity, for U.S. development assistance efforts. To improve the effectiveness of this guidance, it may be necessary to provide some clarification, ranking or consolidation of the other myriad priorities in development assistance expressed by Congress.

Congress often can stimulate improvements in development organizations' handling of issues such as technology selection without creating new legislation. Informal meetings between Members and AID or MDB officials and follow-up cooperation between congressional and agency staff, reportedly had an important role in the changes in development assistance priorities that occurred during the 1960s and 1970s. This kind of cooperation seems less common today.

A goal of identifying the ecological attributes of a recipient country and basing selection of development assistance interventions on those established parameters could be specifically identified in the Foreign Assistance Act. Such a measure would definitively establish integration of environmental considerations into development assistance efforts as a priority.

Legislation and congressional views strongly expressed at hearings certainly affect priorities in the development agencies. But these priorities are likely to be internalized only if they are views shared by the heads of the agencies. Actions and decisions of high-level agency officials, particularly AID's Administrator and Assistant Administrators, may bring about changes affecting the entire agency. Many past AID Administrators have not had backgrounds that equipped them to recognize the importance of the links between technologies and developing country ecological settings. Thus, confirmation hearings provide an important opportunity for Congress to raise issues and to discern the depth of a nominee's knowledge of and concern for matching development projects and technologies to local conditions in developing countries.

It is during these confirmation hearings that the candidate is first exposed to congressional concerns that relate to his/her new responsibilities, and also a time when he/she may be looking for new ideas. Thus, confirmation hearings are an appropriate place to reinforce the guidance given in oversight hearings and in legislation. Questions at confirmation hearings can indicate clearly what Congress will expect from

him/her later on. Similarly, it is a time when Congress can assess the likelihood of its concerns being addressed, should the official be confirmed.

Encourage research and cautious innovation

Even under optimum conditions, development problems are difficult to solve. To find ways to improve the fit of technologies to local conditions, Congress could encourage the AID Administrator to support related research, and to foster innovation and experimentation in cases where sound theory and gradual implementation can protect technology recipients from the consequences of failure. Experiments would, of necessity, be small-scale activities such as on-farm research and demonstration and would be carefully monitored until their suitability for expansion is clear.

Such small efforts, in aggregate, could have considerable impacts. Today, fewer U.S. foreign assistance dollars are assigned to development assistance activities than in past years. However, international development institutions monitor the activities of similar institutions and, where successes occur, they commonly copy them. Therefore, if U. S.-supported development assistance were to take a clear leadership role in assuring that technologies fit developing country ecological settings, even these diminished funds could have a far reaching impact on other organizations conducting development assistance activities.

Restructure technical resources

A key factor in assuring that development assistance promotes ecologically sustainable technologies is effective use of the technical staff with professional training, experience, and interest in applying technology to developing country needs. Although AID and World Bank have such people, they do not seem sufficiently integrated into all aspects of development assistance (e.g., problem efinition, project design, implementation, evaluation and redesign) to assure the highest development project success to failure ratio. This seems particularly true for those projects which involve technology transfer to address developing countries' environment and natural resources problems and opportunities.

Notwithstanding, AID may have the technical staff collectively in its missions and in Washington to increase its overall successes. If AID were to concentrate its knowledge on the various ecological settings in developing countries and on matching technologies to these settings, it seems likely that the physical and biological conditions necessary for sustained development could be maintained. AID could accomplish this by developing in-house, interdisciplinary specialist teams to help screen host country problems and AID-proposed solutions, and to assist field staff in locating technical assistance appropriate to the recipient country's ecological characteristics.

One possible categorization of developing country ecological zones in which AID and the MDBs operate is 1) hot wet lands, 2) arid/semi-arid lands, and 3) high altitude lands. Although differences obviously

exist between the environments and resource systems within these zones (e.g., the Brazilian rainforest is somewhat different than Zaire's rain forest), they are similar enough that technologies compatible with the environment of a given ecological zone are likely to be sustainable when adapted for the same zone in another area. (Of course, political, cultural and economic factors may vary greatly among between areas, potentially rendering technologies incompatible in other ways.)

These ecological teams should include, for example, participation of other technical specialists like agronomists, soil scientists, foresters, hydrologists, anthropologists, geologists, geographers, and ecologists. Grouping AID personnel in this fashion would have the immediate beneficial effect of linking specialists in a close working relationship (e.g., agriculturalists with other environment/natural resource specialists), thus resolving a well-identified communication problem.

A fourth team or office with expertise that overlaps the three ecological zones, such as engineers, economists, health specialists, educators and demographers, would work with the ecological teams on projects. This fourth team would take the lead on technical design and evaluation projects unlikely to have strong interactions with the natural resource base (e.g., projects to improve text books for primary education).[9]

[9] An additional team, less directly related to issues of ecological compatibility, might specialize in projects relevant to urban problems and opportunities.

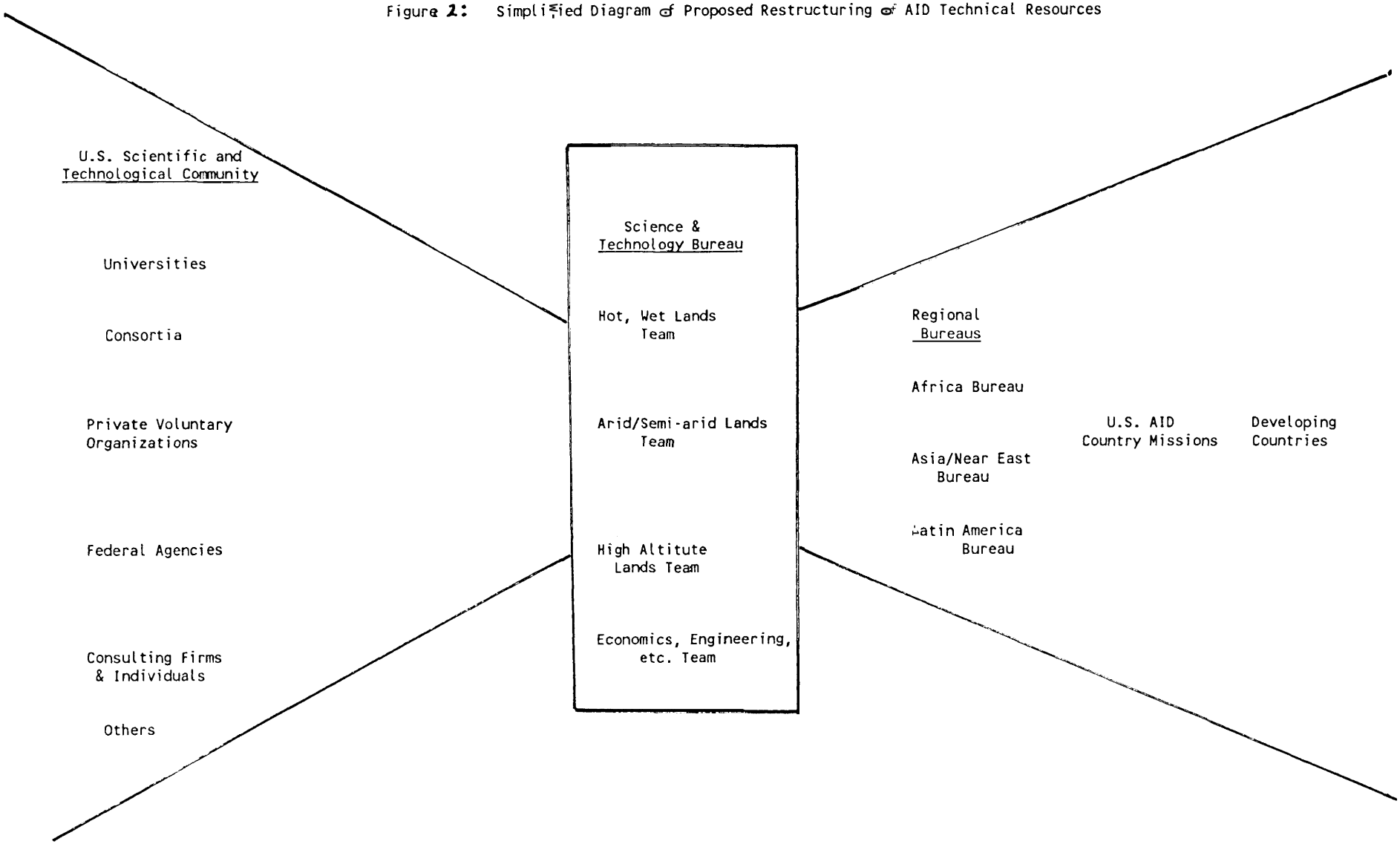
AID could assemble teams from AID/S&T[10] technical staff having appropriate professional training, experience, or interest in the various aspects of natural resources and environment in each ecological zone. So, for example, an agronomist from this Bureau having professional training in dryland agriculture could become part of the team on arid/semi-arid lands; a geographer having many years of experience in Guyana and the Philippines could join the hot, wet lands team; and a new staff member with a general background in hydrology but a strong interest in erosion control might move into the high-altitude lands group.

Where certain specialties might be missing, AID could draw qualified persons from regional bureaus, or from mission staff. Such an arrangement might not require additional AID staff if agency personnel were screened carefully for their appropriate professional training, experience and interest. However, these offices should not be depleted of technical specialists or environmental analysts. A hiring policy aimed at filling vacancies in each ecological team as well as maintaining basic strength in regional bureaus and missions could mitigate potential staffing deficiencies.

Ecological teams could serve as environment/natural resource filters for all proposed projects coming in from the field or arising in AID Washington (figure 2). Each ecological team could examine mission-identified problems and assist in project response development, or review previously prepared plans for their suitability to the development site

[10] Some technical specialists view this Bureau as having the largest number of technical staff with the greatest number of years of relevant experience.

Figure 2: Simplified Diagram of Proposed Restructuring of AID Technical Resources



conditions. The team also could help missions identify relevant outside technical expertise and technologies with a strong likelihood of fitting the local environmental conditions and, thus, of achieving the development goal.

The ecological teams (perhaps within a reorganized Science and Technology Bureau) also would be in direct line between the missions/regional bureaus and U.S. technical expertise (e.g., universities, private sector, PVOs/NGOs, and executive agencies' technical resources) further assuring that AID would be unlikely to select and transfer unsustainable technologies to developing countries. Although AID and MDBs structures differ, such teams could fulfill a similar function in MDBs, operating as a "technical filter" between bank regional technical departments and outside technical resources.

This restructuring might be strongly resisted by AID management or the Foreign Service Union because it would require a significant reorganization of AID technical staffs. If this reorganization became untenable, the ecological teams could be implemented (perhaps on a simplified level) in each geographic bureau.

Suggested Oversight Questions:

* What do you see as advantages and disadvantages of organizing your technical staff into interdisciplinary teams with separate teams for each major ecological zone?

* Please provide a listing of existing personnel with technical qualifications for these ecological teams. Please indicate technical areas for which no qualified personnel are currently available.

Strengthening technology selection expertise

Increasing developing country capabilities to determine which technologies will fit their own particular ecological setting probably will do more to foster sustainable development activities and help to stem degradation of their natural resources than simply having development assistance agencies ensure the ecological compatibility of technologies used in development assistance projects. AID/S&T, eight years ago, began a few special projects to assist mission and bureau staff as well as developing country planners and natural resource specialists to improve their understanding of interactions between technology and ecology. These projects led to the creation of Country Environmental Profiles (CEPs)

CEPs escribe the status of a country's natural resource base and associated problems and potential opportunities for development of the resources. They are used by specialists from developing and developed countries alike in project and strategic planning.

CEPs involve several stages of writing, review and rewriting. Phase-one profiles are desk studies prepared by U.S. experts mostly through library research, followed by Phase-two reports that are supported by AID but largely prepared by host-country experts using outside expertise when necessary. Fifty Phase-one versions are complete; one-fifth as many Phase-two profiles exist. The process provides an opportunity to improve the knowledge base of AID staff, contractors, and host-country counterparts, as well as to increase and strengthen the analytical skills and involvement of developing country environmental/natural resource experts.

Additional AID projects produced comprehensive, individual reports on various ecological settings common to many developing countries; several of these have been published in book format. The reports were produced primarily by teams of U.S. environment/natural resource experts and included separate analyses on: the humid tropics, arid/semi-arid lands, the coastal zone, environment/natural resource planning methods, and case studies of development technologies drawing directly on the natural resource base. Generally, these reports were intended for use by AID bureau and mission personnel involved with project design. However, follow-up training associated with certain topics has been held in developing countries. In addition, experimental computer models were investigated that might facilitate natural resource and environmental planning and research definition in developing countries (see Appendix F). Such efforts by AID and cooperating agencies are important in the process of improving the fit of development technologies to particular ecological settings.

These efforts, though small in comparison to AID's overall activities, address congressional concerns about matching technologies to developing country environments. However, since these are individual projects, they have a defined lifetime. Yet, learning to link the most appropriate technologies to the local ecological conditions of development sites is certainly an ongoing process for U.S. development assistance agencies as well as for developing countries themselves. Expanding, strengthening and building such activities into the on-going development process rather than dealing with them as finite projects may be a promising opportunity to improve technology/ environment linkages.

Suggested Oversight Question:

* What efforts has your agency made to strengthen technology se ect on expertise? What results have been obtained? What further actions are bein g ı plnned?

APPENDICES

Appendix A

House Committee on Science and Technology Request Letter

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U.S. HOUSE OF REPRESENTATIVES

COMMITTEE ON SCIENCE AND TECHNOLOGY

SUITE 2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515 '"
(202) 225-6371

October 17, 1986

Dr. John H. Gibbons, Director
Office of Technology Assessment
U.S. Congress
Washington, DC 20510

Dear Dr. Gibbons:

An increasing awareness exists in the Congress that success of our technical assistance programs for developing countries depends on a clear understanding of the pnysical and biological environment. Commonly, there is a fundamental difference between the developing country's ecological setting and that of the donor nation. Numerous failures of technology transfer have been related to the donor's lack of a keen understanding and appreciation of the ecology of the particular developing country. Therefore, the need exists for development assistance organizations to improve their own ability to integrate environmental and developmental concerns, and to transfer the methods that can assure that technologies promoted will fit the environmental situation in the recipient country.

Consequently, I request that the Office of Technology Assessment undertake an exploratory study or workshop that will identify methods which can improve the capability of aid agencies to assess the compatibility of development technologies with the environment of developing countries. The study would be most useful to our Committee if results were available by April, 1987. Mr. Michael Rodemeyer, of the subcommittee staff, will be the contact person for this project.

Sincerely,

DON FUQUA
Chairman

MANUEL R. LUJAN, JR.
Ranking Republican Member

JAMES H. SCHEUER
Chairman
Subcommittee on Natural
Resources, Agriculture
Research and Environment

CLAUDINE SCHNEIDER
Ranking Republican Member
Subcommittee on Natural
Resources, Agriculture
Research and Environment

Appendix B

Environmental and Energy Study Institute Recommendations for Improved Resource and Environmental Management In The Third World

Recommendation 1: Long-term Assistance to Africa

Recommendation 2: Establish New AID Natural Resources Policy and Bureau

Recommendation 3: Strengthen Developing Country Environmental Authorities

Recommendation 4: Build Indigenous Non-Governmental Organizations

Recommendation 5: Improve Environmental and Related Development Research and Development

Recommendation 6: Enhance Environmental and Related Development Training

Recommendation 7: Strengthen Peace Corps' Environmental Focus

Recommendation 8: Focus Multilateral Development Bank Attention on Resource Issues

Recommendation 9: Expand P.L. 480 Program to Include Conservation of Biological Diversity

Recommendation 10: Review Options for Using Foreign Debt to Encourage Sustainable Development

Recommendation 11: Review International Natural Resource Programs in U.S. Agencies

Recommendation 12: Incorporate Natural Resource Assessments Into Project Cost/Benefit Analysis

Recommendation 13: Support the United Nations Environment Program

[1] Excerpted from: A Congressional Agenda for Improved Resource and Environmental Management in the Third World: Helping Developing Countries Help Themselves, prepared by a Task Force of the Environmental and Energy Study Institute (Washington, DC: EESI, October 1985).

Recommendation 5: Improve Environmental and Related Development Research and Development

Congress should direct the Agency for International Development, in cooperation with the National Academy of Sciences or other appropriate institution, to review and make recommendations for improving the transfer of environmental and related development R&D appropriate to the needs of the developing world.

Background

Successful development requires planners and development leaders in the developing countries to consider ecological constraints and opportunities and incorporate sound resource management in project planning and implementation. To do so, they must have sufficient information and knowledge of research and development efforts in environmental and natural resources sciencess, management and technology related to development, and this i n formation and knowledge must be relevant and appropriate to their needs. In addition, they must have their own R&D capability to design and carry out sound projects.

It is uncertain how many developing country personnel have such knowledge or R&D capability.

It also is uncertain the degree to which U.S.-generated R&D is relevant to the needs of the developing world, or the degree to which relevant R&D is being transferred in such a way to be useful.

Though uncertain, the situation does not look promising. Until it is improved, the drive for successful development will be hampered.

Needed Congressional Action

Congress should require the Agency for International Development to undertake a study of the R&D situation and recommend needed improvements. Section 118 of the Foreign Assistance Act should be amended by adding, after subsection (d), the following new subsection:

> **(e)** In order to effectively carry out the provisions described in subsections (a) and (b), the Administrator of the Agency for International Development, in cooperation with the National Academy of Sciences or other appropriate institution, shall undertake a study to review and make recommendations for improving (1) existing means through which the United States transfers new knowledge on environmental, natural resource, and related development issues and technologies to developing countries, (2) the applicability and relevance of U.S. R&D programs to meeting the goals of sound natural resource management and environmentally sustainable development in developing countries, (3) current levels of knowledge and R&D in the developing countries in this area and (4) the transfer of such knowledge and R&D among developing countries themselves.

The reports of the House Committee on Foreign Affairs and Senate Committee on Foreign Relations could elaborate the purpose of the study with language such as the following:

> The proposed study should be undertaken by an expert U.S. panel drawn from scientists and development specialists knowledgeable and experienced in environmental, natural resource and related development issues. The panel would

have an advisory group of experts from the international science, technology, and development community. The U.S. panel would review the ways in which the United States assists developing countries in the development of environmentally sustainable policies and programs and the appropriateness and relevance of U.S. R&D to their needs in this area. The panel will assess current efforts and make recommendations for improvement. It will be necessary for the panel to identify and evaluate current R&D efforts regarding environmental and natural resources problems and technologies related to sustainable development currently being undertaken by universities, government agencies, foundations and other private organizations in the United States, as well as R&D efforts being carried out in the developing countries themselves with and without U.S. assistance.

This study should build on an earlier report prepared by the National Research Council at the request of the State Department for the 1979 United Nations Conference on Science and Technology for Development concerning the contribution of U.S. scientific and technological resources to developing country needs. Focusing on environmental, natural resources, and related development issues, the proposed study should review subsequent R&D efforts in priority areas and additional ways in which the United States is attempting to meet needs in this field. It should also review ways in which developing countries are cooperating in transferring environmental R&D information and technologies among themselves and how the United States can assist in this process.

Members of the Environmental and Energy Study Institute Task Force

Gus Speth, Task Force Chair; President, World Resources Institute

Robert O. Blake, Senior Fellow, International Institute for Environment and Development

Barbara B1um, Chair, Environmental Policy Institute; President, Women's National Bank

The Honorable Don Bonker, Chair, House Subcommittee on International Economic Policy and Trade

Nan Borten, Executive Director, International Volunteer Services

The Honorable John H. Chafee, Chair, Senate Subcommittee on Environmental Pollution

Harold Corbett, Senior Vice President, Monsanto

The Honorable Benjamin A. Gilman, House Committee on Foreign Affairs

Robert D. Havener, President, Winrock International

Philip Johnston, Executive Director, CARE

Bruce Karrh, Vice President, E.I. du Pent de Nemours & Co.

The Honorable Mickey Leland, Chair, House Select Committee on Hunger; Chair, Congressional Black Caucus

The Honorable Charles McC. Mathias, Jr., Chair, Senate Subcommittee on International Economic Policy

Joan Nicholson, Washington Representative, United Nations Environment Program

Richard L. Ottinger, Chair, Environmental and Energy Study Institute

The Honorable Claiborne Pen, Ranking Minority Member, Senate Committee on Foreign Relations

William D. Ruckelshaus, Member, United Nations World Commission on Environment and Development; former administrator, U.S. Environmental Protection Agency

The Honorable Claudine Schneider, Ranking Minority Member, House Subcommittee on Natural Resources, Agriculture Research and Environment

The Honorable John Seiberling, Chair, House Subcommittee on Public Lands

John Sheehan, Legislative Director, United Steelworkers of America

Ralph Smuckler, Dean, International Studies and Programs, Michigan State University; Chair, Board of Science and Technology for International Development, National Academy of Sciences

Tom Steel, President, Global Tomorrow Coalition; Director, International Program, Natural Resources Defense Council

Lee Talbot, Fellow, East-West Center, World Resources Institute

The Honorable Howard Wolpe, Chair, House Subcommittee on Africa

The Honorable Gus Yatron, Chair, House Subcommittee on Human Rights and International Organizations

Appendix C

Address by Barber B. Conable,
President of the World Bank and International Finance Corporation
to the World Resources Institute, Washington, D.C.
May 5, 1987

It is an honor to address members and supporters of the World Resources Institute.

The Institute is a global resource itself. Policy makers owe you a lasting debt of thanks for the research you pursue and the admirable balance with which you present it.

What I owe you on this occasion is a report on the World Bank's actions, plans and progress in matching our fight against global poverty with our commitment to environmental protection.

The two goals are not just consistent. They are interdependent. Sustained development depends on managing resources, not exhausting them.

Economic growth based on any other premise is a costly illusion. What is wasted or poisoned today leaves that much less to nourish the world tomorrow.

"Environmental neglect," as I said to the Governors of the World Bank seven months ago, "destroys assets vital not just to the quality of life but to life itself." Environmental planning, I would add tonight, can make the most of nature's resources so that human resourcefulness can make the most of the future.

I share the optimism of the recently released report of the World Commission on Environment and Development. With its members I, too, "see . . . the possibility for a new era of economic growth . . . based on policies that sustain and expand the environmental resource base."

My optimism, like theirs, is tempered by caution.

In environmental affairs, as in many others, science has outdistanced government. Yet many of the problems the world has come to recognize as urgent are still beyond man's technical, as well as political capacities.

We know that we must stop the advance of the deserts. We do not yet know how.

We know that population control is essential to environmental protection. But, for all the progress of the past decades in family health and planning, population growth in many of the poorest lands continues to outrun resources.

We know that we must save the tropical rain forests. But neither developing nations nor international institutions have adequate alternatives for hungry people in search of food, and the land to grow it on. And researchers are only beginning to discover the potential of the forests to support settled and wildlife together.

Most broadly, we know of the planet-wide threat to the basic resources of air and water on which the survival of earth depends. But common effort to save the global commons requires a degree of institutional coordination and a measure of sustained political resolve that man applies more readily in destroying than in preserving life.

In measuring the influence of the World Bank against the environmental challenge, I see how long a road there is to travel from awakened environmental consciousness to effective environmental action.

The Bank has long been at the forefront of that march. Ours was the first international lending institution to set explicit policies on limiting any harmful environmental consequences of development projects it supported. In the early 1970s, for example, a Bank-financed iron ore terminal was built on a Brazilian beach under strict safeguards against pollution and with real respect for the site's natural beauty.

Inevitably, the Bank has also stumbled. For instance, a more recent Brazilian project, known as Polonoreste, was a sobering example of an environmentally sound effort which went wrong,

The Bank misread the human, institutional and physical realities of the jungle and the frontier.

A road which benefited small farmers also became a highway for logging companies.

Protective measures to shelter fragile land and tribal people were carefully planned. They were not, however, executed with enough vigor.

In some cases, the dynamics of the frontier got out of control.

Polonoreste teaches many lessons. A basic truth is that ambitious environmental design requires realistic analysis of the enforcement mechanisms in place and in prospect.

When mistakes associated with the Polonoreste project became obvious in early 1985, the Bank interrupted payments as a way to encourage important corrective measures. We learned not that we should avoid projects with environmental implications, but rather that where institutional safeguards are weak, the Bank must be a positive force to strengthen them.

Brazil has not made progress in building safeguards for environmental protection. And the Bank is anxious to support Brazil's government in pursuing a National Environmental Program that can become a model for other nations.

For a second basic truth is that development cannot be halted, only directed. And the Bank cannot influence progress from the sidelines. It must be part of the action.

With the developing nations, we must go on learning by doing. If the World Bank has been part of the problem in the past, it can and will be a strong force in finding solutions for the future.

"Nothing so needs reforming," Mark Twain observed, "as other people's habits." The Bank will begin by reforming its own.

First, we are creating a top-level Environment Department to help set the direction of Bank policy, planning and research work. It will take the lead in developing strategies to integrate environmental considerations into our overall lending and policy activities.

At the same time, new offices in each of the four regional technical departments will take on a dual role. They will function both as environmental watchdogs over Bank-supported projects, and as scouts and advocates for promising advances in resource management. In this process, they will routinely consult with environmental officials in developing countries, and will work to strengthen local institutions. The establishment of these offices will increase significantly the number of staff directly involved in environmental programs.

These organizational changes do not just add layers of interference to head off errors of commission. The added staff will also help define policy and develop initiatives to promote growth and environmental protection together. They will work to ensure that environmental awareness is integral to all the Bank's activities.

Environmental action adds a new dimension to the fight against global poverty. It recognizes that sound ecology is good economics. Indeed, the objectives of sustainable economic growth, poverty alleviation and environmental protection are often mutually reinforcing.

Population pressure, pushing farmers onto increasingly marginal land, is a major cause of ecological problems in many countries, particularly the poorer ones. Curbing population growth is essential for sustainable economic growth; otherwise it will not be possible to introduce policies and programs that steer farmers to the best land, that induce the production of crops which strengthen the soil and stem erosion, that bring livestock to graze where pasture is rich, and that educate city and country dwellers alike to respect and safeguard the balance of nature.

The World Bank is a force for development and will remain so. We will continue to support major investments in energy and infrastructure, in industrializaiton and irrigation.

Our role in such projects, however, will include greater sensitivity to their long-term environmental effects. And we will put new emphasis both on correcting economic policy incentives that promote environmental abuse, and on stimulating the small-scale activities that can combat human and environmental deprivation.

Not only will we strengthen the Bank's long-standing policy of scrutinizing development projects for their environmental impact and withholding support for those where safeguards are inadequate, but we will also institutionalize an approach to natural resource management that puts a premium on conservation.

As part of these philosophical and institutional changes, I propose to allocate new resources to a number of new environmental initiatives.

In partnership with member countries and with the rest of the development community, we will begin with an urgent, country-by-country assessment of the most severely threatened environments in developing nations.

We will promote a continent-wide initiative against the advance of the desert and the destruction of forests in Africa.

We will contribute to a global program to support tropical forest conservation.

And we will participate in a cooperative effort by the nations of the Mediterranean and other international agencies to prepare a long-term campaign to protect that sea and its coasts.

As recent events have demonstrated, environmental protection is a subject which warrants increased efforts in industrialized as well as in developing countries. But progress is especially hard to achieve in the developing world.

So many other priorities demand simultaneous attention. So few skilled personnel are available. And so much must be done to build the institutional capacity to handle complex environmental issues.

Acknowledging those realities, the World Bank also acknowledges its special responsibilities in helping developing nations shape their growth. As an advisor, a source of intellectual as well as financial support, the Bank must be responsive and innovative. And as a lender, it must exert new and persuasive influence to integrate better management of natural resources into development planning and investment.

Fortunately, we are far from alone. The Bank can profit from and contribute to the valuable work of our member nations, the expert and dedicated efforts of non-governmental organizations and the wide, continuing experience of other, international agencies such as the United Nations Environment Program.

We must start, however, with better knowledge of the problems and the opportunities we face.

To gain that understanding, the Bank will use our added staff resources in a collaborative effort to assess environmental threats in the 30 most vulnerable developing nations. That five-year process will involve not just study but education, and not just in the Bank but also with responsible developing country policy makers.

Our goal will be to develop a new appreciation of the forces at work against environmental balance. Our objective is a sort of natural resources balance sheet, a coherent planning instrument for better management.

I believe we can make ecology and economics mutually reinforcing disciplines. By looking closely at market forces and broadly at all key sectors of development activity, we can identify both the effective and perverse factors shaping and misshaping the environment.

I am not proposing make-work research. What I seek from data -- much of which is already on hand -- is a composite inventory of environmental assets and liabilities.

With such a planning instrument, we could move toward establishing the value of those priceless resources -- topsoil and grass cover, water and drainage, human skills and traditional lifestyles -- we too often treat as worthless.

Let us show in economic and environmental terms what subsidies to pesticide producers and timber cutters and livestock growers actually cost in ruining the land and driving families from it.

Let us weigh the real price of wilderness resettlement against the expense of health and family planning clinics, of agricultural extension services, new crops and new farming techniques.

Let us hold pricing policies and currency values up to the light of environmental anlaysis to see if and how they encourage over-exploitation of natural resources.

And let us acknowledge that, while we must exercise increasing care with large-scale development projects, small is not necessarily beautiful. It is time we recognize that individual practices driven by poverty and ignorance and unexamined economic policies have cumulative effects that are just as environmentally destructive as any badly planned wilderness road or hydroelectric project.

We must reshape not just the Bank's outlook and activities but also the customs and ingrained attitudes of hundreds of millions of individuals and of their leaders. In doing so we must remember another piece of Mark Twain's wisdom: "Habit is habit, and not to be flung out of the window, but coaxed downstairs a step at a time."

Our environmental assessment surveys will move us one big step forward. They will assemble the knowledge we need to move further and faster toward environmental rationality in our lending programs.

In Africa, while country assessments proceed, the Bank will also lay the ground for action that crosses national boundaries and tackles regional environmental dangers.

Africa's needs are critical. Over the last 15 years, despite the best efforts of African governments and the international community, per capita income and per capita food production in most of sub-Saharan Africa have declined. At the same time and in the same areas, deserts have spread, forests have dwindled, soil has washed away.

With population projected to rise from 380 million to 690 million in the last two decades of the century, the pressures of urbanization, fuelwood consumption and slash-and-burn farming are stripping West Africa alone of 3.6 million hectares of forest a year. Continued over three years, that tempo of deforestation would denude an area the size of Greece; over ten years, the Ivory Coast.

The rate of forest loss in five West African nations is seven times the world average, and desertification in just one country -- Mali -- has drawn the Sahara 350 kilometers farther south in the last 20 years. The Congo River carries an average of 65 million metric tons of soil into the ocean each year.

Against these natural and man-made forces, I believe we must mount an international environmental rescue and development effort in sub-Saharan Africa. I will ask World Bank staff experts to draw up a special program of technical studies to identify and assess urgent, promising environmental protection projects, regional, not just national, in their sweep.

Environmental threats do not respect political lines of demarcation. Environmental solutions must generate political and technical responses as broad as the challenge.

Our work should point the way for action by donor and recipient nations and non-governmental organizations. The latter have a particularly important role to play, in that problems of deforestation and natural resource degradation are development problems and can best be solved with the active participation of people at the grassroots level. Our common priority should be coordinated intervention against the spread of deserts and for the conservation of forest resources.

We must be bold in both the scope of our enterprise and in testing untried ideas. Unless we reach beyond today's limits and doubts, we cannot truly measure our capacity for progress.

Tropical forests in Africa, Asia and Latin America also demand priority attention. Tropical deforestation is not only a major environmental problem, it is a critical development problem as well. Deforestation is leading to widespread degradation of the natural resource base, undermining the capacity of the environment to support developing country economies and populations.

The World Bank is the world's largest single source of financing for tropical forest conservation and development. Over the past decade World Bank investments and technical assistance grants in forestry have exceeded one billion dollars. We are ready to do more.

The Bank intends to more than double its annual level of funding for environmentally sound forestry projects from $138 million this year to $350 million in fiscal 1989. At the July meeting in Bellagio, Italy sponsored jointly by your Institute, the Rockefeller Foundation, FAO, UNDP and the Bank, we will propose specific strategies for expanding priority work in forest management and reforestation.

Our Tropical Forestry Action Plan is a direct outgrowth of the World Resources Institute's excellent 1985 report, "Tropical Forests: A Call for Action." That study called for a doubling of forestry investments over the next five years. It redefined the challenge of conservation by making it clear -- in cost-benefit terms -- how deforestation impoverished both man and nature. It also recognized that simply providing more funding for forestry is not enough; increased investment in forestry must be accompanied by policy measures designed to ensure sustainability.

We are improving our understanding of the connection between the loss of tree cover in upland watersheds and flood damage downstream, between fuelwood scarcity and fertilizer shortages and between the annual destruction of 11 million hectares of tropical rain forest and the loss of plant and animal species of great, potential genetic benefit to mankind.

We are becoming increasingly able to define investment programs to correct past mistakes and prevent new ones.

We can mobilize resources for agroforestry and sustainable farming systems based on it.

We can help nations determine the wooded areas to protect and those to use more intensive y.

We can help train foresters and farmers in new techniques of tree breeding, in the cultivation of medicinal plants and the conservation of wildlands.

We are, in short, better aware of the gravity of the global danger, better equipped to address it. Now we must be prepared to mobilize resources to combat deforestation on a global scale.

Lastly, in the Mediterranean region, the Bank stands ready to assist in an intensified international effort to protect the heritage of beauty and natural resources that 18 nations and some 400 million people hold in common.

The governments of the Mediterranean states have long recognized the danger of pollution to public health and to fishing and tourism industries. The World Bank, the European Investment Bank and Regional Development Fund, the United Nations Environment Program, with many other agencies, have been active in providing financial and technical help to alleviate this problem.

Now we are exploring together the possibility of designing a broad, international project to improve the Mediterranean environment and strengthen it with a long-term preservation plan. It is an ambitious political as well as technical undertaking, involving many separate governments and technical support agencies.

The World Bank is well placed to help coordinate their effort. And if, with our assistance, the peoples of the Mediterranean can make progress in managing the great resource they share, they can set an example to the whole world of cooperation in protecting the global commons.

I have given you only an introduction to the World Bank's environmental action agenda. Events, not speeches, will test its sweep and its impact. But I cannot end these remarks without a note of combined caution and exhortation.

While there is much we can do, no one knows better than I do the actual limits of the Bank's influence on the policies and practices of the developed and developing nations. No onc knows better than you do the power of informed and aroused public opinion to command and redirect the attention of decision makers.

The World Bank needs the help of environmental activists in every nation, in those where organized groups have already proven their effectiveness and in those where consciousness is only now dawning.

We need your advice, your expertise, your pressure and your imagination to make the urgent work of environmental protection a coordinated campaign for a safer, richer, healthier world.

As ours is a common cause -- the battle against global poverty is also the fight for a sustainable environment -- let us be allies for progress on every front. There is a long campaign ahead. We cannot accept anything less than victory.

Thank you.

Appendix D

Necessary Conditions for Successful Technology Transfer[2]

(1) The technology should be adapted to the local biophyical and socioeconomic environment of the users.

The technology to be transferred should have been used successfully elsewhere under similar conditions, at least on a pilot scale. Technology transfer should not be confused with experimentation or applied research. Otherwise, the technology is likely to be unsuccessful and the adopters might become unwilling to try other innovations.

(2) Technolog is transferred most effectively by direct people-to-people actions.

People who are to adapt and apply the technology need to learn it directly from people who have experience applying it. Successful technology transfers seldom are based solely on pamphlets, books, radio programs, or films; rather, personal interactions are essential. Mcdia presentations, however, can help motivate the personal interaction, supplement technology transfer efforts, and support subsequent applications of the technology.

(3) Technology transfer agents must be well-qualified and able to communicate effectivelv to people who are capable of receiving applying the technolo

Agency personnel who are themselves learning the technology for the first time as they try to transfer it are often a cause of failure. Thus, development assistance agencies need to employ substantial numbers of experienced technical personnel.

A more serious constraint is the lack of indigenous capacity to continue the technology transfer beyond the boundaries of development assistance projects. Thus, the task for development assistance agencies is to enable local organizations to build an effective system of transfer agents who use personal contact to reassure people about the appropriateness of an innovation and who provide the information needed for a fair trial.

(4) In addition to transfer agents and capable recipients. “facilitators” or “middlemen” arc needed.

These people must understand the technology transfer process, especially the market for the technology and its products and the political, social, and economic constraints and opportunities affecting the other actors. Because technology transfer is usually a long-term process, subject to mistakes and setbacks, it needs advocates to help the new technologies compete with established ways of using resources. Thus, facilitators must maintain their roles throughout the transfer process.

The permanent staff of development assistance agencies could act as facilitators. Too often, however, they are rotated to other parts of the agency before the technology transfer process is complete. An alternative is for the development assistance agencies to locate and work with facilitators among the indigenous tropical people.

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[2] Derived from a Technology Transfer Workshop held for the OTA assessment of Technologies to Sustain Tropical Forest Resources (Washington, DC: U.S. Congress, Office of Technology Assessment, OTA-F-214, March 1984).

(5) Users and transfer agents should be involved in choosing, planning and implementing the technology so it meets actual needs and is appropriate for the situation.

(6) All parties involved must feel that they are "winners" and must, in fact, be winners.

Each actor's interests should be identified at the start of the technology transfer process so they can be addressed. Early in the transfer process, the potential users must be shown the merits of an innovation. Many ideas that outsiders think will solve development problems may not seem so beneficial to the people who are directly affected by them.

Further, for technologies designed to produce items or services for sale, the intended adopters usually must have information on markets in order to anticipate benefits. This information can be obtained through demonstration projects, surveys, and market research. Where education and research technologies are being transferred, it is necessary to determine who will reward the educator or researcher for using the new technologies.

(7) Participants must be aware of subsequent steps in the transfer process and the relationship between their actions and those steps.

This requires early definition and communication of roles for each person involved. A well articulated strategy must be flexible, since it is planned at the time in the transfer process when least is known about how it will work. In particular, plans must be made to disseminate the technology beyond the pilot project.

(8) Demonstrations of the technology should take place under conditions similar to conditions that will exist subsequently.

Pilot projects should not be made unrealistically easy by being given unrealistic levels of funds or other inputs, being located where there are few socioeconomic or institutional constraints, or being provided with artificial markets.

(9) The initial commitment of resources should be sufficient to carry the technology transfer until it is self-supporting.

A transfer is self-supporting when the techniques have been adapted to local conditions and are being adopted spontaneously by organizations or individuals.

Appendix E

Summary of the U.S. Agency for International Development's Environmental Procedures

AID's environmental procedures identify integration of environmental aspects into the development assistance decision making process is a priority for the agency's resource development activities. In pursuit of the agency's mandate[3] and in adherence to the National Environmental Policy Act, these environmental procedures provide a construct to 1) identify and consider environmental consequences of proposed AID actions, 2) assist institution building in developing countries, 3) identify environmental damage resulting from AID actions, and 4) carry out activities to restore the natural resource base.

AID activities, except those determined to be categorical exclusions or meeting exemption conditions[4], are subject to the environmental procedures. Special clauses in addition to the regular environmental procedures apply to actions involving assistance for pesticide procurement or use. Although the originating office/officer may determine that a proposed action is eligible for exception to environmental review, this determination must be made in writing and reviewed by the Bureau Environmental Officer as part of the Project Identification Document or Program Assistance Initial Proposal.

The agency's actions are categorized into: 1) those known to have a potential for adverse environmental impacts, 2) those which only sometimes have such potential, and 3) those which are not likely to have any significant direct environmental effects. For the first type, an Environmental Assessment or Environmental Impact Statement usually will be prepared without the preliminary step of an Initial Environmental Examination (IEE). However, if an action in the first category is believed not to affect the environment significantly, then standard environmental procedures are followed, beginning with the preparation of the IEE.

Documents prepared as part of environmental procedure (i.e., Initial Environmental Examination, Environmental Impact Statements, Environmental Assessments, scoping statcmcnts, Determinations, and Declarations) arc maintained in a permanent file and available to the public under the Freedom of Information Act.

The Initial Environmental Examination (IEE) is prepared by the originator the proposed action; in most cases concurrently with the Project Identification Document (PID) or Project Assistance Identification Proposal (PAIP). The IEE identifies probable direct and indirect environmental effects that may be generated by a proposed action. If the IEE is not

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[3] To upgrade the quality of life of the poor in developing countries; conduct projects that address hunger, malnutrition, overpopulation, disease, disaster, environmental and natural resource base deterioration, illiteracy, lack of housing and transportation. Assistance pursuant to Foreign and Assistance Act is provided in the form of technical advisory services, research, construction, and commodity support; and pursuant to the Agricultural Trade Development and Assistance Act (1954) by programs that address hunger, malnutrition, and facilitate economic development.

[4] Exemptions to environmental review may be allowed in cases of international disaster assistance, emergency situations, and circumstances involving foreign PO1icy sensitivities. The latter two require written determination of the AID Administrator or Assistant Administrator and consultation with the Council on Environmental Quality prior to approval.

completed with the PID/PAIP, then the identification document explains the cause, estimates the additional time requirement, and includes a recommendation that the Threshold Decision be delayed until IEE completion.

The completed IEE estimates the significance of the foreseeable environmental effects and includes a recommended Threshold Decision on whether to do further environmental analysis. Threshold Decisions are positive if the IEE indicates that the proposed action will have a significant environmental effect; and negative if no significant environmental effect is forseeable. If the Bureau Environmental Officer reaches a conflicting Threshold Decision, the originating office is requested to reconsider their determination. Final determination in these cases generally lies with the Assistant Administrator.

Decision to conduct further environmental analysis (positive Threshold Decision) leads to a formal Environmental Assessment or Environmental Impact Statement as appropriate. A negative Threshold Decision requires issuance of a Negative Determination. The Administrator or Assistant Administrator may prepare a written Negative Declaration stating that environmental assessment will not be performed despite a positive Threshold Decision when:

- a number of Environmental Assessments of Impact Statements on similar relevant activities have been prepared previously,
- a previously prepared agency Statement or Assessment covering such an action has been considered in activity development, or
- agency-developed design criteria have been applied to avoid significant environmental effects.

The project originating office holds the responsibility for identifying the significant issues in connection with the proposed action and determining the scope of issues to be addressed in the development of the Environmental Assessment or draft Environmental Impact Statement. The written statement of environmental scope identifies

- significant environmental issues,
- issue areas not requiring assessment,
- analytical methods and disciplines involved, and
- proposed scheduling for the continued environmental evaluation.

The scoping process is performed by persons with expertise relevant to the action and may include experts, recipient country representatives, Mission staff, and contractors. The statement is reviewed by the Bureau Environmental Officer, and may be further circulated for comment. Comments are considered and become part of the project file with the scoping statement. If, during the scoping process, it becomes apparent that the action will not significantly affect the environment, the positive Threshold Decision may be withdrawn with the approval of the Bureau Environmental Officer and environmental evaluation may be discontinued.

An Environmental Assessment (EA) describes the need that the agency action is designed to address, identifies the foreseeable significant environmental effects associated with the proposed action, the affected environments, and suggests possible alternative actions that mitigate or minimize these effects. Environmental Assessment preparation is intended to be a collaborative effort with the recipient country (to the fullest extent practicable), and is subject to their review. If the proposed action has the potential to cause international environmental effects, recipient countries are encouraged to consult with neighboring nations prior to action approval. Relevant bilateral or multilateral environmental studies in which the U.S. has participated or is a member of the preparing organization, or a concise review of environmental issues may be substituted for the EA with the approval of the AID Administrator. Environmental Assessments are reviewed and cleared by the Bureau Environmental Officer and, in certain instances, by the Agency's Environmental Coordinator and Office of the General Counsel.

AID also may develop programmatic environmental assessments that analyze environmental effects common to a specific class of actions and which are not country-specific. The content and form of these programmatic assessments are similar to Environmental Assessments and are subject to review and comment (circulated to Missions and interested governments). Individual actions falling under a programmatic assessment then may require only additional assessment of a specific aspect or area that has not been covered in programmatic analysis. Programmatic assessments also may be developed to identify categorical exclusions or to derive design criteria to mitigate common environmental effects. Such programmatic assessments may contribute to paperwork reduction for individual projects.

An Environmental Impact Statement (EIS) is prepared if an agency action is determined to affect in a significant way:

1) the global environment,
2) the U.S. environment, or
3) other environmental aspect at the discretion of the Administrator

Environmental Impact Statements prepared on an action that affects the U.S. environment are procedurally structured and adhere to the specific form and content requirements of the Council on Environmental Quality (CEQ). Environmental Impact Statements prepared for agency actions affecting either the global environment or other environmental aspect adhere to CEQ requirements, but also address additional AID considerations.

Draft EISs must be circulated U.S. Federal agencies, the public, AID Missions, and recipient country governments for review and comment. In some instances, the Administrator may hold public hearings on draft EISS if input beyond the required circulation procedure is desired. The final EIS along with comments are forwarded to CEQ and to all other agencies and organizations that made substantive comments on the draft. The Agency Environmental Coordinator organizes draft circulation, receives and relays reviewers comments, and coordinates distribution of the final Environmental Impact Statement.

Appendix F

Summary of Selected Systems Analysis Procedures for
Incorporating Environmental Considerations in Development Assistance

Introduction:

Although a number of systems analysis procedures have been suggested for formal inclusion of environmental analyses in project design and development, few have been systematically used by development assistance organizations. The most commonly applied procedure is simply supplying environmental guidelines and checklists to project design teams and managers. While helpful, these guidelines and checklists leave little room for institutional learning, and provide neither assistance nor encouragement for interdisciplinary analysis or local participation in planning. Further, these techniques rely wholly on the knowledge, interest and creativity of the project manager or designer to adapt them to each project, and do not provide for continued monitoring of the development activity:

> Certainly, development professionals need net be told that there is no secret, no checklist, no single approach that triggers the development process and sustains its momentum. They know that even the best-laid development plans are fragile, temporary structures vulnerable to constantly changing conditions [7].

Checklists and guidelines may proliferate beyond the capabilities of even the most dedicated manager.

Therefore, procedures are being developed by numerous groups to encourage formal and systematic consideration of environmental and other impacts in project design. Each of these methods is based upon interdisciplinary communication and analysis (and rely increasingly on local participation) to generate insights into the working of natural and social systems and to predict the probable impacts of alternative development activities. Experience has shown that the generation of these insights relies upon "organizing concepts and frameworks and a relatively formal working procedure which encourages and engineers cross-disciplinary exchange" [2]. The basic method underlying each procedure includes:

1. Identification of key interactions between a proposed development activity and the surrounding natural and socio-economic systems.

2. Prediction and estimation of the effects on natural system productivity and environmental quality.

3. Valuation and/or comparisons of the gains and losses sustained by natural, socio-economic, and human recipients of the impacts.

Five major technologies are:

Environmental Impact Assessment
Extended Benefit-Cost Analysis
Integrated Regional Development Planning
Integrated Planning Technology/System Dynamics
Agroecosystcm Analysis

The first two involve categorizing and valuing environmental impacts expected to occur from a proposed development project; the latter three depend upon systems analysis--a process of identifying all the important components of a system and determining how they interact to produce a set of behaviors [6]. While other techniques or subtechniques also are in use [cf: 5], these methods have been used by, developed by or their development was funded by development assistance organizations.

Environmental Impact Assessment

Environmental Impact Assessment (EIA) is, in theory, an overarching process in which systematic identification and assessment of alternative projects is undertaken. In practice, however, EIA refers to a process in which environmental analyses largely are kept separate from other analyses -- economic, social impact, and engineering -- and predicted environmental impacts commonly are valued on monetary scales to allow decision makers to identify trade-offs.

> EIA is a tool for predicting, assessing and estimating an economic value for the effects of a proposed action and its alternatives across a number of dimensions representing the main indicators of natural and socio-economic systems.... It also applies methods for determining the significance of individual and amalgamated effects and for estimating their value to permit selection of a preferred alternative [4].

AID often includes other measures in environmental impact statements, such as reliability or comparative evaluations of incidence (e.g., rates of incidence of a health impact).

Although methods vary, and sub-assessment may also be undertaken, EIA tends to follow a basic sequence of steps:

- Define the development objective and the key constraints to its achievement.
- Identify the alternative options for achieving it.
- Identify key linkages of development with natural resources, socio-economic systems, and other development activities.
- Determine the need for EIA on the basis of evident implications for or uncertainties about the impacts on natural system productivity and environmental quality.
- Scope the assessment, if needed, so that analysis and presentation of results focuses on the most prominent and potentially harmful problems.
- Assemble baseline data.
- Analyze the proposed development activity to identify resource demand and outputs and the effects on natural systems productivity and environmental quality.
- Predict the magnitude and severity of the effects.
- Assess the significance, distribution, and permanence of predicted effects.
- Determine the monetary equivalents of real resource costs and benefits associated with development and incorporate these values into the overall economic evaluation of the development.

- Propose realistic cost-effective measures for mitigating and managing the environmental effects.

- Establish mechanisms for monitoring and controlling environmental problems during the life of the project.

Extended Benefit-Cost Analysis

Benefit-cost analysis (BCA) is a complex, largely theoretical attempt to incorporate environmental considerations directly within economic analysis, and commonly is applied in EIA. While BCA has been used and developed by a number of groups, the Asian Development Bank (ADB) has sponsored (and AID has supported) its development by the East-West Center in Hawaii. Because the ADB has accepted the objective of maximizing the economic efficiency of Bank projects, the goal of developing extended BCA is to include "explicit economic measure of environmental impacts through the identification and prediction of development project impacts on environmental and natural resource conditions, quantification of direct and indirect impacts, and monetization of these impacts" [3].

While economic analysis techniques are well-developed, the methods for measuring and valuing the economic value of environmental impacts remain largely theoretical. A number of measurement and valuation techniques have been developed, including those that use the market value of directly related goods and services (changes in productivity, loss of earnings, and opportunity costs), those that use the value of direct expenditures (cost-effectiveness analysis; preventive expenditures), those that use surrogate-market values (property or other land value, wage differential, and travel cost approaches) and those that use the magnitude of potential expenditures (replacement costs, relocation costs, and shadow-project approaches). While the final product is a number--a benefit to cost ratio--the primary value of BCA is found within its analysis and (sometimes qualitative) comparison of impacts.

Interated Regional Development Planning

This technology, developed by the Organization of American States (OAS) is based on the concept that negative environmental impacts are a manifestation of the "conflicts created by the activities of one development sector inhibiting or negating the activities of another development sector" [9] such that spatial, temporal, and sectoral integration of the development process is needed rather than simply a trade-off between project costs and benefits. Most adverse environmental impacts can be considered as conflicts between interest groups which commonly can be associated with existing public agencies. While "maintaining its conviction that an area's natural resource base is a major determinant of its development potential," [7] the focus is expanded to include the collection and analysis of regional economic and social data.

The goal of integrated regional development is to organize a number of discrete development projects in a piece of landscape into a unified development strategy. Thus, the purpose of Integrated Regional Development Planning (IDRP) studies is to formulate ideas for projects and programs that are compatible with one another as well as with the needs, cultures, and economics of the affected populations.

The underlying precept incorporated in this technology is that, if environmental relationships ("the environmental dimension") are considered early in the planning process, sectoral conflicts can be identified and minimized, thus obviating the need for costly environmental impact statements [7]. If environmental quality is defined as the degree to which a given environment provides the goods and services required to satisfy the needs and wants of individuals and interest groups who depend on that environment, a development activity can be defined as an effort made to improve environmental quality. This can be achieved through the use, enhancement or conservation of goods and services and through the mitigation of hazardous

events [8]. Conversely, adverse environmental impacts are the en forcead non-use of a region's goods and services, the impoverishment or destruction of those goods and services, or the intensification of hazardous phenomena.

Conflict commonly arises because "the development activities of one sector have changed the mix of goods and services available from a system shared with other interest groups or they have become competitive with another sector using the same goods and services." It is a fundamental assumption of IRDP that "only the parties that are involved in the conflict can provide a satisfactory solution to that conflict" [8]. Major components of IRDP, then, are multisectoral systems analysis and conflict resolution.

Any regional system can be considered to have three main subsystems: (1) a physical subsystem composed of natural resources and infrastructure; (2) an activity subsystem composed of social and economic components; and (3) a regulating subsystem of institutions and technology. The major steps of the environmental analyses can be identified as:

1) classification and description of the region's major ecosystems;
2) examination of the goods and services available from these ecosystems (including consideration of economic, social or cultural values; scientific and future development option values; and key component of ecosystem functioning values);
3) review and selected evaluation of existing development proposals;
4) identification of the most likely types of development;
5) identification of the conflicts that would result from implementation of each proposal; and
6) notification of the interests involved in identified conflicts.

Major tasks of the IRDP studies are institution building and technology transfer. The regional development studies are performed jointly by technical experts and national counterparts, providing a mechanism for on-the-job training and helping to mobilize local participation. This improves the likelihood that the study's recommendations will be implemented. The studies commonly take from two to four years to complete and cost anywhere from US $350,000 to U$l,000,000 [7]. The final products are usually a detailed five- to ten-year regional development strategy and a package of interrelated development projects within a proposed action plan.

Integrated Planning Technology

Integrated Planning Technology (IPT), founded on a computer-based systems analysis paradigm, is being developed by AID and International Institute for Environment and Development (IIED) and tested as a method to help guide the AID Office of Forestry, Environment, and Natural Resources' research planning. Previous demonstrations of the technology have identified potential uses of this technology in USAID'S development program planning and implementation cycle:

> There are several levels... where systems analysis could be applied: where demonstrations of linkages among sectors, cause and effect, and scenario simulation might be of most benefit. Three levels where systems amalysis might be most useful are (1) at the CDSS policy and strategy planning step, (2) at the PID project-level design stage; and (3) mid-term evaluation [6].

IPT's basic assumption is that, in addition to the need for multidisciplinary analyses, human understanding of large systems is limited by an inability to consider more than a few variables or relationships between variables at a time [6]. Because of this inability to think

through the complex linkages of a large systems, such as are common in biophysical, economic or regional systems, connections are overlooked that, in implementation, result in unintended or "count erintuitive" impacts.

In order to make the relationships between variables explicit, the IPT approach features a several day workshop that draws together the knowledge of a multidisciplinary team of experts whose role is to identify the ecological, economic and social variables that together make up the system in question and to examine the interconnections between them. In this way, a graphic picture (called a causal loop diagram) is incrementally constructed illustrating the inner workings of the system. During this process, assumptions are made explicit and data and knowledge gaps are identified. This process often is more useful than the model itself, in that it aids the specialists to gain insight into the workings of the system and the interrelations of each specialist's knowledge with others [6].

Further discussions or analyses identify more specific information about the relationships between each set of variables (e.g., magnitude of response or length of time delays). Each of these relationships can be quantified to form the mathematical basis of a computer simulation of the system. Once quantified, the model must be tested to determine if its behavior matches the known behavior of the system, and further refined or reconstructed if it does not. Once it has been recogized as a valid representation of the system, the model can be run with changes in variables identified as amenable to policy manipulation. The effects of these changes on other variables can be compared to expand the mental models of the participants, and to help predict the impacts of various development options. Thus, IPT provides "a simulated policy-testing environment which is more informative than common subjective methods and less expensive or dangerous than trial and error in the field" [1].

It should be emphasized that the model does not and is not intended to provide "the answer," but only to provide a structure through which ideas can be tested and alternate scenarios explored [6]. Further, although IPT analyses may be fastened upon by planners who have long been looking for an integrated and quantitative decision tool, it's use still requires sound human judge merit, and other benefits may be even more useful:

1) it encourages and even required cross-field collaboration between experts;
2) it enhances understanding of the system and the needs of colleagues; and
3) the systems includes retrievable data, allowing ready updating or expansion ("a living source of updated information which at any moment will give an environmental profile for status and trends in specific resource areas" [1]).

Agroecosytem Analysis

Agroecosystem analysis also in in an experimental stage. AID has supported its application through case studies in the Philippines and Thailand.

In this form of analysis, an agroecosystem (a natural ecosystem simplified and manipulated for the purpose of food or fiber production) is determined to be a basic system underlying rural development in developing countries. Agroecosystem analysis, then, is the interdisciplinary analysis of agroecosystems aimed at producing agreed upon programs of research or development. A multidisciplinary team is needed because each individual has, "necessarily, a narrow perspective restricted to only one geographic part of the agroecosystem or to only one aspect of its behavior" [2]. The major steps of agroecosystem analysis are definition of the agroecosystem, analysis of its patterns and discussion of its properties.

While the agroccosystem of interest may be readily identified, each is actually one of a large number of agroecosystems that are arranged in a nested hierarchy. For example, a farm is an agroecosystem, but it is a subsystem of an area of landscape, which is situated in a watershed that 1 ies with in a particular ecological region, that is governed by the policies of a nation, etc. Systems higher in the hierarchy tend to control those beneath them, thus each level must be considered in the analysis.

Agroecosystems are characterized by four interconnected properties. Productivity, defined as the net output of valued product per unit of resource input (in which resources are land, labor, capital, energy or technological inputs), is the property of most obvious value to humans. [If there is no resource introduced to the system, valued products may still be produced, but the ecosystem in not properly then an agroecosystem.] Stabilitv, or "the constancy of productivity in the face of small disturbances caused by the normal fluctuations of the surrounding environ merit," can be measured in terms of changes in productivity over time. The third property, sustainability, refers here to the resilience of the system's productivity i n the event of a major disturbance. Finally, equitability measures the "evenness of distribution of the productivity among the human beneficiaries." Thus, development of an agroecosystem can be seen as a series of major changes in agroecosystem properties [2].

The key functional relationships that determine a system's properties are spatial relationships; temporal relationships dynamic flows of materials; energy, information, etc.; and decisions. The first three are important to understanding the ecological functions of ecosystems, and the fourth reflects the processes of human management. These "patterns" can be depicted in maps, graphs and simple flow diagrams.

During the entire procedure of defining the system, analyzing its patterns and discussing its properties, questions, working hypotheses and management guidelines are expressed by the participants. Evaluation of the questions and working hypotheses can uncover areas where further data collection and/or research are needed. Guidelines and working hypotheses differ only in expression of certainty: while guidelines are based on well-established knowledge derived from experience in the area or elsewhere, working hypotheses reflect greater uncertainty and need to be tested. Further, contained with the guidelines and hypotheses are a number of proposed innovations in management of the system. Evaluation of these proposed innovations for their impact on the system's properties, cost, time horizon of benefits and technical and operational feasibility allows them to be ranked to assign priorities for action.

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