REVIEW AND RECOMMENDATIONS FOR THE ECONOMIC ANALYSIS OF AID ENVIRONMENTAL AND POLICY REFORM PROJECTS

Prepared for

by

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FINAL REPORT

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INTRODUCTION

In recent years, U.S. AID has seen increasing funding for "non-traditional" projects. These "non-traditional" projects include topics such as: policy reform, natural resources management projects, umbrella projects with private volunteer organizations (PVO's) and non-government organizations (NGO's), governance and democratization, biodiversity, non-project assistance, and data collection projects. The relevant distinction of these is that they all pose special difficulties for standard applications of project analysis. In more traditional projects funded by AID, project beneficiaries were well defined, as were the tangible benefits they received as a result of project completion. For example, an irrigation project would directly increase the incomes of farmers in a region, and consumers might benefit as well by a more abundant and less expensive food supply. In this case, standard benefit-cost analysis could be applied to the project following the guidelines presented in AID Handbook 3 and the AID Manual for Project Economic Analysis.

For these non-traditional projects, the link between the project activity and the quantifiable economic benefits may be less direct. The project may ease the way for changes in the region that could ultimately make the citizens better off economically, but it may require a chain of events that are not all directly linked to the project. For example, a democracy and governance project which aids free elections might eventually lead to removal of government market controls. The freer markets would supposedly be more efficient than the government controlled market, but how should this subsequent benefit be discussed in evaluating the governance and democracy project?

Non-traditional projects may pose additional difficulties in economic analysis in that the benefits, even if clearly attributable to the project activity, are not traded on the market. This problem of measurement of non-market benefits is particularly apparent in natural resource and biodiversity projects where preservation or restoration of pristine natural resource areas is desired. While measuring the costs of such an activity may be straightforward, the benefits may be less tangible and more difficult to measure.

Purpose and Limitations of Guidance

The purpose of this document is to provide guidance for the preparation of economic analyses during the design of "non-traditional" AID projects. A review of previous economic analyses of these types of projects conducted at the design stage (Project Papers and Program Assistance Approval Documents, PAADs) (see Chapter 1) reveals that the type and quality of these efforts varies greatly. In a few cases, rather extensive analyses have been attempted, whereas, in other situations, a cursory analysis is provided. Without some standardization or baseline requirements for an analysis, project reviewers are unable to determine whether an adequate analysis has been

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performed.

Any guidance provided can only be useful if it is realistic about the situation in which it will be applied. The time frame in which project analyses are conducted is usually a matter of weeks or a few months. Although, there may be rigorous economic analyses that can be applied to analyzing a particular project, the necessary data collection and expense would make it unrealistic to expect the economist to perform this level of analysis. So while the guidance may suggest techniques available for an analysis, it is a central theme throughout this report, that somewhat less than ideal analyses will have to be performed given the time, resource and data constraints the analyst faces.

It is not the purpose of this report to develop new techniques for analyzing non-traditional projects. The approach taken here is to examine state-of-the-art techniques that are being or should be applied in project analysis by both AID and other donor agencies. Some of this guidance is adapted from U.S. government agency guidance on economic analysis such as that developed for the Environmental Protection Ageⁱcⁱ.

The Purpose of Project Analysis

It is important to make explicit the purpose of project analysis prior to providing guidance on how it should be accomplished. Particularly for the non-economist there can be confusion about the purpose of different kinds of economic analyses.

The purpose of project analysis is to determine whether a particular investment is an efficient use of resources, or determining the relative efficiency of a number of investment choices (including the no action alternative). The term economic efficiency refers to the net benefit (benefit minus costs) or change in economic welfare of a particular action. The efficiency criterion does not address the issue of equity or fairness of the proposed activity.[1]

Most other types of economic analyses are interested in prediction, how the economic system will perform as a result of a particular action. For example, an analysis might try and predict what would happen to prices and quantities of certain commodities if a state-controlled monopoly were eliminated and replaced by a free market system. Such an analysis, no matter how good a predictor, tells us little about the efficiency gains resulting from this action. In fact, the predictive model would be a necessary first step in the measurement of efficiency gains or losses.

This distinction in the two kinds of analyses (prediction vs. measuring welfare changes) is important because many AID project goals in areas such as policy reform and

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[1]The reader is referred to Applied Welfare Economics and Public Policy, by R.E. Just, D.L. Hueth and A. Schmitz, Prentice Hall, 1982, and R. Boadway and N. Bruce, Welfare Economics, Basil Blackwell, 1984 for the most authoritative reviews of welfare economics. Apparently, a revised version of Just et al. will soon be released.

democracy and governance are written to achieve specific macroeconomic criterion (e.g., improve trade balance, reduce inflation, etc.). If the predictive economic analysis comes close to achieving these goals, the project is considered likely to be "successful". Prediction of outcomes, however, would only be the first step in measuring the welfare changes related to a particular project. The analyst would use the results from the prediction in the second step of the analysis, which would be to determine the net welfare gains from the policy reform.

If one is not interested in measuring the benefits of a project's objectives, then there is little need to proceed further in this document. For example, if, for political or other reasons, a decision has been made to achieve some specific goals, then one need only be concerned with the predictive aspect of economics. In other words, one wants to be assured that the expected outcomes are likely to be achieved. In addition, "least-cost" analysis (or cost-efficiency approach) is substituted for a benefit-cost analysis when this is the case. This is appropriate since when the project outcomes are predetermined, the most efficient way to achieve them is the least-cost way. Least-cost analysis allows us to choose among different ways of achieving a specific objective. The guidance and analysis that follows is directed towards this notion of benefit-cost analysis and economic efficiency.

Types of "Non-Traditional Projects"

For purposes of this guidance we have identified seven categories of "non-traditional projects" that may require special consideration when conducting economic analyses. Other categories may become apparent over time. As will become clearer later in the guidance, economic analyses of any non-traditional projects should resemble analyses of traditional projects, but may pose more difficulty in data collection and may require different methodologies to measure welfare changes. The seven categories of non-traditional projects were identified in the original scope of work for this project and are:

1) Policy Reform
Program and project assistance is carried out in support of policy reforms. It may be difficult to attribute economic changes to activities, such as institution-building assistance aimed at strengthening the capacity of host government institutions to implement sound policy. Policy reform may also require multilateral donor efforts, thus posing problems of attributing benefits to a given project.

2) Natural Resources Projects
Examples include soil and watershed conservation and environmental education, where the primary focus is on protecting the resource base,

rather than increasing current production levels. Resources may be common property, and hence, their market price is zero, yet they still have value to society.

3) PVO/NGO Umbrella Programs

These are projects where the principal objective is building local level capacity to implement assorted development activities and where actual activities undertaken in the field are only identified after implementation begins.

4) Governance and Democratization Projects

These projects include efforts aimed at a) empowering local communities, private groups and others; b) strengthening audit and other watchdog functions to ensure greater transparency and accountability in government; and c) "enabling programs" aimed at supporting structural adjustment and providing a healthy institutional environment for private sector-led growth.

5) Biodiversity Projects

These may be similar to other natural resource projects except the main objective is maintaining biodiversity. Benefits may be for use values or non-use values.

6) Non-Project Assistance

Includes debt relief, cash transfers, budget support, etc. that is typically linked to policy reforms.

7) Data Collection

Projects where the primary output is data, for example, remote sensing and aerial photography. Might also include institution-building where the institutions role is to collect information

Initially, we attempted to provide a detailed analysis and guidance on all seven of these project areas. We soon realized that such a broad scope did not allow us to provide the level of detail that would be meaningful to AID in developing their guidance. Subsequently, we decided to focus on two areas of "non-traditional" projects: policy reform and natural resources. For the latter we included biodiversity, as well.

Organization of the Report

In Chapter 1 we analyze recent USAID project papers for natural resource and

policy reform project in order to assess the adequacy of their economic analysis. In Chapter 2 we make our recommendations on how current guidance should be modified to allow for more consistent and rigorous analysis of non-traditional projects. Since much of this requires relatively new measurement tools in environmental valuation, these are reviewed in Annex A. Annex B is devoted to a discussion on the economic value of biodiversity.

Chapter 1

ECONOMIC ANALYSES OF USAID NATURAL RESOURCE AND POLICY REFORM PROJECTS : A REVIEW

Introduction

The purpose of this Chapter is to review the projects undertaken by the USAID in the fields of (i) natural resources and environmental management, and (ii) policy and administrative reforms, and to evaluate these projects based on the rigor and content of economic analysis. Projects for examination were suggested by REDSO/WCA. During the first phase we examined the microfiche summaries of 165 (121 in policy reform, and 44 in natural resource management) project reports. Out of these, only 58 reports (32 in policy reform, and 26 in natural resource management) contained some economic analysis of the project. These projects were then examined in detail in order to assess the adequacy of the economic analysis. In what follows, we provide a brief description of the project, taken from the published abstract, followed by a brief description and the assessment of the economic analysis for each of the 58 projects reviewed. The projects relating to natural resource management, and policy reform are reviewed in separate sections. The results on the rigor and content of the economic analysis are summarized in the final section.

Natural Resources and Environmental Management Projects

<u>Project Name</u>: Gambia Agriculture and Natural Resources Project
<u>Project No.</u>: (625-0235 and 625-0236) (NOTE: Information for this project is from the author's project review.)
<u>Project Description</u>: This is a $22 million project, with a six year life. Of that amount, $10 million is for non-project assistance, a direct grant which will be used by the Gambian government for debt retirement. The remaining $12 million is to finance a support project to encourage the adoption of sustainable agricultural techniques in Gambian farming and forestry management practices.

<u>Economic Analysis:</u>
Annex F contains the economic analysis of the Gambian PAAD. It is concluded that the project benefits outweigh the costs for both the economic and financial analyses. The financial analysis examines private returns to Gambian farmers to determine if their

private benefits exceed their private costs with the project in place. The economic analysis compares the social (private + public) costs and benefits of the project.

The approach taken is to model a representative hectare of Gambian real estate on which the appropriate mix of farming and forestry activities occur. A partial budget (costs and returns) for the various enterprises on this land is developed from various Sahelian data sources to form the baseline scenario. Costs and returns to this hectare are then compared with and without program implementation for a 25 year time horizon. Without program implementation, productivity of the land continues to deteriorate and incomes decline from the base period. With program implementation, productivity improves at varying rates depending on the products and assumptions about effectiveness of the management actions. The assumptions about technical relationships between management actions and productivity are derived from a variety of published and unpublished sources based on experience in other regions.

An internal rate of return is calculated for the six years of project costs and the 25 years of increasing project benefits. Also included is an "environmental salvage value" calculated at the end of the time horizon for the two scenarios. The project has a positive net present value at a 10 percent discount rate, and an internal rate of return of 21 percent.

Project Name: Maya Biosphere Project
Project No.: 520-0395 (PD-ABC-450)
Project Description: This project aims at improving the management of renewable natural resources and protecting the biological diversity and tropical forests in Maya Biosphere Reserve. To achieve the objective, the project proposes three activity components and one management component. The first component, Biosphere Administration, establishes a biosphere administration and strengthens the Guatemalan government institutions responsible for the protection of the reserve. The second component, Environment Education, addresses the environmental issues through formal education sector, public awareness campaigns and policy activities. The third component, Sustainable Resource Management, develops a resource management basis for income generation through environmentally competitive forestry, and a few other activities. Finally, the fourth component, the Technical Assistance, Management and Evaluation, supports necessary planning, coordination, and evaluation functions.

Economic Analysis: The analysis recognizes the complexity of the economic analysis of such a project and the data requirements to deal with such complexities. The data to resolve all the issues involved in such a detailed economic analysis is not readily available. To overcome that difficulty the project builds into implementation activities to collect information on physical data covering the stock of environmental assets,

demand for the service of such assets and the negative consequences of the satisfaction of that demand. Once sufficient information becomes available, the project design will be modified to incorporate information learned and make the project more efficient. Until that time, however, the economic analysis is limited to cost-effectiveness. Based on consultations with several experts, the analysts are convinced that the components of the project are least cost in terms of project inputs. Thus, the least-cost analysis is non-rigorous, relying on the judgement of experts rather than a detailed quantitative analysis.

Project Name: Industrial Environmental Management Project
Project No.: 492-0465 (PD-ABD-633)
Project Description: This project aims at improving the industrial management of pollution in the Philippines. The project, to be implemented by the Department of Environment and Natural Resources (DENR), includes a pollution reduction initiative, a policy studies and public/private dialogue component, and institutional strengthening. Working cooperatively with geographically concentrated firms within selected industrial sectors, the project will analyze pollution problems and seek to develop remedial actions. Pollution management appraisals (PMA's) -- plant evaluations in which specialists work together with industry personnel on ways to reduce pollution -- will be the principal method employed. In addition to PMA's, the project will conduct an environmental risk assessment across a broad spectrum of industries in order to help the DENR improve its policies and regulations, with a focus on the five industrial sectors that pose the highest social cost from pollution.

The project supports a wide range of policy analyses to identify how legal and regulatory controls on industrial pollution can be improved. Specific issues to be examined include, inter alia, regulatory structure, incentives and disincentives to voluntary pollution control, decentralization, and market-based instruments for industrial pollution management. To complement the above activity, the project will increase public awareness about industrial pollution through industry associations and other pertinent private organizations and the establishment of citizens' discussion and participation groups.

Economic Analysis: The project authors seem to be aware of the need and methods for rigorous economic analysis. However, data limitations prevent them from performing a rigorous quantitative economic analysis. In performing the economic analysis, the project writers have focussed on the following pollution related economic losses:

* Illness and premature death

* Reduced productivity of farming, forestry, and fishery,

* Adverse effects on ecological systems, and

* Increased costs on industries and residences in the form of materials damage, lowered property values, and increased clearing and maintenance.

In view of the above, the economic benefits of the project are examined in terms of three contributions:

* Cost savings resulting from changes in processing efficiency and waste handling

* Improvements in fishery productivity because of reduced water pollutants, and

* Health benefits in communities where the project helps reduce pollutants.

Valuing these contributions is, no doubt, difficult and highly demanding in terms of data requirements. However, this project report does not even attempt to develop a framework to value these contributions, leave aside attempting to gather relevant information necessary to conduct the economic analysis. Instead, the analysts rely on assumptions and guesses in order to calculate NPV and IRR. The appearance of quantitative estimates in the economic analysis is deceptive to the non-economist reviewer who believes a rigorous economic analysis has been performed.

Project Name: Employment and Natural Resource Sustainability
Project No.: 527-0341 (PD-ABD-641)
Project Description: The purpose of this project is to enhance the income of people in Pacaya-Samiria National Reserve area in Peru, while conserving the natural resource base of the area. To achieve that objective the project proposes two kinds of activities: (i) income increasing activities, and (ii) resource sustaining activities. The income generating activities include fish harvesting and processing activities (such as improvement of fish drying and salting technology, introduction of fish smoking technology, etc), agroforestry activities, and marketing activities. These activities are aimed at benefitting 5,000 people in 18 communities who economically depend upon the reserve. Resource sustaining activities, on the other hand, target the improved use and protection of the natural resource base of the Reserve through the establishment and operation of a reserve management program.

Economic Analysis: The project report notes that a macroeconomic analysis could not be performed due to the lack of reliable data, although it is unclear why such an analysis would be necessary. The microeconomic analysis evaluated activities that would create

employment and generate foreign exchange while preserving natural resources. These activities included: (i) expansion of fish capture through renewal of equipment, (ii) agroforestry in agricultural land or second growth forests, and (iii) improvements in dry-salt processing for fish preservation.

NPV and B-C ratios were calculated for individual projects at market prices (because shadow prices could not be calculated due to insufficient data) using a 10% discount rate. It is difficult to comment on the adequacy of the economic analysis because the assumptions and projections of these projects are provided in a separate annex which was not available to us. Based on the information available, it appears that a relatively rigorous economic analysis was developed, given the information available.

Project Name: Thailand - natural resources management and environmental protection
Project No.: 493-0345 (PD-AAT-579)
Project Description: This project strengthens public and private capacities to manage natural resources and the environment (NR&E) in Thailand. Among the major objectives of the project, to be administered by 7 subprojects, are:

* development of NR&E plans for 4-6 coastal areas. Organization of seminars for the National Coastal Resource Management (CRM) Advisory Committee, provision of technical assistance for policy research, and establishment of a CRM monitoring unit at the Office of the National Environment Board (ONEB).

* organization of seminars for public/private leaders on problems posed by industrialization. Provision of technical assistance to develop 12 site-specific actions on environmental or worker health/safety problems in Thai industries.

* development of a provincial rural resources management (RRM) planning process and establishment of a regular source of government funding to implement RRM plans.

* developing formal and informal NR&E curricula/materials and training teachers and community leaders in their use; developing Regional Resource Centers for Environmental education at teachers' colleges; preparing a national strategy for environmental education; and conducting a mass media campaign.

* strengthening the analytical and administrative capacities of ONEB and National Economic and Social Development Board (NESDB), supporting prospective policy research by the Thailand Development Research

Institute, disseminating findings through seminars and conferences.

* strengthening the management and public education capacities of the Royal Forest Department's National Parks and Wildlife Conservation Divisions and promoting scientific understanding of wildlife species/habitats through a National Biological Survey, fund action research, and improving public-private cooperation in biological resource conservation.

Economic Analysis: The project designers seem to be well aware of the issues involved in the economic analysis of such a project. However, the analysis presented in the report is only a general discussion of a few possible reasons for overexploitation and resulting degradation of natural resources in Thailand. The scope of the discussion is too general to put the problem into perspective. In fact most of the reasons discussed in the project report can be applied to any developing country facing the problem of deterioration of its natural resource base. The analysts note that "it is exceedingly difficult to calculate expected changes over time in, say, levels of exports or per capita income attributable to the project because the activities and elements comprising the project do not easily lend themselves to this sort of analysis....Since natural resources can be managed so as to degrade, maintain, or enhance their productivity, the challenge is larger and immediate. This project is designed to help meet part of the challenge". This analysis offers an excellent example of incorrect reasoning to avoid a thorough economic analysis. If the outcome is so uncertain, why should the project be undertaken?

Project Name: Natural Resource Management (Panama)
Project No.: 525-0248 (PD-AAU-487)
Project Description: The project is designed to assist the National Institute of Renewable Resources in developing its capabilities to implement the organizational responsibilities in such fields as natural resource policy and planning formulation, management and protection of public lands (particularly, the national parks), and the regulatory function of land use control and the protection of environment. The project strategy is based on:

* strengthening the policy, planning and coordination function of the National Institute of Renewable Resources in the Panama Canal Watershed to insure that programs of public agencies and private organizations in the watershed are appropriate, collaborative and mutually supportive, and

* supporting an increased role for local 1 IGOs and private organizations to carry out boundary and trail demarcation, construction of basic park infrastructure, community programs, and local environmental awareness programs in buffer areas surrounding parks and forest reserves.

Economic Analysis: The project report divides the economic analysis into two components: (i) analysis of public sector managed components, and (ii) private forest plantations. Regarding public sector managed components, the project report notes that the project has the objective of conservation and management of natural resources which can not be quantified. It only notes that encouraging tree planting by small land holders is less expensive than public land reforestation. How that justifies the public sector component is, however, not clear.

Economic analysis of private forest plantations is straightforward. The project report estimates that the IRR of the industrial plantation component at 24 per cent. However, even a cursory reading of the project report points towards the simplistic nature of the analysis. The economic analysis of private forest plantations can, at best, be characterized as 'fair'.

Project Name: Sustainable Approaches to Viable Environmental Management
Project No.: 687-0110 (PD-ABA-854)
Project Description: This project identifies and initiates systems for the management of protected areas in Madagascar. The project will establish a National Association for the Management of Protected Areas (ANGAP) and provide grants to PVO's for large and small community-level conservation and development activities.

One of the main aims of the project is to provide long-and short-term technical assistance to help ANGAP: (1) plan biodiversity policy in collaboration with the National Office of the Environment; (2) coordinate the management of protected areas and the development of their peripheral zones; (3) develop internal financial and administrative systems; (4) establish educ.. 'onal, training, and communication networks; and (5) set up a computerized system for monitoring environmental management activities.

Another major responsibility of ANGAP will be the establishment of a Biodiversity Planning Service (BPS), responsible for diagnostic studies, data collection, and monitoring of conservation/ development activities. The BPS will include: a Geographical Information System; a data base on flora and fauna, topography, climate, and soils in protected areas; and socioeconomic data on human communities in and around the protected sites.

Economic Analysis: Economic analysis presented in the report attempts to demonstrate the need on the project and the economic problems that the project must address. The broad categories of the benefits and costs considered in assessing the overall economic viability of the project include:

* aggregate economic costs of environmental degradation in Madagascar,

* economic value of protected areas,

* economics of current forest uses by peripheral-zone populations, and

* economics of alternative income generating activities.

The analysts have attempted to be moderately rigorous while analyzing the benefits and costs of various categories The range of aggregate economic costs of environmental degradation is placed at US$104-293 million. The economic value of the protected areas is assessed in terms of the opportunity costs of maintaining woodlands as protected areas. Based on various assumptions regarding sustainable yields and prices, the economic value of the resources being protected is placed at US$384 million. Regarding the current uses of forests by peripheral-zone populations, the analysis considers slash-and-burn cultivation, hunting and gathering activities, cultivation under natural forest cover, livestock rearing in natural forests and logging. The alternative income generating activities included agricultural intensification, agroforestry, tree planting on government land, aquaculture, tourism, and road building. To justify the economic viability of the project, NPV and IRR are estimated under various scenarios. On the whole, the analysis presented in the report is sufficiently rigorous in nature.

Project Name: Natural Resource Management Project
Project No.: 675-0219 (PD-BCC-954)
Project Description: This project is a follow-up to a component of a previous project to improve natural resource management (NRM) in three watersheds in the Fouta Djallon Highlands of Guinea for profitable and sustainable agricultural production. The project has six components: (1) improving local NRM capabilities; (2) applied research; (3) enterprise development and management; (4) training; (5) policy analysis; and (6) impact monitoring.

Specific project activities include: (1) collection and dissemination of knowledge about natural resources in the watersheds, the long-term impacts of current agricultural practices, land tenure and ownership arrangements, and suitable technologies and mechanisms for improving the use of natural resources; (2) helping communities prioritize NRM issues, develop action plans, and organize to initiate action; and (3)

testing and transferring technologies, with a focus on soil enhancement (reducing erosion, enhancing fertility, tree planting, etc.).

Economic Analysis: Since this project is a follow up to another project, the analysts rely on the economic analysis presented in the previous project report which was not available to us. Nevertheless, it is noted in the summary of the economic analysis presented in the report under review that the analysis mainly focused on assessing key issues in selection of intervention strategies, such as replicability and financial incentives. Standard cost-benefit analyses were conducted on four principal interventions for the target watersheds: well construction, spring capping and spring headland reforestation, composting, and live fencing. These analyses showed positive returns on all four interventions. Since the specific details on the benefit cost analysis were not available to us, it is difficult to comment on the adequacy of economic analysis.

Project Name: Uganda Action Program for the Environment (APE)
Project No. : 617-0123 (PD-ABC-543)
Project Description: The project is designed to assist Uganda's policy and institutional system to manage its natural resource base in a more effective manner while at the same time promoting economic growth. Specifically, the project has two components : (i) Policy reform, and (ii) Local level PVO/NGO natural resource activities.

The approach involves assisting the Government of Uganda in the development of a National Environment Action Plan (NEAP). The plan will be developed through broad, country-wide participation involving both those within and outside the government. It is expected that the NEAP will produce policy recommendations, and activity in the area of tenure legislation, public and private investment, institutional administration, budgeting and support, and public infrastructure.

Economic Analysis: Annex C of the report presents the economic analysis, but it is primarily a general discussion of the potential benefits of improved natural resource management. Only towards the end of Annex C do the analysts have presented some figures to justify the need for the project. For example, the analysts ask the question : how much benefit would need to accrue to the target population to make the US$30 million investment viable? The analysis presented is sketchy at best.

Project Name: Environmental and Coastal Resources
Project No.: 538-0171 (PD-ABD-465)
Project Description: This project is an attempt to demonstrate that partnership between public, private, and community interests can protect the environment in the Eastern Caribbean. A regional environmental management component will strengthen national and regional institutional capabilities, especially those of the Organization of

Eastern Caribbean States (OECS) and its Natural Resource Management Unit (NRMU), while a local site management component will undertake community-based, environmentally sensitive development projects at three sites.

The regional component, to be conducted in all 8 OECS countries, includes activities in four areas: (1) public awareness activities comprised of a basic environmental database for each country; 6 communications programs for use by radio and TV stations, schools, etc.; 10 special programs (local media events); 8 regional environmental conventions open to the public; and 500 environmental education packages for distribution to some 250 schools. (2) Training comprising of short-term technical training (12 persons), graduate study (18 grants), and postgraduate study (3 persons) in areas such as coastal and terrestrial resource management, tourism, economics, etc., as well as 50 regional, national, or local workshops for representatives from government, the private sector (e.g., tourist industry), NGO's, etc. (3) Policy dialogue activities, and (4) Environmental monitoring activities.

The local component demonstrates the advantages of cooperation between communities, governments, and NGO's in managing natural resources for long-term economic growth. This component will include three economic development projects which address specific environmental issues, and especially, which protect coastal and other resource upon which the economy (e.g., tourism) depend. Local residents will participate in conceptualizing, planning, and implementing the projects, details of which will be determined during implementation; general outputs will include comprehensive management plans, activation of community groups, initiation of business activities, and development of local environmental databases and environmental monitoring programs.

Economic Analysis: Perhaps an adequate economic analysis was not considered to be important for this project as can be inferred from the following statement in the economic analysis section of the project report: "The mission's decision was not based on a comparison of economic rate of return, but rather on a perceived consensus in the region that such a project is urgently needed". Nevertheless, some economic analysis was conducted.

The summary of economic analysis presented in the project report indicated that the economic analysis addressed two main questions:

* do the proposed activities offer an acceptable economic return in comparison to other potential areas in which the mission might program its resources, and

* given the decision to program resources into activities promoting sounder environmental management in the eastern Caribbean, does the program minimize the cost of achieving project objectives when considered among

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alternative designs?

While these are pertinent questions to answer, it is not clear to what extent the analysts succeeded in answering them, since the details of the economic analysis are presented in unattached Annex E which was not available to us.

Project Name: Natural Resources Management Program (NRMP)
Project No.: 492-0444 (PD-ABC-422)
Project Description: This project promotes the sustainable management of the Philippines' tropical forests and attempts to enhance economic efficiency in the forest products industries. The project's main component consists of performance-based disbursements aimed at policy reform in six areas : (1) to empower communities and local governments to protect and manage much of the country's forest estate; (2) to sell commercial timber exploitation rights at prices that represent the true economic rent and to invest the increased proceeds in sustainable forest development; (3) to remove constraints to imports and exports of forestry raw materials, products, and technologies; (4) to remove barriers hindering the entry and exit of firms into and out of the forest products industry; (5) to stop logging in the remaining primary forests; and (6) to implement site-specific plans for conserving and developing all the nation's natural forests.

Economic Analysis: The project report presents the economic analysis for following six policy reforms : (i) ban on logging in old-growth forests, (ii) control of illegal logging, (iii) reform of property rights, (iv) trade liberalization, (v) enterprise entry, exit and competition, (vi) reform of timber pricing policies, and (vii) forest protection. However, none of the policy reforms have been rigorously analyzed. The scope of analysis is mostly limited to a general discussion of the potential benefits of improved natural resource management. For timber pricing, trade liberalization, forest protection, and forest management, the analysts have provided some quantitative measure to reflect the net economic gains of the proposed policy reforms. For example, in case of timber pricing the project report notes that "Under the 20 percent pricing policy supported by NRMP, forest charges increase from the current 30 pesos per cu.m. to 530 pesos per cu.m. Projected over future sustainable timber cut in second growth forests, the gain is $196-393 million in terms of present value in 1990." Calculation of this figure is not well documented. The analysis also ignores the equilibrium effects of the pricing policy.

Project Name: Natural Resource Management Project
Project No.: 696-0129 (PD-BBR-041)
Project Description: This project aims to improve natural resources management in Rwanda. The project has five components: marais (wetland) management, integrated

fish culture, agroforestry and soil conservation, natural forest management, and e⁻ ᵎ·ntal planning.

ᴵ ＿ ᵎ ᵎ· Analysis: For the purpose of economic analysis, the project activities are div: into three components: (i) soil conservation, agroforestry, and forestry interventions; ₍ii) aquaculture/marais; and (iii) biodiversity and natural forest managem ₍nt. The forestry interventions are analyzed in terms of NPV, IRR, and SEV (soil expectation value), and the aquaculture/marais activities are analyzed in terms of NPV and IRR. No quantitative economic analysis is performed for biodiversity and natural forest management. The analysts do attempt to provide some economic footing to biodiversity/natural forest management component in terms of increased tourism potential, but inadequate information pertaining to the market potential for expanded tourism prevents any definitive analysis.

Regarding forestry and fishery operations, the analysts have provided sufficiently quantitative economic analysis. For forestry operations, the NPV, IRR, and SEV are estimated under five yield scenarios and the NPV is positive even for the worst scenario. For fishery, the NPV and IRR are estimated for a four acre fish pond. The analysis suggests that the investments are economically sound.

Project Name: Watershed and Applied Research Project
Project No.: 655-0017 (PD-ABC-033)
Project Description: The goal of this project is to improve sustainable agricultural productivity in Cape Verde. Agricultural productivity here is defined as irrigated or rainfed crop yields, production of forage, and livestock and other forest products. The goal is expected to be achieved by better on and off-farm soil and water conservation practices; promotion of forestry, agroforestry, and silvopastoral activities and research; and applied agricultural research, monitoring and evaluation, and institutional strengthening. The project is to be implemented on the basis of two geographical distinctions : a target watershed and other selected watersheds. The purpose of designating a target watershed is to focus applied research and soil and water conservation in a defined area.

Economic Analysis: The project report notes that a complete economic analysis of the project is not feasible with the resources allocated to the project paper team. At the same time, however, they argue that such an analysis is not needed to justify the project because the financial analysis is positive. The analysts then provide some crude calculations and argue that if all project benefits were considered, the IRR would probably be of the order of 20-25 per cent.

Project Name: Profitable Environmental Protection
Project No.: 879-0023 (PD-ABD-841)

<u>Project Description</u>: This project aims to develop model private enterprises in South Pacific Region which are both profitable and contribute to the preservation of natural environments. The project: (1) identifies sites for enterprise activities; (2) helps develop demonstration enterprises at the selected sites; and (3) disseminates lessons, guidelines, and models throughout the region.

Six Ecological Management Units (EMU's) will be selected for demonstration activities. Implementation will begin in Vanuatu, where the first 3 EMU's will be located; building on this experience, 3 more will be established in other nations, beginning with Papua New Guinea.

<u>Economic Analysis</u>: The project report notes that, in the context of this project, where the actual model enterprises or their associated environmental management units are not yet identified, any attempt to assign monetary values to the benefits would be unprofessional. Thus, a brief discussion of the qualitative benefits is provided in lieu of the financial and economic analysis. The discussion includes such benefits as hydrological stabilization, soil protection, climate stabilization, genetic resource protection, environmental balance maintenance, and tourism support. However, the discussion is too brief and too vague.

<u>Project Name</u>: Regional Environmental and Natural Resource Management
<u>Project No.</u>: 596-0150 (PD-ABA-752)
<u>Project Description</u>: This project supports sustainable natural resource use in Central America through policy reform, environmental education, and improved agricultural and forestry practices. The activities planned to promote environmental awareness and biodiversity conservation include:

* improved regional strategic planning through workshops for decision makers, environmental monitoring, publication of a regional environmental profile and maps, and conservation strategy papers;

* increased environmental awareness by developing a regional environmental awareness strategy and mass media programs, and developing educational materials and pilot interpretation programs;

* support for environmental specialists via M.S. training, research grants, and a clearinghouse for faculty exchanges, scholarships, and technical assistance;

* a regional wildlands management program, including 5 pilot reserve and buffer zone projects, development of "conservation corps" to supplement pilot site staff, and grants for similar activities initiated by Peace Corps volunteers;

* improved information management, by supporting national data centers, working to standardize data entry and analysis, and preparing software and manuals.

Economic Analysis: The project report rejects the use of benefit-cost analysis in favor of least cost analysis for at least two reasons: (i) the benefit-cost methodology favors current consumption over conservation, and is weak in dealing with distributive/intergenerational equity issues; and (ii) the primary focus of the project is on such activities as formal and non-formal training, demonstrations, coordination and technical support, etc. and the benefits of such activities are not quantifiable. The project report also notes that in such projects the least cost analysis is recommended by AID Handbook 3. The details of the least cost analysis (presented in unattached Annex III.D) were not available to us.

Project Name: Institute of Forestry
Project No.: 367-0154 (PD-AAN-976)
Project Description: The objective of this project is to upgrade the capacity of the Institute of Forestry (IOF) of Tribhuvan University in Nepal to train foresters and natural resource managers with special attention to community forestry management. The project will improve IOF's administration, curricula, faculty competence, policies, applied research, and facilities.

The project will provide short-term pedagogical training for all IOF faculty and short- and long-term training for selected faculty (including up to 15 M.S's and 5 Ph.D.'s) in a wide range of subjects. Faculty will also be provided grants for applied research activities, including extension and demonstration projects and case studies in natural resource management. The project will provide technical assistance in research policy and priorities, research training, a special program for research by junior faculty, and support to the IOF Journal. Over the life of the project, IOF will graduate 200 B.Sc.'s and 1,000 Certificate holders. The enrollment of women and of students from remote areas will be increased. The project will provide scholarships to women students and book and equipment grants to all students.

Economic Analysis: Since the broad objective of this project is to build social capital, some sort of social welfare analysis should be performed in order to assess the welfare effects. The project report notes that this field of economic analysis is imprecise and relies upon broad assumptions not suited to the investment decision process needed in the analysis. The traditional benefit-cost analysis, on the other hand, presumes a production or product which has a market value and produces revenue. Since this project produces no revenue, a benefit-cost analysis would have been meaningless. Thus, the analysts use the least cost approach to justify the project which appears to be a

reasonable compromise.

The analysis is structured in three parts : (i) cost of the project to Nepal and the potential benefits to the economy, (ii) current and potential demand for graduates from the Institute of Forestry and the Institute of Forestry as a least cost alternative, and (iii) future impact of the project on the resources of the Government of Nepal and the ability of Nepalese government to sustain the institute. The analysts have attempted to quantify a large portion of potential benefits using the opportunity cost method under various assumptions. On the whole, the analysis is sufficiently quantitative in nature.

Project Name: Central Selva Resource Management, Phase II.
Project No.: 527-0321 (PD-AAY-197)
Project Description: This project tests and demonstrates improved technologies for tropical forest and agricultural production/use systems in Peru's Palcazu Valley. The National Institute for Development's Pichis Palcazu Special Project and Regional Development Policy Support Unit implement the project with U.S. technical assistance.

The project's forestry component tests the Natural Forest Management System on 5,000 hectares of production-class forest land owned by the native Indian Yanesha Forestry Coop (YFC); trains YFC members in forest product harvesting, processing, etc.; and analyzes species-specific wood properties and marketability.

To stabilize high jungle crop and livestock systems, the project introduces, and tests on-farm, new forages, animal species, and tree and other crops; renovates 500 hectares of degraded pasture using bush fallow and pasture fallow rotations; and demonstrates the advantages of hair sheep in mixed production systems.

The project also produces land use maps for 12 of the principal native communities and one *colono* area and utilizes satellite imagery and aerial photos to enhance local capacity to identify unauthorized forest use.

Economic Analysis: The economic analysis for this project aims to provide estimates of:

* Net present value of social benefits from research investments,

* Profitability of proposed economic enterprises, and

* NPV and B-C ratio of investments in upgrading and maintenance of primary access road.

Research activities proposed in the project report mainly aim at developing improved technologies for timber extraction that protects against environmental degradation and assures sustained yields through natural reforestation with no net loss

of biomass. The project report notes that the research activities can be justified only if the net present value (NPV) of social benefits from application of the new systems is greater than the NPV of the opportunity cost of research and extension required to develop and apply the new system. The NPV of the projected additional social income at 10% real discount rate is estimated at $415,000. This is the amount that the benefits from the project exceed the research and extension costs.

Regarding the profitability of proposed economic enterprises, again NPV, IRR and B-C ratios are calculated using estimated cost and income flows for a ten year period. Similarly, NPV of total net benefits and the B-C ratio of the investments in upgrading and maintenance of primary access road are presented. Given the available data the analysis appears to be sufficiently rigorous.

Project Name: Forestry Development Project (Nepal)

Project No.: 367-0158 (PD-AAX-053)

Project Description: This project is part of a multi-donor effort to strengthen the institutional capacity of Nepal's Ministry of Forests and Soil Conservation (MFSC) to implement Nepal's Master Plan for the forestry sector and to increase nationwide the use of improved stove models.

To improve MFSC's institutional capacity, the project provides long- and short-term technical assistance to help the Ministry's Planning Division: (1) develop an overall strategy for institutional development in the areas of organization, personnel, and technology; (2) institutionalize planning functions, including program budgeting, at all relevant levels; (3) upgrade and expand analytical capabilities; (4) improve project planning. analysis, and evaluation; and (5) install a planning/programming information system.

To facilitate the expanded use of improved stoves, the project provides technical assistance to the Forest Department's Community Forestry Division and to involved women's organizations, communities, and volunteer organizations. Major activities include the development, production, and marketing of improved wood-burning stove models for home and commercial use; promotion of cookstoves by trained extension personnel and a publicity campaign; and ongoing cookstove development to optimize fuel efficiency, convenience, durability, and cost.

Economic Analysis: Since this project only funds two activities as part of multi-donor financed Forestry Sector Master Plan, an independent economic analysis of these two components is not considered appropriate. It is assumed that, if the Master Plan is an economically sound investment, then the USAID support of the two components would also be justified. The economic internal rate of return for the Master Plan is estimated at 36 per cent (details of how this figure was estimated are provided in the Volume II of the Master Plan which was not available to us).

Project Name: Community Natural Resource Management (Lesotho)
Project No.: 632-0228 (PD-ABB-852)
Project Description: This project intends to establish community grazing associations as a means to manage rangeland at sustained carrying capacities for livestock. It is expected that the project will help bring 180,000 hectares of rangeland under management and would affect about 42,000 inhabitants of the participating communities. Specific project elements include establishment of six new Rangeland Management Areas (RMAs) by providing technical assistance (TA), training and commodities. A six person TA team consisting of local and foreign experts will help establish the RMAs.

Economic Analysis: Economic soundness of the project is expressed in terms of high NPV and IRR. The relevant benefits and costs are identified and projected over a 20 year period. Using the projected benefits (direct and indirect) and costs (cash and non-cash) streams, the NPV and IRR are calculated at the social discount rate of 8 percent. The IRR over a 20 year period is estimated at 17 percent. The net benefits of the project are also calculated for a range of project costs to assess the sensitivity to varying mark-up percentages on total project cost. The IRR falls to 13 percent with a project cost mark-up of 25percent, and to 7percent with with a mark-up of 75 percent.

Project Name: Natural Resources Management Project
Project No. : 525-0308 (PD-ABD-614)
Project Description : This project is an attempt to protect and manage Panama's renewable natural resources with particular emphasis on the canal watershed. Specifically, the project addresses the problem of unplanned and exhaustive use of Panama's renewable natural resources. Specific components of the project include:

1. Panama Canal Watershed Management: This component assists the Institute of Renewable Natural Resources in strengthening its capacities in policy formulation, land use planning, and development and implementation of land use classification systems.

2. National Parks and Wildlands Management: This component assists the Institute of Renewable Natural Resources to establish a physical presence in national parks and reserves and improve the management and protection of these areas to conserve threatened biological resources and ecosystems.

3. Conservation Foundation: This component establishes a natural resource conservation foundation with a trust fund capitalized by a debt-for-nature swap. The trust fund provides a long-term source of income to finance environmental activities in public and private sectors.

Economic Analysis: This project aims at improving the natural resource base in Panama which, of course, is a worthy objective. But, that by itself does not justify the project. The report notes that "while the costs of the project inputs can be quantified, the value of the economic benefits can not". The project designers then move on to a qualitative discussion of why the project may be economically justified. However, the discussion can at best be characterized as sketchy.

Project Name: Village Reforestation
Project No. : 688-0937 (PD-BBO-474)
Project Description: This project aims at identifying successful and cost-effective processes for achieving reforestation and more efficient use of wood resources at the village level in Mali's Fifth Region. This is expected to be achieved by combining the following elements : (i) planting trees in a manner to achieve stability and augment fertility, (ii) dissemination of fuel conserving woodstoves, and (iii) locally managed woodlands.

Economic Analysis: While the report indicates that a detailed benefit cost analysis was performed for the project which addressed the economic and financial returns of reforestation and conservation activities. However, Annex I, to which the summary of the economic analysis in the project paper refers, merely consists of the USAID/Mali program economist's observations on the financial and economic analysis. A detailed economic analysis is not included as part of the project paper, and is, therefore, not available to us. Our comments on the economic analysis are based on incomplete information and should, therefore, be interpreted with caution.

The project report note that the analysis focussed on the following interventions: (i) contour ridges, (ii) fuelwood or polewood production, (iii) protection of in field Acacia albida trees, (iv) live fences, (v) mini nurseries, and (v) improved mud woodstoves and portable ceramic stoves. These interventions, in principle, are amenable to standard benefit-cost analysis provided sufficient data is available. But, the analysts claimed that there was almost a universal lack of documented information on the benefits of natural resource management interventions such as contour ridges, windbreaks, and others. The extent to which that claim can be accepted is open to question. Besides, a reading of Annex I suggests that the USAID/Mali program economist had serious reservations about the economic analysis presented in the project report. Based on the available information, it appears that, though the analysts attempted a rigorous quantitative economic analysis, the quality of economic analysis is not good. Note that in a similar project in Gambia, benefits were estimated for many of these technological advances. The difference in quality may be due to the timeframe of the two projects. The Mali project design was done in the early 1980's. The Gambia project was done in 1992. A great deal of work was done in the intervening years to evaluate the returns to these

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types of technologies. Indeed, much of the data used in the Gambia paper was developed as a result of this Mali project. It is quite possible that adequate data on these technologies was not available at the time of the Mali design.

Project Name: Natural Resources and Environmental Policy
Project No. : 383-0109 (PD-AAZ-099)
Project Description: This project in Sri Lanka aims at strengthening the technical and analytical capabilities of public and private institutions concerned with natural resource management, improving public understanding of environmental issues, and increasing the public accountability of public and private bodies controlling natural resources. The specific components of the project include:

* development of techniques for natural resource planning and management, supported by research on, and development of, new policies and institutional mechanisms for resource management,

* support for special project on policy formulation and implementation to test private-public management partnerships,

* support for more effective public education and participation, and

* training in environmental and economic resource impact assessment and natural resource management for the public and private sector, and

Economic Analysis: The project report rejects cost-benefit and cost-effectiveness analysis, claiming that the project is simply too complex to be summarized in any kind of single performance measure. The analysts, therefore, choose to simply highlight major prospective economic benefits and assess the likelihood that the their total value will exceed total project costs. The qualitative analysis is divided into two categories: (i) efficiency gains, and (ii) distributional gains. A reading of the analysis presented in the report, however, leaves the reader uneasy, since the analysis is too general in nature. The analysts have presented some back-of-the-envelope calculations, but the sources of the figures used in these calculations are not known. On the whole, while it can be agreed that the project benefits are difficult to quantify the factors preventing the analysts from performing a satisfactory qualitative analysis is not clear.

Project Name: Protected Areas Resource Conservation
Project No: 532-0148 (PD-ABA-627)
Project Description: This project intends to initiate national park services in Jamaica in order to protect and preserve its unique biological habitat which is under increasing

pressure from a variety of sources. Since Jamaica had no functioning national parks at the time, the project objectives included building of the conceptual, legal, and institutional foundations for smooth functioning of the national park services. The project was to be implemented in two phases. The first phase implements the project at the pilot level in Blue Mountain/John Crow Mountain Forest Reserve and the Montego Bay Marine Park. During the second phase the project will be implemented at a much wider scale.

Economic Analysis: The project document presents a standard benefit-cost analysis of the project. The direct economic benefits considered are the impact on the tourism sector, and additional employment benefits. The impact on the tourism sector is measured by estimating the increase in bed nights sold in the project areas. Similarly, the additional employment benefits are measured by estimating the number of jobs expected to be created as a result of the project. Economic impacts are not benefits, and thus, benefits are probably overstated.

Regarding the costs, the project document notes that there are only direct costs (i.e. park operation and maintenance costs) associated with this project because the Blue Mountain is not an economic site for agro-pastoral activities, and Montego Bay reefs are an already exhausted fishery resource. Thus, no opportunity costs are involved in the use of this land. The direct costs are estimated in straight forward manner and the B-C ratio is placed at 5:1.

Project Name: Forest Resources for a Stable Environment
Project No: 515-0243 (PD-ABB-170)
Project Description: The purpose of this project in Costa Rica is to develop forestry and agro-forestry as economically and ecologically appropriate land uses. The project area is restricted to the buffer zones around a few national parks and other natural protected areas. The task was proposed to be accomplished by strengthening an independent private foundation, which was to act as the coordinating agency for the project. Four specific components of the project included : i) General Operations, ii) Management of Protected Areas, iii) Management of Natural Forest for Production, and iv) Integration of trees on farms.

Economic Analysis: The project report presents estimates of NPV and IRR. An attempt has been made to make the calculation of these measures as rigorous as possible. Appropriate thought has been given to the choice of discount rate.

The project produces four types of measurable outputs in addition to important intangible benefits. The intangible benefits are not valued and, thus, are not reflected in estimated NPV and IRR. The measurable outputs are:

* increased recreational, educational and scientific use of three national parks,

* increased production, consumption and sales of trees from farms and ranches,

* increased harvest of timber, and

* reduced deforestation in the project area.

For timber and other wood products the market prices are available and, thus, it is relatively easy to value these products. Valuation of recreational services and reduced deforestation, however, merits separate discussion.

Recreational, Educational and Scientific Services: The basic framework used to measure this class of output is the 'travel cost method', though no travel cost analysis is actually performed. The estimates of the willingness to pay are derived from other studies.

Reduced Deforestation: Placing an economic value on this class of output is indeed a difficult task. The project report notes that a rigorous analysis of the value of reduced deforestation requires estimation of a probabilistic damage function with and without the project. Each asset at risk (due to landslides, floods, soil erosion, etc.) should then be valued in terms of losses avoided. However, in this project it is assumed that each hectare not deforested has an economic value for watershed protection of $20 per hectare per year.

On the cost side, major project inputs are i) foreign exchange, ii) forested land, iii) labor and professional services, and iv) infrastructure and construction. All inputs except forested land are relatively easy to value. The appropriate economic value of the forested land should take into account its opportunity cost, i.e., the highest discounted net income that would have been obtained from the land in the absence of the project. Moreover, the opportunity cost needs to be readjusted for subsidies, non-economic motivation for owning the land, cost of relocating the current residents, and other institutional factors. No attempt is made to measure the opportunity cost of forested land. This project simply assumes an economic conversion factor of 0.5 for forested land to be acquired for expansion of national parks.

Given the complexity of this project, it is one of the better examples of an honest attempt to perform an adequate benefit-cost analysis using state-of-the-art techniques, given the paucity of data.

Project Name: Land Use and Productivity Enhancement (Honduras)
Project No.: 522-0292 (PD-AAX-468)
Project Description: This project addresses the constraints faced by small-scale

marginal and commercial farmers in the Honduran watersheds. Some of these constraints include:

* unsustainability of traditional Honduran farming pra ·ices, e.g. forest clearing, grazing, and slash and burn cultivation.

* lack of appropriate knowledge for changing from traditional farming practices to   ecologically sound practices,

* limited access to road infrastructure for marketing, increasing production costs and declining harvest prices,

* lack of credit availability,

* low productivity of women (due to the social constraints they face) who are the head of household in at least 25 percent of the target households.

Economic Analysis: The economic analysis presented in Annex H to the Project Paper was not available to us. A brief summary of economic analysis
presented in the report indicates that the economic soundness of the project was expressed in terms of NPV, IRR and B-C ratio, and all of these are extremely favorable. However, we can not comment on the adequacy of the analysis due to insufficient information.

Project Name: Natural resources management
Project No: 690-0251 (PD-BBS-688)
Project Description: This project is an attempt: (i) to improve community-based natural source management in Botswana, Zambia, and Zimbabwe in a manner which sustains wildlife and provides income for local populations, and (ii) to improve national and local level capabilities in wildlife resource conservation. At the country level, the project will focus on community-based resource utilization, planning and applied research, and on resource base conservation. At the regional level, the project will support the Southern Africa Development Coordination Conference Sector Coordinating Unit for Forestry, Fisheries, and Wildlife in Malawi, which will act as project coordinator and the clearinghouse for information dissemination.

Economic Analysis: The profitability of the project is expressed in terms of NPV and IRR under four main forms of resource utilization:

* safari hunting, including elephant,

* safari hunting, without elephant,

* elephant cropping for products, and

* photographic (benign) tourism.

The NPV and IRR even under the worst scenarios are positive. We are in no position to comment on the data used and the assumptions made by the analysts. But, assuming the projections and assumptions of the analysts are within reasonable range of error, the analysis presented in the report is relatively rigorous.

Project Name: Sudan Reforestation and Anti-Desertification
Project No.: 650-0082 (PD-AAW-251)
Project Description: The objective of this project is to strengthen forestry management and agroforestry and to halt desertification in western Sudan. The project, which will inventory forest resources (using remote sensing and ground surveys) and conduct community forestry and agroforestry activities, will be implemented by Sudan's Central Forestry Administration (CFA) in cooperation with the Regional Center for Services in Surveying, Mapping, and Remote Sensing (RCSSMRS). To develop objective information on the state of forestry resources and the extent of desertification in western Sudan, the Resource Inventory Component will prepare base maps for southern Kordofan and southern Darfur Regions using existing and new satellite reconnaissance images, supplemented by field surveys of forest potential in sample areas. The data collected will be translated into forest management recommendations. The component will be implemented first on a test basis in five Rural Councils in Kordofan and then expanded. CFA capabilities to perform these tasks will be upgraded through technical assistance, commodities, in-service training at RCSSMRS, and in-country workshops.

The Resource Rehabilitation Component will support two types of participatory forestry activities: natural woodland management and agroforestry. Under the first category, management plans will be developed for 25,000 feddans of community woodlands, and for 25,000 feddans of private and institutional woodlands and designated reserves. Under the agroforestry activity, nursery/demonstration centers will be established in each of the five Rural Councils and self-help nurseries will be established in 100 villages. In addition, a seed program will promote the planting of gum arabic trees, a traditional product. The project will establish an extension network through training of CFA staff, local leaders, village nursery supervisors, and village extension workers; a high percentage of the latter will be women. A system for monitoring and evaluating the project will be established. Finally, M.S./Ph.D. fellowships will be provided to participants.

<u>Economic Analysis</u>: Economic analysis for this project has been carried out separately for (i) Resource Inventory, and (ii) Resource Rehabilitation Components. The methodology used (that is, calculation of B-C ratios) rely as far as possible on the measurable outputs. Since the Resource Inventory component does not yield any direct measurable benefits, the economic analysis for this component has been limited to the least cost analysis. The economic analysis for Resource Rehabilitation Component is carried out for following four models:

* Improved Traditional Bush Fallow,

* Mixed Tree Alley Cropping,

* Participatory/Social Forestry, and

* Natural Woodland Management.

For each of these models, net benefits of intervention are calculated for the 30 year period. The benefit-cost ratio is computed for discount rates of 2.5%, 5%, and 8%. Once again, we are in no position to comment on the data and assumptions used in the analysis. However, but, on the whole, it appears that the economic analysis is sufficiently rigorous.

Policy and Administrative Reform Projects

<u>Project Name</u>: Zimbabwe Grain Marketing Reform Support Program
<u>Project No.</u>: 6130233; 6130234 (PD-BCC-466)
<u>Project Description</u>: This program supports the Government of Zimbabwe (GOZ) in implementing policy reforms related to grain marketing. The objective is to make the system more competitive by reducing marketing controls and allowing expanded private participation. The reforms also increase access to grain in deficit areas and reduce the contribution of domestic grain trading losses to the national budget deficit. The program grant of $5 million supports the GOZ's new Open General Import License System, which as the centerpiece of Zimbabwe's structural adjustment program, will efficiently allocate market rate foreign exchange. Disbursement of the grant will be conditioned on: (1) establishment of an autonomous Board of Directors for the Grain Marketing Board (GMB); (2) open sale of grain from GMB depots to any buyer at any quantity above one bag, and dissemination of information on this policy to depot managers and potential grain marketing system participants; (3) approval of a policy that any buyer can resell grain through any channel in Natural Regions IV and V, (4) selling of grain at selected

GMB collection points and/or other non-depot distribution points to any buyer on a trial basis and the monitoring of the impact of this program on grain availability and operational costs; and (5) implementation of a medium-range strategy for liberalizing national grain markets and for promoting the development of a strong, competitive marketing system with expanded private participation.

<u>Economic Analysis</u>: It is noted in the project report that the IRR and NPV of proposed programs were calculated, but the report is silent on the methodology used to estimate the costs and benefits of the project. It only notes that the NPV is positive in all cases and IRR is positive in all but one case. At the same time it is also noted that calculation of IRR may be misleading because policy reforms can be implemented at virtually no cost, or at very little direct cost and offer high returns. But, if that is the case, then the obvious question is why have an inefficient system prevailed so far? It is important to identify the constraints that have prevented the governments from implementing the policy reforms and the direct and indirect costs and benefits of these policy reforms. But, the economic analysis presented in the report simply states some conclusions as a matter of fact. The assumptions and constraints regarding the first year proposed policy reforms is presented in Annex II-B. Unfortunately, the copy available is completely illegible.

<u>Project Name</u>: Primary Education Program
<u>Project No.</u>: 6320230; 6320225 (PD-BCB-590)
<u>Project Description</u>: This program supports the Government of Lesotho (GOL) in implementing policy and institutional reforms aimed at improving primary education in Lesotho. The policy reforms to be implemented by the GOL include : (1) increased budget allocations to primary education; (2) hiring of additional teachers (1,300 over the life of the program, of whom 910 will be assigned to standards 1-3); (3) improved teacher training, particularly for standards 1-3, through upgrading of the National Teacher Training College, as well as improved in-service training; (4) a streamlined curriculum for standards 1-3, with improved syllabi, additional instructional materials, and improved guidelines for student assessment; (5) improved classroom environment, through the addition of pupil and teacher desks, and the reduction of repeaters and of over- and under-age children; (6) reorganization of the Ministry of Education's (MOE) structure and functions, (7) strengthened MOE financial management capacity through the establishment of decentralized budgeting; and (8) upgraded MOE systems for planning and data collection, analysis, and use. Broad goals include a 60% primary education completion rate, and a decrease in the pupil:teacher ratio at the primary level from 56:1 to 54:1 by the year 2000.

<u>Economic Analysis</u>: The economic benefits of primary education reform are estimated as the cost saving in completing the primary school cycle under the reform program

compared to the cost of completion under the existing system. The graduation rates and the cycle times are obtained from cohort analysis based on 1989 flow rates applied to annual intakes. The estimated NPV (at 12 percent discount rate) and IRR suggest that the program is economically sound. A reading of the summary of economic analysis and of Annex L gives an impression that sufficient care has been exercised in identifying various benefits and costs of the project. Appropriate sensitivity analysis is performed.

Project Name: Kenya Market Development

Project No: 6150242 (PD-BBT-679); 6150250

Project Description: This program provides $10 million in sector grants to the Government of Kenya (GOK) to encourage reforms in agricultural marketing. The program has a three-fold policy agenda: (1) the removal of movement controls on maize, beans, and minor grains; (2) the development of systems for regular dissemination of agricultural market price information; and (3) a 10% annual increase in GOK road maintenance budgets. The Ministry of Agriculture's Farm Management Division will develop extension messages to teach farmers how to use price information in their production decisions. The GOK will provide the local currency equivalent of $38 million to finance the rehabilitation and maintenance of 1,500 km of rural inter-market roads. A companion project will provide technical assistance and training to support the program's policy agenda.

Economic Analysis: Economic viability of the project is expressed in terms of the Internal Rates of Return after four and ten years. The detailed assumptions on which these calculations are based are provided in unattached Annex F which was not available to us. At the same time, the summary of economic analysis presented in the report does not contain sufficient information to provide any meaningful comments.

Project Name: Cameroon Export Sector Reforms

Project No: 6310074; 6310082 (PD-ABB-942)

Project Description: This program is designed to help Cameroon to implement its newly enacted, privately managed, Free Zone Regime. Policy reforms are aimed at reducing the Government of Cameroon's (GOC) inappropriate involvement in the regulation and administration of the economy. Under this project, the GOC receives sector grants totalling $3.1 million to import goods from the United States, pay debts (other than military) to the United States or to a multilateral bank or the IMF. The GOC, in turn, provides an equivalent amount in local currency to establish two private, nonprofit institutions -- a National Office of Industrial Free Zones (NOIFZ) and an Investment Promotion Center (IPC). NOIFZ will be responsible for approving investment proposals, providing licenses and permits for export-oriented businesses, and overseeing management and enforcement of the Free Zone Regime. IPC will be

responsible for marketing and investor assistance. Policy reforms will be directed at regulatory and legal constraints regarding investment approval, customs clearance, dispute settlement, labor laws, and the provision of administrative services required by Free Zone investors.

Economic Analysis: The project report notes that there are four major categories of quantifiable economic benefits to be had from the Cameroon Free Zone Regime: (i) benefits to the Government of Cameroon in the form of higher taxes, (ii) benefits to Cameroonian workers in the form of higher wages, (iii) benefits to Cameroonian businessmen in the form of higher profits, and (iv) benefits to foreign businessmen in the form of higher profits. What is not so clear, however, is what, in the absence of any theoretical model and any information about the supply and demand functions, allows the analysts to claim that all the actors: government, workers, capitalists, and foreigners gain as a result of policy reform. One explanation is that the present resource use is highly inefficient and that the reforms will move the economy closer to the production possibility frontier, thus, generating enough surplus to be shared by the involved actors. However, that kind of conclusion has to be shown in a theoretically coherent framework. The economic analysis presented in the project report, on the other hand, merely appears to be an exercise in multiplying few numbers to calculate the net gains to various parties. While the space limitations prevent us from commenting on the specifics of the analysis, it is clear that the analysis does not provide an adequate economic justification for the project.

Project Name: Nigeria Primary Health Care Support Program
Project No: 6200003 (PD-BBR-464)
Project Description: This program provides a cash transfer of $25 million to the Government of Nigeria to support two major policy changes in the health sector: (1) a shift in the provision of public sector primary health care (PHC) service from the federal and state levels to local government authorities (LGA's); and (2) a concurrent shift at the primary level from a curative to a preventive focus. The first policy shift will be accomplished by decentralizing budgetary and administrative control for PHC, as well as shifting the administrative control of several employees involved in PHC from the states to the LGA's. The second policy change will involve two extraordinary budget allocations from the Federal Government to the LGA's to finance the equipment, supplies, transport, and training needed to reorient and strengthen PHC staff and services. The program will also support studies and pilot activities to test means of reducing the costs of tertiary level facilities by (1) increasing user fees, (2) contracting out catering, laundry, and laboratory services to the private sector, (3) operating private wings in public hospitals and clinics, and (4) permitting private practice by the staff of public facilities.

<u>Economic Analysis</u>: The goal of this project is to improve the health care system in Nigeria which, of course, is a worthy task. Also, there is little doubt that health care improvement in developing countries has huge societal benefits via improvement of the quality of human capital. It is also true that quantifying all such benefits may not be a feasible task and, thus, a qualitative analysis of the potential benefits may provide sufficient rationale to justify the project. Still, the above, the qualitative economic analysis presented in the project report does not make a strong case for the project. Essentially, a two and a half page economic analysis presented in the project report has one message: since prevention is better than cure, the project is justified on economic grounds.

<u>Project Name</u>: Mozambique Private Sector Support Program
<u>Project No.</u>: 6560208 (PD-AAZ-846)
<u>Project Description</u>: This program supports private agriculture in Mozambique through liberalization of agricultural prices and marketing. Specifically, the program supports following reforms: (1) increased liberalization of the producer pricing system for agricultural commodities, (2) the divestiture of state farms to commercial and family farmers, (3) the development of private sales and service networks for agricultural inputs, and (4) the institutionalization of open general licensing as a mechanism to increase private sector access to foreign exchange and to allow the market to play a greater role in determining the uses of scarce foreign exchange. Direct assistance will be provided for agricultural inputs and other commodities that address production and marketing constraints in the agricultural sector.

<u>Economic Analysis</u>: The economic analysis presented in the project report is basically an attempt to measure quantitatively the net gain/loss in producer and consumer surplus as a result of increased food prices. The analysis is cast in the most simple linear demand-supply framework. It is assumed that the loss in consumer surplus is approximately zero and, thus, the net gain in producer surplus represents the total gain in welfare. What justifies that assumption is, however, not clear to us. Moreover, this analysis assumes the complete absence of other externalities, which may not be a very realistic assumption. For example, it has been shown in the literature that, if agricultural production depends upon the extent of biomass in the area, then expansion of area under agriculture may not necessarily be welfare improving. In the context of African countries, where shifting cultivation is still a predominant system of cultivation, ignoring such externalities can substantially bias the estimates of welfare gains.

<u>Project Name</u>: Morocco Agribusiness Promotion
<u>Project No.</u> : 608-0210 (PD-CBK-679)
<u>Project Description</u>: This project has been developed with the objective of increasing

the capacity of the private agribusiness sector in Morocco to produce, package, and market agricultural commodities. Particular emphasis has been placed on the vertical marketing channels from assembly of raw materials to delivery of final products in their fresh or processed state to consumers. The four principal components of the project include: (i) promotion of agribusiness products with emphasis on export marketing, (ii) improving the agribusiness climate, (iii) reinforcing industry organization and supporting institutions with the objective of improving the effectiveness and efficiency of companies, private groups, industry and trade associations, and public institutions, and (iv) development of human capital needed by agribusiness. The commodity subsectors on which the project will focus on include : fresh vegetables (off-season), fresh fruit, processed fruit and vegetables, spices and essential oils, olives, food legumes, cut flowers, and grapes, raisin and wines.

Economic Analysis: The Internal Rate of Return of the project is estimated at over 24 percent. The types of benefit streams that entered into the calculation of IRR are:

(i) increased sales of horticultural products to domestic and foreign markets,

(ii) net increases in employment in Morocco through expanded agribusiness activity, particularly in exported products generating foreign exchange, and

(iii) economic savings stemming from a conversion of a proportion of irrigated land to higher value horticultural crops from low economic value crops.

The costs, on the other hand, included USAID funds, private industry funds where project activities call for matching contributions, and estimated Government of Morocco contributions in kind. The project benefits are estimated over the period of 15 years. Appropriate sensitivity analysis is performed.

Project Name: Private Participation in Urban Services
Project No.: 497-0373 (PD-ABD-593)
Project Description: The goal of this project is to increase the stock of infrastructure essential for economic growth and improve access to efficiently delivered services that contribute to an improved urban environment in Indonesia. This is expected to be achieved by expanding the participation of the private sector in the provision of selected urban services (water, waste water, and solid waste) through direct investment or contracted participation in supply, delivery, or other operational functions.

Economic Analysis: The economic analysis for this project: (i) attempts to estimate the investment gap that must be met by private sector funding, given the stated goals of the

government and inadequate public sector resources, (ii) reviews the microeconomic considerations underlying the urban services sector, and (iii) reviews the macroeconomic aspects of private sector participation. For the most part, the analysis is qualitative in nature. It is noted that, due to current underpricing of water, there are serious misallocations of water resources and that enhanced private sector participation is an effective and efficient way of correcting these misallocations. However, no attempt is made to quantify, in a systematic manner, the extent of welfare loss due to these misallocations or the level to which these misallocations would be corrected as a result of this project.

Project Name: Commercial Agricultural Production and Marketing Project
Project No. : 645-0229 (PD-ABE-796)
Project Description: The objective of this project is to create a better business environment so as to stimulate increases in small-scale commercial production and other agri-business and domestic and export marketing activity in Swaziland. The project strategy consists of the following components: (i) private sector development, (ii) policy and program analysis, and (iii) strengthening the institutional capacities of the private sector and the University of Swaziland. The first component is expected to demonstrate the feasibility of stimulating and marketing small-scale farmer production through vertically integrated horticultural and specialty crop marketing firms in Swaziland. The second component, policy and program analysis, focusses on assessments and studies that apply specifically to production and marketing interventions. Finally, the objective of the third component is to prepare students in commercial agriculture and for agribusiness employment, and to conduct commercially oriented management and skills training.

Economic Analysis: The economic analysis projected the value of output and the outlays (excluding estimated local transactions) for a period of ten years and then calculated the Internal Rate of Return for the project. The production, costs and returns were estimated for the participating farmers and the outlays for fixed capital investment, sales and expenses were projected for vertically integrated produce companies. The cost inputs were adjusted for estimated local content. On the whole, it appears that the economic analysis was conducted taking into account only the direct measurable benefits and costs. No economic analysis was conducted for the last two components, that is, policy and program analysis, and institutional capacity strengthening.

Project Name: Health Finance Development Project
Project No. : 492-0446 (PD-ABD-632)
Project Description: The broad goal of this project is to develop the health care market in the Philippines in order to improve health service quality, equity, and efficiency. More

specifically, the purpose of this project is to establish a process for formulating and implementing health sector policies, regulations, and legislation supportive of improved health care. The project has three components:

(i) development of the country's capacity for private-public sector policy formulation,

(ii) improvement of efficiency and expanded coverage of the national health care program, and

(iii) improvement of efficiency and effectiveness of care provided through public and private hospitals.

Under this project the assistance will be given for : (i) support for the health care policy process, (ii) support for the multisectoral health finance policy forum, and (iii) development of the National Health Association Database and Health Policy Database.

Economic Analysis: It is noted in the Project Paper that the quantification of the benefits of investment in human capital requires extensive data on life spans, absenteeism, returns to education, marginal productivity of labor, etc. In the context of the Philippines, no studies have been conducted which could help quantify these variables. Therefore, the project's economic analysis involves:

* a qualitative cost-effectiveness analysis,

* a quantification of the minimum economic benefits required to cover project costs,

* a quantification of the reduction in expenditures for family health care, and

* a quantification of the gross value added from expansion of the private health care sector.

We can not comment on the quality of the analysis because the analysis is based on several simplifying assumptions which are specific to the project area. However, the overall approach of the analysis appears logical. At the same time, however, the analysis needs to be focussed in terms of how the project will contribute to accelerated economic growth. In this context, a macroeconomic model incorporating health status as a factor of production in the aggregate production function can be extremely useful in putting the project into perspective. The model can also be used to work out the welfare

implications of improved health status, etc.

<u>Project Name</u>: Support for Development Program II
<u>Project No.</u>: 492-0450 (PD-ABD-634)
<u>Project Description</u>: This project is developed to assist the Government of the Philippines in implementing economic policy and administrative reforms to improve the competitiveness of the Philippines in the international market. The focus of the project is on the reforms that directly benefit exporters by improving the pricing of Philippine exports. However, other policy reforms aimed at improving the financial environment for inter-island shipping are also supported. Specific objectives of the project are: (i) liberalizing foreign exchange transactions, (ii) strengthening the administration of value added taxes, (iii) lessening the impact of public debt financing on interest rates, (iv) increasing access to inputs at world prices, and (v) liberalizing shipping rates and route franchising.

<u>Economic Analysis</u>: The impact of reforms pertaining to foreign exchange transactions, value added tax, and public debt management are evaluated using the 1989 version of the Philippines Institute for Development Studies - National Economic and Development Authority (PIDS-NEDA) annual macroeconomic model. This model is based on a combination of classical, Keynesian, structuralist, and monetarist concepts. Comprised of 114 behavioral and structural equations and 53 identities, the model is divided into four major blocks : (i) the real sector, (ii) the fiscal sector, (iii) the financial sector, and (iv) the external sector.

The economic analysis for this project is performed by comparing the projections of key macroeconomic variables, for the years 1991-2000, <u>with</u> and <u>without</u> the project. Finally the Internal Rate of Return is calculated for the <u>with</u> case. For the other reform actions which could not be evaluated using the PIDS-NEDA model, that is, streamlining the duty drawback and value added tax rebates for inputs, and inter-island shipping reforms, a mostly qualitative analysis is performed. On the whole, the economic analysis for this project appears to be sufficiently rigorous.

<u>Project Name</u>: Export Industry Technology Support
<u>Project No.</u>: 596-0165 (PD-ABD-658)
<u>Project Description</u>: The purpose of this project is to promote the exports of non-traditional agricultural products from Central America. The focus of the project is on: (i) institutional development of counterpart Export Federations, and Commodity and Trade Groups, (ii) agricultural production, (iii) post harvest crop management and quality control, (iv) marketing, and (v) information dissemination and technology transfer. The specific activities envisaged for this project include: (i) long- and short-term technical assistance; (ii) training, (iii) limited commodity procurement, (iv) applied

research, (v) special studies, and (vi) support for the USDA agricultural marketing service in Miami. The outputs of the project include improvement of technical services capacity for non-traditional exports, a more knowledgeable and competitive business environment in the field of non-traditional exports, better product quality, and improvement in human capital.

Economic Analysis: The report discusses very briefly the factors that determine the economic viability of the non-traditional agricultural export industry. These include: the policy environment, market prices, market saturation, regulatory factors, availability of appropriate technology, and political support. Clearly, these factors are not specific to the non-traditional export industry. The success of any industry depends on such factors. Besides, the discussion in the project report is too brief to put the problem into perspective. In fact, a reading of the Annex F leaves the reader wondering why the analysts chose to label the Annex as an Economic Analysis.

Project Name: Strengthening Health Institutions

Project No. : 527-0319 (PD-ABD-657)

Project Description: This project is designed to evaluate and identify models of private primary health care delivery which improve access, coverage, efficiency, and sustainability of services in two areas of Peru. Specifically, the project has two components : (i) MAXSALUD (A Self-financing Primary Health Care (PHC) Network in the North), and (ii) MAXSERV (Expansion of PHC Services in the South).The MAXSALUD component establishes a network of health centers in the Department of Lambayeque. A total of 11 health centers will be planned and organized, supported by a Management Support Unit. The MAXSERV component, on the other hand, focusses on expansion of primary health care in the Puno area in southern Peru. This component supports a number of different models for providing health care and promoting health education through the private sector. It is expected that the results of this component would demonstrate to the health department the potential mechanisms for providing health care in collaboration with the private sector.

Economic Analysis: The stated objectives of economic analysis for this project are to:

(i) identify and describe the costs and benefits of design of the project,

(ii) analyze the cost-effectiveness of the project's components,

(iii) estimate project's recurrent costs and impact on Peruvian government's health budget, and

(iv) analyze whether the proposed costs of the health services provided are affordable by the target population.

The summary of the economic analysis presented in the main body of the report is too incoherent to allow a clear understanding of what was actually done to evaluate the economic viability of the project. The detailed economic analysis is presented in unattached Annex 5 which was not available to us.

Project Name: Agricultural Commercialization and Enterprise
Project No.: 386-0521 (PD-ABD-350)
Project Description: The objective of this project is to improve the investment environment for private entrepreneurs in the agribusiness sector in India. The focus is on the horticultural sector where the growth has been relatively slow during the last few decades despite enormous potential for expansion. Initially, the project focusses on one state, Maharashtra. The commodity focus of the project is on fresh and processed fruits and vegetables, flowers, and foliage.

Economic Analysis: For the purpose of economic analysis, the analysts identified two broad categories of project activities: (i) technical assistance and financial transfers to private firms, and (ii) strengthening a trade association to improve the investment environment for agribusiness. The project report notes that the activities in the first category have relatively clear future benefits and, thus, are relatively more amenable to quantitative economic analysis than the activities in the second category. To evaluate the economic viability of the activities in the first category, the project report notes that, since all the loans are to be provided through the ICICI (Industrial Credit and Investment Corporation of India), and since, according to Asian Development Bank estimates, the value added generated by a dollar lent by ICICI is about $3.30, the value generated by the $10 million loan fund for this project is estimated to be about $33 million. Similarly, since one job is created for every $7,100 in ICICI loans, this project should create 1,400 jobs.

The economic analysis presented above is beyond our understanding. Normally, the economic viability of any project has to take into account specific activities of the project. However, this analysis does not consider any of the project activities planned for this project. It simply assumes that, since ICICI has generated good value added on its previous loans, it should repeat its performance for this project. The question then is why not provide $100 million or even $1000 million to be distributed as loans through ICICI. The estimate that this loan should create 1,400 jobs is even more questionable.

Regarding the second category of project activities, no economic analysis is performed. The project report simply notes that it is reasonable to assume that the activities under this category should result in benefits that are considerably greater than

their costs. The justification for that assumption is a mystery.

Project Name: Provincial Enterprise Development
Project No.: 521-0223 (PD-ABD-246)
Project Description: The purpose of this project is to improve the access of small businesses and emerging enterprises access to credit throughout Haiti, especially in provincial towns. The idea is that expanded credit availability would enhance the capital availability to these enterprises which, in turn, would result in new jobs, higher incomes, and increased financial stability. The specific components of the project include : (i) Capital Fund and Term Lending, (ii) Provincial Private Enterprise Development, and (iii) Institutional Support. The capital fund under this project will be granted to the Haitian Development Foundation and will be managed by a Fund Management Group. The objective of the second component is to make accessible to the provincial entrepreneur the same range of business services which are already available in Port-au-Prince. Examples of such services include market information, technical assistance for product design, etc. Finally, the last component, institutional support, encompasses long-term technical assistance, short-term technical assistance to address specific problems, short-term training, and analytical studies. This component will operate out of the Fund Management Group office.

Economic Analysis: The economic analysis of this project consists of a short qualitative discussion of the economic benefits of the project which is sketchy and too brief to put the problem into perspective.

Project Name: Industrialization Stabilization and Recovery
Project No.: 519-0287 (PD-ABD-217)
Project Description: The purpose of this project is to stimulate the growth in the non-traditional export sectors of El Salvador. Specific activities of the group are divided under two categories: private sector activities, and (ii) public sector activities. The private sector activities provide support for an Export and Investment Promotion Program (PRIDEX), the privatization of an Investment Fund for Export Development (FIDEX), economic and social research, and the coordination of national export strategy through support for CONAEXI (National Commission for Exports and Investment).

Economic Analysis: The economic analysis for this project consists of a brief descriptive overview of the overall economic impact, a sector overview, and estimation of IRR for the investments under FIDEX and PRIDEX sub-components. The descriptive overview of the overall economic impact is superficial. The analysis asserts that the project will generate 23,500 jobs, $110.4 million in investment, and $131.6 million in export sales. The source of these figures is, however, not clear. The report notes that the estimation

of the IRR for the activities under FIDEX and PRIDEX components is accomplished by constructing sample budgets for various investments. Assuming that these investments would continue for 6-10 years, the IRR is estimated to lie between 24 and 41 percent under various scenarios.

Project Name: Export Promotion (Amendment Number 1)
Project No.: 511-0585 (PD-ABD-195)
Project Description: The broad goal of this project is contribute to Bolivia's economic recovery and growth by expanding the legal export sector. The project has three main components : (i) Technical Assistance to Exporters, (ii) Foreign Investment Promotion, and (iii) Export Financing. The first component provides assistance to exporters in product development, market research, joint venture formation, quality control, pooling of exporters to meet large orders, and identification of financing needs and sources. The second component mainly finances the establishment of a program in foreign investment promotion. Finally, the last component, export financing, provides medium- and long-term credit to the exporters.

Economic Analysis: In the Project Paper no economic analysis is performed for the technical assistance and export financing components. The economic analysis for foreign investment promotion attempts to estimate the total foreign investment that may be expected to result from this project, the benefits accruing to the economy as measured by gross and net exports (or value added), and employment generation. The framework for estimating these variables was based on a similar study conducted for Costa Rica in 1990. The assumptions of that study were modified to suit the economic conditions in Bolivia and the IRR and NPV were then calculated.

Project Name: Local Government Infrastructure Fund Project
Project No.: 492-0463 (PD-ABC-466)
Project Description: This project is designed to alleviate some of the infrastructure constraints in various provinces and chartered cities of the Philippines, thereby promoting private sector-led economic growth. Specifically, the project funds approximately 150 construction subprojects. Under this component selected local governments will receive a mutually agreed upon amount to fund specific projects selected from a library of standard subprojects.

To ensure that most viable subprojects are selected, the project will also assist and fund the feasibility studies. This component will also: (i) assist the local governments to prioritize their projects, and (ii) finance the overall environmental assessment for the project and any mitigating actions required for individual subprojects based on the results of these feasibility studies.

Economic Analysis: Since this project is not specific on what activities would ultimately be undertaken, a detailed economic analysis was not possible at this stage. Nevertheless, the economic analysis section of the project report provides a qualitative overview of the potential positive externalities and the multiplier effect on the overall economic growth of the country. It is also noted that, in the process of project implementation, the economic viability of each individual subproject will be examined and only subprojects which have an IRR of at least 15 percent or have positive NPV at 15 percent discount rate will be funded. Such a provision appears reasonable for this project.

Project Name: Basic Education Expansion
Project No.: 688-0258 (PD-BBV-949)
Project Description: The purpose of this project is to improve the efficiency of Mali's basic education system. The specific components of this project include: the development of a permanent in-service training capacity for primary education personnel and an improved primary school curriculum. The project provides matching funds to communities for education purposes and financed the development of an Educational Management Information System.

Economic Analysis: In order to present an economic justification of the project, the report looks at two major issues: the potential improvement of the internal efficiency of the system and the likely prospects for an increased external efficiency. The internal efficiency is addressed from two perspectives: (i) impact of the project on enrollments and on unit costs, and (ii) impact of the project on variables such as repetition rates and drop-out rates. However, the data needed to evaluate these impacts in a rigorous manner are not available. The report, thus, presents some crude estimates of the internal impacts based on simplifying assumptions. The external impacts are not evaluated.

Project Name: Financial Management and Training Project
Project No.: 688-0261 (PD-ABD-983)
Project Description: This project aims at promoting economic growth by improving the investment climate for the private sector in Mali. This is expected to be accomplished by improving public sector funds management which, in turn, is expected to result in fewer and more efficient government controls over the productive sectors of the economy.

Economic Analysis: No rigorous economic analysis is performed. The project report notes that the system that existed allowed for wasteful and fraudulent management of resources and that "according to some accounts, the value of money and goods misappropriated under the former regime may be in the billions of CFA, amounts which would be greater than the entire annual GNP of the country". What justifies that

statement is, however, not clear.

Project Name: Economic Policy Development
Project No.: 525-0313 (PD-ABD-244)
Project Description: The purpose of this project is to assist the Government of Panama in expanding and strengthening the process of economic policy making. The specific components of the project include : Economic Policy, Economic Training, and Canal Management and Development. The economic policy component provides funds for technical assistance for the development and implementation of economic policies. The economic training component initiates an in-house training program to upgrade economic capacity within the Government of Panama. The Canal component provides funding to assist the Government of Panama and the private sector to identify the impact of policy options following Panama's assumption of responsibility of the Panama canal at the end of 1999.

Economic Analysis: The project report notes that the traditional benefit-cost analysis is not a feasible methodology for this kind of project. In order to provide an economic justification to the project, the report notes that "based both on projections for Panama and the experience of other countries, it is fair to estimate that adoption of a serious reform program could stimulate an increase in real growth of 2-3% over the medium term". What projections and what experiences the authors are referring to is not clear. Moreover, even if the traditional benefit-cost analysis may not be feasible, there exist other analytical methods, such as Partial and General Equilibrium Analysis, that would permit relatively rigorous economic analysis. However, but the report makes no mention of alternative analytical methods.

Project Name: Small Enterprise Credit Project
Project No.: 263-0238 (PD-ABC-690)
Project Description: The goal of this project is to expand the economic output of small-scale entrepreneurs by improving their access to credit and other banking services. The target group includes the entrepreneurs in the greater Cairo metropolitan area with less than 15 employees and less than LE 25,000 in fixed assets.

Economic Analysis: The project report notes that it is not feasible to quantify the various costs and benefits associated with such an investment. Therefore, it is more useful to perform a descriptive analysis. The descriptive analysis presented in the report is based on two main issues: (i) the economic rationale for the project, and (ii) the degree of sustainability envisaged by the project. However, the two page descriptive economic analysis provides no clear answers.

Project Name: Kenya Export Development Support

Project No.: 615-0249 (PD-BCB-971)

Project Description: This project is designed to support the newly formed Export Promotion Programmes Office (EPPO) and other agencies in the Ministry of Finance (MOF) to assist the Government of Kenya (GOK) in its efforts to improve the export environment and to expand non-traditional exports. The project activities include technical assistance, training, commodities, analytical research and finance activities. Specific components of the project are: (i) public sector assistance, (ii) firm-level assistance, (iii) support for an export processing zone facility fund, and (iv) studies. The public sector component basically provides the technical assistance, training and commodities to improve the GOK's capacity to formulate trade policies and assists with the implementation of new export incentive programs through the EPPO. The activities under the firm-level assistance component are aimed at increasing non-traditional exports, foreign exchange earnings and employment generation through Kenya's private sector. The export processing zone facility fund creates an Export Processing Zone Swap Fund that would give medium-sized firms access to foreign exchange to allow them to set up operations in the export processing zone. Finally, the objective of the studies component is to provide up-to-date information, analyses and recommendations to key policy officials on relevant export development issues.

Economic Analysis: The report notes that there are two objectives of the economic analysis conducted for this project. The first is to analyze the growth rate necessary in non-traditional export earnings to maintain an overall economic growth rate of over five percent per annum during 1990-2000. The second objective is to determine the role and attribution of this project in meeting these export growth targets. It is not clear just how answering these two questions constitutes the economic analysis of the project. The objective of economic analysis for any project has to be to justify the use of scarce resources, or, in other words, whether or not the society as a whole is going to be better off with the project than without. The economic analysis for this project certainly doesn't address this question. Nor is it clear how one can estimate the growth rate necessary in non-traditional export earnings to maintain an overall economic growth of X percent, in isolation. Overall the economic growth rate is affected by a multitude of factors and activities and complete information is necessary on all those factors and activities in order to determine the role of one sector in meeting the stipulated targets. The analysis for this project is based on assumptions and guesses about other sectors. How much confidence can one place in this economic analysis is, therefore, open to question.

Project Name: New Enterprise Development

Project No.: 608-0204 (PD-CBK-579)

Project Description: The purpose of this project is to reduce the barriers to entry for

new entrepreneurs and to facilitate expansion of existing small and medium-sized businesses in Morocco. Specifically, the project has three components : (i) Business Support Services, (ii) Working Asset Liquidity Facility and Small and Medium Enterprise Financing, and (iii) Administrative Reform and Private Institution-Building.

The first of the three components provides programs to suit the needs of new entrepreneurs and existing enterprises. The programs are to be delivered by the Moroccan Business Center established in Casablanca with the support of project funds as a unit within an existing private firm. The second component concentrates on a loan guarantee facility which accepts the working assets of a business as collateral. That will allow the small and medium sized enterprises to borrow against current assets and will also encourage banks to expand working asset lending. Finally, the objective of the last component is to incorporate into the project a mechanism to address policy issues and to implement the policy reform recommendations.

Economic Analysis: The economic analysis for this project is mostly qualitative in nature. The analysts have attempted to estimate the IRR but the analysis does not specify, in clear terms, the assumptions for projecting the benefits. It is, therefore, difficult to comment on the adequacy of economic analysis.

Project Name: Investment and Export Promotion
Project No.: 527-0349 (PD-ABD-648)
Project Description: The goal of this project is to provide the Peruvian economy with needed foreign exchange and the employment-generating alternatives to Cocoa production. In order to achieve that objective the project aims at providing technical and financial resources to non-traditional exports where Peru is believed to have a comparative advantage. Specifically, the project components include : (i) General Export Promotion Assistance, and (ii) Specialized Technical Assistance. The objective of the first component is to develop an export promotion strategy including establishment of annual export targets, and development of bench-mark indicators of performance. The second component, on the other hand, supports firm and sector level technical assistance in such fields as product design and development, process technology, quality control, finance, marketing, packaging and labelling.

Economic Analysis: Economic analysis for this project was carried out at two levels: a macroeconomic estimate of the economic benefits of the project, and a microeconomic analysis of individual model investment subprojects likely to be generated by this project. At the macroeconomic level, the analysis attempted to estimate the cost-benefit ratio of the project by estimating overall streams of benefits and costs. The benefits from the project included the net increases in export earnings and labor value added due to the project. The costs included outlays from private and project sources. The

microeconomic analysis, on the other hand, focussed on two representative asparagus exporting firms and one representative apparel exporting firm. The individual projects were evaluated at both market prices and shadow prices. On the whole it appears that, given the constraints, the analysts have done a good job in performing the economic analysis.

Project Name: Self-Financing Primary Health Care II
Project No.: 511-0607 (PD-ABD-394)
Project Description: The objective of this project is to improve the health status of populations in poor urban and semi-urban areas of Bolivia. The particular emphasis of the project is on reducing maternal and infant mortality. The project has three major components: (i) the provision of quality health care services to approximately 160,000 people in the La Paz-El Alto region, (ii) strengthening the La Paz-El Alto Management Support Unit's ability to manage and operate the PROSALUD [Proteccion a su Salud (Health Protection)] health care network and for the recovery of project costs in La Paz and El Alto. Finally, the last component is designed to enable PROSALUD to provide high quality, low cost diagnostic and therapeutic care to low income populations within the city and surrounding areas of Santa Cruz.

Economic Analysis: The stated objective of the economic analysis presented on this project report is to examine and compare the interrelationships between disposable family income for health care, the current costs of health care services, and the proposed cost and coverage of health care service under the PROSALUD system. Presumably, if as a result of the project the beneficiaries can be supplied the current level of health care at less cost or better quality health care at the current levels of health care expenditures, or both, then the project is economically justified. While we have no objection to this approach, the analysis presented in the project report is rather sketchy. For example, the report states, as a matter of fact, an average size family in El Alto will typically allocate approximately 5 per cent of its annual income to cover costs of health care services. However, the source of this figure is not known. Similarly, at another point the report notes that the number of medical consultations per family member is expected to increase by 50 per cent as a result of PROSALUD system. How the analysts arrived at this figure is not clear. On the whole, the analysis appears to rely on assumptions and guesses and the accuracy of the economic analysis greatly depends on the accuracy of these assumptions.

Project Name: Trade and Investment
Project No.: 518-0094 (PD-ABD-425)
Project Description: As suggested by the project title, the main objective of this project

is to develop a supportive environment for expanding external trade and for accelerating the rate of capital accumulation in Ecuador. In terms of the project strategy, the project focusses on:

(i) Improving the macroeconomic climate : A major activity of this project is to establish Fundacion Ecuador, an organization which will serve the as lead private sector organization in coordinating trade and investment promotion programs. The project also assists the Government of Ecuador in implementing policy reforms it has already undertaken, or agreed to undertake, such as reduction of bureaucratic obstacles through the establishment of a one-stop window for exports.

(ii) Developing a quality control, productivity, and an export mentality : The idea of this component is to help Ecuadorians overcome the fear of the international market and to help the country build a critical mass of successful new investors and exporters. It is hoped that this would help muster support for more far-reaching policy reforms.

(iii) Strengthening institutional framework in support of trade and investment: This project also seeks to strengthen local institutions in support of increased exports and investment by the private sector. The new institution, Fundacion Ecuador, is expected to play a major role in achieving this objective.

Economic Analysis: The project report notes that "given the practical constraints of developing a complete economic analysis with the baseline data for this project, the Mission has chosen to analyze both the experience of the Non-Traditional Agricultural Export (NTAE) project, now in its sixth year of implementation . . . A careful review of AID's widespread experience has also been undertaken". Thus, the economic analysis for this project basically constitutes of an analysis of previous experience with the NTAE project in Ecuador and with other LAC (Latin America and the Caribbean) trade and investment projects. The projects reviewed, besides the NTAE, include (i) the Investment and Export Promotion (IEP) Project in Peru, (ii) the IEP Program in Costa Rica, and (iii) the IEP Project in Dominican Republic. As a result of review of these projects, the project report notes that, "the Mission is confident that this project can be successful in generating investment, exports and employment".

It is clear from above description that this project by itself was not subjected to any kind of economic analysis. Surely, a complete economic analysis of the project would be preferred over the approach taken here, but, given that adequate data for performing detailed economic analysis is not available, this approach appears to be an acceptable compromise. In essence this approach resembles the "benefit transfer" approach discussed below.

Project Name: Energy Management Consultation and Training

Project No.: 386-0517 (PD-ABE-721)

Project Description   The goal of this project is to improve the efficiency of energy supply and use in the industrial and other sectors of the Indian economy. This is considered important in view of the projected shortfalls of energy supply in India by the year 2000 and in view of the fact that current production of energy in India is extremely inefficient. For example, the thermal plant availability in India is about 10-15percent lower than the norm in Asia, and the power transmission and distribution losses average a high 19 percent, as compared to 10percent in Thailand, and 6 percent in South Korea. Specifically, the project has two components : (i) the Power Finance Corporation Power Supply Component which assists the State Electricity Boards in preparing Operational and Financial Plans and lends funds only to those with approved OFAPs, and (ii) the IDBI Energy End-use Component, which deals with the problem from the demand side by implementing relatively simple measures such as energy audits, introducing energy efficiency devices, and replacing outdated process and product technologies.

Economic Analysis: The objective of the economic analysis conducted for this project appears to be to illustrate the potential benefits of energy conservation and not necessarily to identify and quantify all associated project costs and benefits. Our assessment is that since this is the kind of project where the potential gains are simply monumental, a rigorously worked out economic analysis may not be required in order to justify the project. The illustrative economic analysis was based on two basic assumptions. These are: (i) average growth rate in electricity consumption during the period 1985-2005 will be 5.6%, the same as during 1970-85, (ii) energy use efficiency will increase by 25% under the conservative scenario and by 40% under optimistic scenario. Based on these assumptions the analysis estimates that aggregate direct economic savings in power plant fuel use alone could easily exceed $10 billion under the conservative scenario. Under the optimistic scenario the savings would be close to $25 billion. We, obviously, are not competent to comment on these numbers. But, methodologically, the analysis though simplistic, is sufficient to justify the project.

Project Name: Zimbabwe Business Development

Project No.: 613-0232 (PD-ABB-833)

Project Description: The broad goal of this project is to enhance the rate of investment by the private sector, specially the foreign private sector, in Zimbabwe's economy. More specifically, the project is designed to test the effectiveness of selected interventions in promoting private sector led growth. There are two components to this project: (i) operational testing activities, and (ii) analytical activities. The operational testing component includes development of a competitive export processing zone. This component also assists the Government of Zimbabwe (GOZ), with private sector input,

to develop the laws, regulations, and institutions necessary for export processing zones. Other items under this component include facilitation of the linkage between small and large businesses in Zimbabwe, and the development of a volunteer business advisory service. The analytical components, on the other hand, are designed with the objective of enhancing the understanding of how the private sector works in Zimbabwe. This will involve analytical studies, seminars, etc.

Economic Analysis: The economic analysis for this project consists of a descriptive analysis of the reasons for sluggish private investment in Zimbabwe in the past and the steps undertaken by the Government of Zimbabwe to attract private investment. However, how and why that constitutes the economic analysis for this project is not clear. That is not to say that the project was not economically sound, but rather that an appropriate economic analysis was not performed for it.

Project Name: Cochabamba Regional Development
Project No.: 511-0617 (PD-ABD-399)
Project Description: The broad goal of this project is to significantly reduce the supply of cocaine entering the U.S. and other markets from Bolivia. Specifically, this project aims at providing alternative non-coca economic opportunities to coca growers and laborers in order to introduce a shift in cropping pattern from coca to non-coca related activities. The project is comprised of three components : (i) marketing, (ii) capital resources, and (iii) sustainable small farm production. The first component is designed to remove constraints and enhance efficiency in the marketing channel from producer to consumer, so as to increase the price to the farmer and processor of alternative crops. The second component provides the producers with necessary capital to enable them to extract the maximum possible market surplus. Those who give up coca production completely will also receive, in addition to $2000 provided by the Government of Bolivia, a partial grant of farm inputs. Finally, the third component involves market research and extension activities.

Economic Analysis: The strategy of this project can be simply stated as 'provide the farmers with alternative crops which are even more profitable than coca and the farmers will give up coca production'. It is clear then that there can be only one approach to the economic analysis of this project and that is to compare the with and without scenarios. The economic analysis presented in the project report notes that a related study was undertaken to determine the relative profitability of alternative crops suitable for cultivation in the region and to determine the price range of coca leaf within which the compensation and the credit program could be expected to be effective in inducing coca eradication. The study determined that all of the nine crops considered would be competitive with coca after adding $2,000 per hectare in compensation payments to the

net present value of alternative crops. While we can not comment on the numbers used in the analysis, the approach used to assess the economic soundness appears logical.

Project Name: Ghana Primary Education Program
Project No.: 641-0119 (PD-BBW-680)
Project Description: This program aims at strengthening the policy and institutional framework of Ghana's primary education system. The program consists of a cash grant of $32 million, complemented by technical assistance. Conditionality focuses on: primary education budgeting; Ministry of Education (MOE) decentralization; teacher training; equity improvement; and student testing. Local currency generated by the auction of U.S. dollars will support the primary education budget. To ensure adequate funding, the program requires the MOE to disaggregate data on primary education budgets and expenditures, maintain the overall budget share for primary education at no less than 1989 levels, and increase its budget allocation for primary education materials to at least 6%. Decentralization of the MOE is a major requirement of the program. The MOE is also required to present evidence that 90% of primary school teachers have been trained to minimum standards by the end of the program. To improve access to education, the Government of Ghana is required to undertake an Equity Improvement Program and equity improvement policy designed to reduce enrollment discrepancies between geographical areas, income levels, and sexes. Approximately 63,000 primary school educators, 1,400 supervisory personnel, and 2.1 million children are expected to benefit from the program.

Economic Analysis: The economic analysis for this project addresses three questions: (i) the macroeconomic impact of the program, (ii) the sustainability of the Primary Education Program, and (iii) the elementary rate or return to education. The analysis to assess the macroeconomic impact of the program is mostly qualitative and too brief to put the problem into perspective. The sustainability of the program is analyzed in three steps: (i) determine the physical requirements in terms of enrollments. teacher supply, etc, (ii) project the financial implications of realizing these targets, and (iii) examine alternative scenarios for the economy to determine the conditions under which the program is sustainable and to what factor the sustainability is sensitive. Finally, social rate of return to education is estimated. On the whole, it appears that the last two aspects, that is sustainability and rate of return on education, have been adequately scrutinized.

Summary of Project Reviews

As mentioned in the beginning of this chapter, we initially scanned a total of 166

project reports of which only 59 projects (i.e., 35 per cent) contained some kind of economic analysis. Moreover, within the projects pertaining to policy and administrative reforms, only 26 percent, were subjected to economic analysis. The comparable figure for natural resource and environmental management projects was 59 per cent. In order to evaluate the level of economic analysis for the projects for which some economic analysis was performed, we classified the projects based on our judgement of the contents and rigor of economic analysis. The classification is presented in Tables 1 and 2. The classification is based on a two-dimensional scale. One dimension measures the level of quantification performed in the economic analysis. The range is from qualitative to highly quantitative. A highly quantitative analysis is one where data is collected and subjected to econometric analysis for estimation and prediction. The other dimension for evaluating these projects measures the quality of the content of the analysis, and ranges from poor to good. It is possible to have a highly quantitative economic analysis that measures the wrong parameters, and therefore receives a poor content ranking.

Although a more detailed breakdown of our review follows, it is important to note the following summary statistics of our findings. Of the 166 project papers reviewed, 107 (65%) appeared to have no economic analysis and for an additional 8 (5%) we could not ascertain the level of the analysis. Of the remaining 51 projects, the economic analysis was found to be poor in 23 (45%), satisfactory in 15 (29%) and good in (25%). This finding does not imply that AID projects should not have been conducted and that the investment that AID is making is being paid back, but rather, that their is a lack of accountability that AID should be working to rectify. In other words, AID would be hard-pressed to determine from its own analyses of projects, what the benefits are of their expenditures.

Table 1 : Classification of Natural Resource and Environmental Management Projects Based on Content and Rigor of Economic Analysis

| Quality | Level of Quantification | | | |
	Qualitative	Slightly quantitative	Moderately quantitative	Highly quantitative
Poor	525-0308 675-0249 879-0023 383-0109		655-0017 688-0937	
Satisfactory	493-0345 518-0094	525-0248 617-0123 538-0171	632-0228	
Good		492-0465	619-0129 527-0321 696-0129 532-0148 650-0082 690-0251 527-0341	Gambia ANR 367-0154 515-0243 687-0110

Note: The following projects were not classified due to lack of sufficient information 367-0158, 596-0150, 522-0292, 520-0395, 492-0444

Summary of Quality of Economic Analyses

Natural Resource Projects

Slightly Quant.
14%

Qualitative
21%

Moderately Quant.
34%

Unclassified
17%

Highly Quant.
14%

Satisfactory
20.7%

Poor
20.7%

Good
41.4%

Unclassified
17.2%

Policy Reform Projects

Slightly Quant.
32.3%

Qualitative
25.8%

Unclassified
9.7%

Highly Quant.
3.2%

Moderately Quant.
29.0%
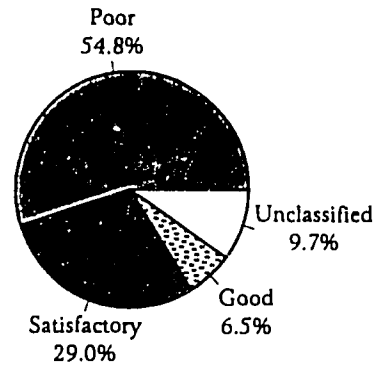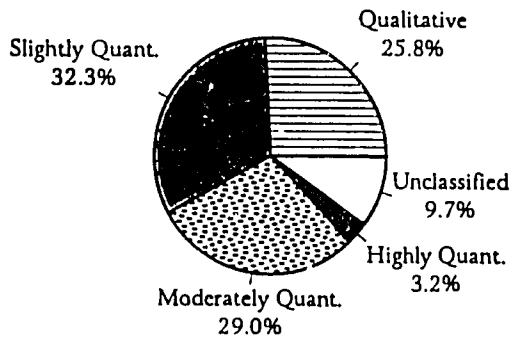
Poor
54.8%

Unclassified
9.7%

Good
6.5%

Satisfactory
29.0%

54
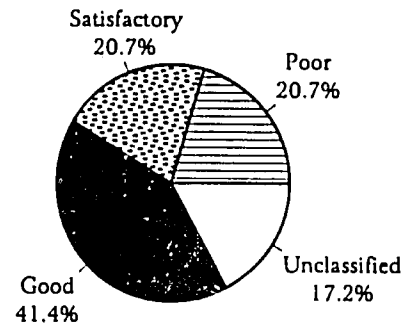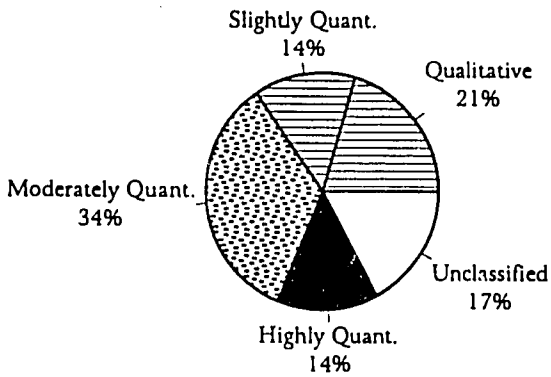
Table 2 : Classification of the Policy Reform Project Based on Content and Rigor of Economic Analysis

Quality	Level of Quantification			
	Qualitative	Slightly quantitative	Moderately quantitative	Highly quantitative
Poor	620-0003 596-0165 521-0223 263-0238 688-0261 613-0232	631-0074 631-0233 497-0373 386-0521 519-0287 525-0313 688-0258 511-0607	656-0208 645-0229 615-0249	
Satisfactory	492-0463 518-0094	492-0446 511-0585	632-0230 608-0210 527-0349 386-0517 511-0617	
Good			641-0119	492-0450

Note : We could not classify following projects due to insufficient information
615-0242, 527-0319, 608-0204

In our judgement, the economic analysis for about 46 percent of the projects was of poor quality. In terms of quantification, the economic analysis for more than 50 percent projects was qualitative to slightly quantitative. It is also clear from Figure 1 that most policy reform projects lacked good economic analysis. For example, the economic analysis for 55 percent of the policy reform projects were ranked 'poor' whereas, for natural resource projects, only about 28 percent were classified in that category. Similarly, on the scale for quantitativeness, the economic analysis for 54 percent of the policy reform projects were qualitative to slightly quantitative, whereas the comparable figure for natural resource projects was 43 percent.

The observation that the level of economic analysis for natural resource project

is relatively better than the policy reform projects should not be surprising. Most of the benefits (at least the direct benefits) and costs streams associated with projects relating to improved management of natural resources are relatively easily identifiable. Besides, there has been substantial advancement in valuing the intangible benefits of improved management of natural resources and environment (see below). Some of the reviewed projects attempted to make use of these newly developed techniques in performing the economic analysis, though the quality of these applications leaves much to be desired.

The projects reviewed under policy reform can further be classified into two broad categories: (i) projects pertaining to trade/macroeconomic policy reform, and (ii) projects in the social sectors such as education, health care, etc. The economic analysis for the projects dealing with trade and macroeconomic policy reform generally ignored the general equilibrium effects of the proposed policy reforms. Trade and macroeconomic policy reforms have strong effects on various sectors of the economy and, thus, these projects need to be analyzed in a general equilibrium framework. One possibility is to postulate the National Income function and then analyze the effect of the proposed policy reforms on the national income. Several studies dealing with the general equilibrium effects of trade and macroeconomic policy reforms are available which can provide useful guidelines for this purpose. Projects in the social sectors are usually undertaken as a matter of national priority and a least cost analysis should suffice to justify them.

CHAPTER 2

GUIDANCE FOR ECONOMIC ANALYSIS OF "NON-TRADITIONAL PROJECTS"

It is apparent from our review of 166 AID projects that there is a great deal of inconsistency in the quality of the economic analyses. Approximately 65% of the projects had little or no economic analysis to speak of. Even in projects where there was an annex devoted to economic analysis of the project, the quality varied from a detailed, highly quantitative state-of-the-art analysis (e.g., Madagascar Sustainable Approaches to Viable Environemntal Management, 687-0110) to unsubstantiated guesses about what the net economic benefits of a project would be (e.g., Philippines Industrial Environmental Management Project, 492-0465).

Our assessment is that the inconsistency in the quality of economic analyses for non-traditional environmental and policy reform projects stems from two causes. One cause is the failure to adhere to the basic guidance in the AID Manual for Project Economic Analysis published in 1987. The other source of the problem is an apparent lack of familiarity with current standards and practices for economic valuation of environmental and natural resource projects. Based on this premise, the following guidance is provided as a combination of highlighting some of the key components of the previous AID guidance, supplemented with detailed guidance on valuing environmental and natural resources.

Overview of General Guidance

Ideally, project economic analysis should consist of four basic steps, regardless of the type of project being considered:

☞ 1. Determine <u>with</u> and <u>without</u> scenarios including a description of the physical (non-monetary) impacts such as resource depletion, environmental degradation, health, productivity, etc.

☞ 2. Determine what groups will be affected by the predicted Changes

☞ 3. Determine impacts in physical or non-monetary terms

Below, we will describe the components of each step and see how they should be applied to natural resource and policy reform projects.

Application to Non-Traditional Projects

Policy Reform

As pointed out in Ward and Deren (1992), in general, good policies tend to have a much greater impact than good projects because policies affect entire sectors of the economy. A subsidized irrigation project will help those farmers that receive the irrigation, but a policy that leads to efficient input and output prices in the agriculture sector will benefit the whole industry, as well as consumers.

For policy reform projects, it is necessary to first determine what policies will be changed as a result of the project, and then determine what market and non-market goods will be affected. In other words, how will these markets operate with the policies in place, as opposed to in the absence of policy reform.

Most of the policy and institutional reforms supported by the World Bank and other donors under structural adjustment loans are intended to increase the efficiency of the economy and to promote economic growth. The extent by which economic growth increases due to reforms is seldom explicitly quantified (Lutz and Munasinghe 1993). Policy reform designs would improve with better attempts to identify and estimate the costs and benefits of such packages, based on the standard with and without policy approach (Kanbur 1990).

Policy reforms are routinely justified on the basis of their contribution to economic growth, the performance of which is typically measured by growth in GDP (gross domestic product). Many effects, however, are difficult to quantify. Computable general equilibrium models are typically used to quantify and measure many policy reforms, such as trade policies. Policy reforms may also be targeted at resource and environmental concerns. (See Lutz 1993, El Serafy 1989, Repetto et al. 1989, and Dasgupta and Maler 1989).

AID has funded five years and over ten million dollars worth of research building social accounting matirces and related models fo several African countries under the Cornell Food and Nutrition Policy Program. The publications catalog available from Cornell University (phone: 607-255-8093) lists three books, 17 monographs and 69 working papers. Many of these deal with identifying groups and their net income changes resulting from policy changes. In particular, there have been attempts to develop computable general equilibrium models for a number of these countries which can be used to develop the "social accounting matrix" describing the economic affect of the policy change. Once the general equilibrium model for a country has been developed, it is a much simpler task to modify it to examine other types of policy changes. There were only a handful of examples in our analysis from Chapter 1 where

this type of approach has been employed. An economic development program in the Phillippines (PD-ABD-634) uses this kind of approach.

Recommendation: 1) AID should continue to fund development of general equilibrium models of countries where major policy reform projects are anticipated. 2) Project analysts should be trained in the use of these models for studying a variety of policy reforms.

Natural Resource Projects

The fundamental principles governing cost-benefit analysis of natural resource projects are exactly the same as the principles followed in traditional projects. They rely on the cost-benefit framework for less developed countries developed by Little and Mirrlees (1974), UNIDO (1972), and Squire and van der Tak (1975). While none of these sources pay major attention to natural resource projects or the environmental and natural resource effects of development projects, they lay out the framework for project analysis based upon social welfare criteria, incorporating distributional and efficiency effects and externalities (Dixon 1990, Tisdell 1993). For example, Little and Mirrlees includes a chapter on externalities but exhibits misgivings about placing monetary values on unpriced aspects of the project. Subsequent extended benefit-cost analyses built upon this framework, developing techniques for taking into account natural resources and environmental factors. Growing awareness of the interconnected issues of economic development and ecosystems and public policies is working its way into the preparation and appraisal of projects and public policies, including explicit consideration of environmental linkages and impacts (Dixon, Tisdell).

The growing literature on preparation and appraisal of projects, explicitly considering the environmental and resource impacts, identifies two major components (Dixon). The first is to identify correctly the likely resource and/or environmental impacts. The second is to explicitly incorporate the social welfare effects of these impacts into the economic analysis. Impacts may be formed in either a qualitative or monetary manner.

The difficulty is in measuring the value of natural resources that are not traded in markets. Tools for measuring "non-market" benefits will be discussed in the next section. At this preliminary stage, however, we are not interested in valuation, but in determining how the quantity or quality of natural resources will be affected by the project.

Recommendation: AID project analysts should be trained in the practical application of environmental valuation and non-market benefit techniques as described later in this report.

If the natural resources in question are market traded goods, then the producers and consumers of these goods are the parties that will be affected by the project over time, and the analysis proceeds as usual. For natural resource or environmental goods and services not traded on markets, there are usually no producers, just consumers. Uses may be either consumptive, such as fishing or hunting, or non-consumptive, such as hiking or wildlife viewing. Farnworth et al. (1983) used the following classification scheme for uses of tropical moist forests:

Table 3: Classification of Uses of Tropical Moist Forests

Market Value	Non-Market Value	
	Attributable or Assignable	Intangible or Non-assignable
Lumber - logs, plywood, veneer	Maintenance of global air quality - removal of particulate and gaseous material	Maintenance of global carbon balance
Fibre - paper, fodder, fibre for clothing and shelter	Maintenance of tropical water quality - erosion control, flood control, regional water quality	Maintenance of atmospheric stability
Fuel - firewood, methanol	Recreation - hunting, tourism, filming, aesthetics, etc.	Habitat for native people
Food - oils, nuts, fruits, cacao, etc.	Genetic stocks 1. New food plants and animals	Intrinsic worth of species, culture and ecosystems
Chemicals - oils, resins, esters, phenols	2. New chemicals 3. Potential biological control agents	Natural laboratory for study of evolution, natural selection, and natural forest cycling processes
Pharmaceuticals - quinine, nicotine, caffeine, alkalids	4. New germ plasm to reinvigorate food or fibre	
Exotic flora and fauna - house plants, pets	stocks (i.e., disease control or yield improvement)	
Research on plants and animals		

source: Farnworth (1983)

Although current thinking might reassign some of the items and do away with the term non-assignable altogether, the process in classifying items of potential value is still worthwhile. For each item of value identified in the table, there are groups of individuals that need to be identified who value the use. In some cases, the group is the entire population.

Step I. Determine With and Without Scenarios

In all projects, traditional and non-traditional, the first step in any economic analysis is to determine the "states-of-the world" with and without the project. That is, what additional goods and services will society obtain as a result of going forward with the project or policy, compared to the situation which would result if the project or policy were not adopted. These additional goods and services are the expected program outputs. However, care must be taken to identify the final results from the project and not just intermediate steps that are inputs to a final program output. It should be remembered that inputs have no value unto themselves. Rather, their value is derived from the value of the output that they produce (the economic concept of derived demand). For example, institutional strengthening is not a valued project output unless it leads to that institution taking actions which improve the welfare of citizens of the country.

Another common error in benefit-cost analysis is to compare before and after project scenarios rather than with and without the project. Our review of AID projects was not sufficiently detailed to reveal whether this is a major problem in AID economic analyses. The problem arises because projects may take several years to be implemented and have an impact. The scenario building of the without project case should take into consideration the changes that would have occured over time if the project had not been adopted. As an example, look at the Sudan Reforestation and Anti-Desertification Project (PD-AAW-251). A before and after scenario would look at the current level of desertification and compare it to the level if the project were adopted. This would understate the project benefits because without the project, desertification would continue to advance at current rates. With the project desertification is slowed or halted.

The timeframe of the project should always be taken into consideration in the scenario building whether it is a natural resource project or policy reform. It makes no difference whether the actual modeling uses a comparative static analysis or dynamic analysis. The dynamic analysis takes the time path directly into consideration, whereas, the comparative static analysis involves implicit assumptions about what occurs between implementation of the project and achievement of a new economic equilibrium as a result of the project. In this latter case, the analysis should explicit state what

assumption is being made during the time period between implementation and equilibrium. For example, one could assume an all-or-nothing response; there is no change until the period of equilbrium. On the other hand, the analyst might assume partial changes occur during project implementation.

Recommendation: Although usually included in the body of the project paper, the economic annex should contain at least an abbreviated version of the project timeframe and expected project impacts by year. These impacts would reflect the with and without cases, not before and after. This would be the appropriate stage to select the time horizon for the project. Both environmental and policy reform projects may have only a few years of activities, but their impacts are often felt far into the future.

Step 2. Determine What Groups Will be Affected by the Predicted Changes

An extension of the process of scenario building regarding project or policy change, is the identification of groups of consumers, producers, and citizens that are affected by the predicted changes from project adoption. This is especially important, not only to ensure that there is a complete accounting of benefits and costs, but to reveal the distributional aspects of the project's benefits and costs. The latter is important because benefit-cost analysis only reveals whether an activity is economically efficient. There is no 'social weighting' in benefit-cost analysis, and knowing who receives the benefits and who pays the costs will assist those involved in deciding whether or not to approve a project. Transfer payments, which do not count in benefit-cost analysis since they cancel out, still should be described in the analysis. For example, taxing a relatively wealthy sector of the economy to support basic human needs in another sector may be desirable despite the lack of a positive net benefit. The decision-makers need to take this into account when making determinations about the project.

Policy reform projects typically will have a larger number of beneficiaries than standard projects. This is because the policy reform will affect entire sectors of the economy rather than those in the immediate area surrounding a project. In this step, it is necessary to identify which of the sectors of the economy are directly affected by the policy reform. Depending upon the methodology chosen for welfare change measurement, it may be necessary to identify all the related markets as well as those that are directly affected. When general equilibrium models are estimated, welfare changes can be measured in the primary market affected by the policy. However, in partial equilibrium models it may be necessary to estimate multimarket welfare changes (Just

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et al. 1982).

Recommendation: Project papers should contain a table listing the various groups that are positively or negatively impacted by a project or policy change. The relative size of these groups should also be indicated.

Boundaries on Project Impacts

One issue that USAID must explore as an agency, an issue which is beyond the scope of this paper, is where to set the geographic boundaries in defining project benefits. For example, is it proper to consider only the benefits to the citizens of the country in which the project or policy is being conducted? What are the benefits to the United States of a proposed project? As an example of the contradiction that benefit/cost analysis that ends at a country's borders entails is the fact that AID is mandated to consider the negative effects of projects on U.S. employment under Policy Determination Number 20 dated January 3, 1994 "Guidelines to Assure USAID Programs do not result in the loss of jobs in the U.S." The political reasons for adoption of this policy are apparent, but it is inconsistent and biased to consider the negative impacts on the U.S. of AID programs, and ignore the positive impacts in a social accounting.

Step 3. Quantification of Welfare Gains and Losses to the Affected Parties

The first two steps of the economic analysis identify what will occur as a result of a project, and who will be affected. These two items should be considered mandatory components of the economic analysis of any project, traditional or non-traditional, being considered. Actual measurement of those benefits, however, may be intractable for a variety of reasons, particularly limitations on time and money. Given enough of both, however, reasonable estimates of net economic benefits could be derived for any of the projects USAID might consider. In Annex A we will discuss the methods that may be applied, but mention here that the method of contingent valuation, theoretically, would allow an economist to measure benefits from any type of project being considered. It is not the intention here to review the techniques of welfare measurement and benefit-cost analysis. It is assumed that there is sufficient guidance and numerous references such as Schmid (1989). The remainder of our focus is on what's different or needs to be considered in policy reform and environmental projects.

Values Measurable in a Market Context

There are two types of values that can be approximated using information gathered from markets. One is the change in profits to suppliers of goods and services. This includes changes in profits to firms of all sorts (e.g. fishermen and farmers, as well as oil companies.) It also can include changes in incomes to workers. The other is the effect on consumers of marketed goods.

Changes in both *producer surplus* and *consumer surplus* must be measured in any markets in which a price and/or a quality change takes place. Practically speaking, only those markets with obvious and significant effects are considered. There are sophisticated theoretical models and complicated empirical techniques for measuring these welfare effects in multiple and related markets (see Just et al., 1982).

Recommendation: In cases where supply and demand shifts resulting from project adoption can be predicted, the economic analysis should entail a full benefit-cost analysis using changes in consumer and producer surplus and income changes as the measures of benefits and costs. If only some of the benefits and costs can be quantified in this manner, this information should be presented along with a description of the other impacts of the program.

Recommendation: It is generally recognized that for practical purposes, the willingness-to-pay approach to valuation is preferred over willingness-to-accept. In most cases the two measures will not differ significantly, with willingness-to-accept being greater than willingness-to-pay.

Non-market Measures

Some goods and services, like recreational fishing, wildlife viewing, etc. are not traded on the market. That is, they are not supplied by private firms and consumers do not pay market prices. Nonetheless, individuals benefit from their use and loss of such environmentally related goods signifies welfare losses to these individuals. Conceptually, the same measure of benefit applies as in the market case - the maximum amount an individual would pay to avoid losing access to the good. There are a variety of methods that have been developed to measure this value concept in the absence of markets.

Individuals may have non-use values for natural resources or states of the environment. Typically these are called existence values and relate to willingness to pay measures of individuals to preserve the existence of something even when they don't use

it. Measurement of these values are even more problematic.

Resource economists have developed a variety of techniques to measure changes in value in a non-market contest. These include: travel-cost models; random utility models; hedonic model; and, the contingent valution method. A summary of each of these methods, strengths and weaknessess, and data requirements is included in Annex A.

Recommendation: Although quantification of non-market benefits may be difficult, or not feasible in a particular situation, it is inappropriate to state in the section on economic analysis that these benefits or costs can not be quantified. The analysis should explain why it was not feasible to estimate the non-market benefits for the proposed program using the suite of available techniques.

Recommendation: Contingent valuation is a controversial technique (and the only technique) for measuring existence value. However, it can also be used for valuing anything such as individuals willingness-to-pay for democratic reform in a democracy and governance project.

Alternatives to Cost-Benefit Analysis

Cost-Effectiveness Analysis

Cost-effectiveness analysis, also called least-cost analysis, selects the least-cost alternative of a given objective. Cost-effectiveness analysis measures the costs but not the benefits of a given objective in monetary terms. Cost-effectiveness analysis cannot indicate whether the benefits are worthwhile or not. That decision is made on some other basis. Cost-effectiveness analysis also assesses trade-offs between benefits, measured in non-monetary units, and resource costs. The fundamental decision criterion is to select the alternative that produces the maximum effectiveness or physical benefits for a given cost or minimizes the costs of meeting a given objective (Mishan 1988, Sassone and Schaffer 1978).

A key point is that it is not necessary to attach any explicit money value to benefits (Sugden and Williams 1978). In contemporary project analysis in less developed countries, the only method used to any extent to deal with intangible benefits is to

determine on a present worth basis the least expensive alternative combination of tangible costs that will realize essentially the same intangible benefit (Gittinger 1982).

Because benefits and costs are measured in different units, cost-effectiveness provides no direct guidance when there is uncertainty whether the total benefit justifies the total cost, or when selecting the optimal budget level for a project. Nonetheless, cost-effectiveness is an appropriate criterion when there is a given objective or a given budget (Stokey and Zeckhauser 1978).

Cost-effectiveness analysis may, in some instances, be preferred to a full benefit-cost analysis (Hufschmidt et al. 1983, Pearse and Markandya 1988). Methods of placing economic values on benefits, particularly where no direct market exists, are often not well received by decision-makers and scientists. Rather than placing monetary values on benefits or standards elucidated by health experts, scientists, and others, a frequently more realistic approach analyzes the least-cost way of reaching the standards. Nonetheless, as Mishan (1988) stresses, a cost-benefit analysis, when feasible, provides more information to decision makers and allows more efficient resource allocation.

The first step is to decide on a objective, such as reducing infant mortality to a certain level. The target is set at an appropriate level in a process separate from the economic analysis (although economic considerations may enter into the setting of the target level). Benefits cannot be precisely valued, but trade-offs among different objects and the costs involved are considered. Once the target is established, the approach examines various ways of achieving it. The costs of these alternatives are then evaluated and the least-cost alternative selected (Dixon and Sherman 1990). Thus, the reduced infant-mortality may be achieved in a number of ways such as increased pre-natal care, greater access to clinics, subsidies to health care providers, delivery of vaccines and drugs, etc. Each of these options has a cost associated with it in order to achieve the stated objective.

Cost-effectiveness analysis is used in two forms: the constant-effects method, which uses least-cost analysis to determine the least-cost alternative for meeting a stated level of benefits; and the constant-cost method, which calculates the cost per unit of benefit or the cost-effectiveness ratio, and requires that means exist for quantifying benefits (but not necessarily for attaching a monetary price or economic value to the benefits) (Gittinger 1982). The preferred alternative under the constant-effects or least-cost analysis is that which has the lowest present value or maximizes the discounted present value of units of output per unit of currency. The discounting is typically done at the opportunity cost of capital or the cut-off rate (Gittinger 1982).

Cost-effectiveness analysis is commonly used when it is not feasible to estimate the monetary value of economic benefits. If the lowest cost per unit of output of a project is unacceptable, taking into account any special circumstances surrounding that project, then the project may be rejected. Cost-effectiveness analysis is frequently used in projects or policies involving health, education, rural potable water, or electrification

(Markandya 1991).

Cost-effectiveness analysis becomes complex when there are several benefits, each expressed in its own units of measurement, or when benefits are less narrowly defined and hence provide a wider range of alternatives that can be evaluated (Sugden and Williams 1978, Pearse and Markandya 1988, Markandya 1991). These benefits of a policy or project cannot be simply summed because they do not have a common unit (which would be money with cost-benefit analysis). Extending our infant mortality example, a health care project might also seek to reduce the spread of aids in Africa through an education program. An alternative to cost-effectiveness analysis in this case is multiobjective (multicriteria) analysis, discussed in greater detail below.

A major pitfall of cost-effectiveness analysis is that it uses two very different kinds of valuation: individuals' valuations and decision-makers' valuations (Sugden and Williams 1978). Combining two different kinds of valuation can lead to inconsistency and double-counting. Mixing together two different types of valuation can occur when one type of valuation is applied to a particular good at one stage of an analysis and the other type of valuation is applied to the same good at another stage. Double-counting can arise by using both types of valuation for the same item of benefit, as if there were two rather than one benefit to be counted.

Recommendation: It appears that with many AID projects, a determination to achieve a specific objective is made and then an economic analysis is performed to justify what has been decided. This is an inappropriate excuse to perform a cost-effectiveness analysis over a cost-benefit analysis, unless the predetermination of the project objective is justified by political or other overwhelming reasons. In most cases, adoption of a level of project objectives should not be predetermined, rather it should await the results of a cost-benefit analysis.

Expenditure-Based Approaches

Some benefits (willingness to pay) may be difficult, if not impossible, to measure using traditional measures based on market price. In some cases, the result of the project may not be directly related to a market activity. Information on expenditures by those affected by adverse impacts, both actual and potential, can be used to define the issues (Dixon and Sherman 1990, Lutz and Munasinghe 1993, Munasinghe and Lutz 1993). If costs are voluntarily incurred to alleviate damage, these costs indicate the victim's

minimum valuation of mitigating the damage. An example would be incurring additional expenses to avoid experiencing flood or fire damage. Although the information is related to costs avoided, it gives an indication of the minimum magnitude of benefits created by avoiding an adverse impact. Dixon and Sherman note that it is only a minimum, since responses may be constrained by the ability to pay for the defensive measures and the benefits may be greater than the costs involved. A person would incur these costs only if it was expected that the reduction in damage was at least equal to the amount spent. Caution is warranted with this approach, especially where defensive expenditures are arbitrarily mandated by governments, having little or no relationship to market forces or free choices by informed economic agents (Munasinghe and Lutz 1993).

A variation on the expenditure-based approach uses information on potential expenditures, as opposed to observed actual expenditures as described above (Dixon and Sherman 1990). This approach examines investments required to offset or mitigate environmental damage. The first approach in this potential expenditure category is the mitigation-cost approach (Dixon and Sherman 1990). This approach examines how much it would cost to mitigate or reverse damage cause by a project or policy. It requires estimating the cost of labor and materials need to counter the effects of a change. Only the additional costs attributable to the change, not the total cost, should be included.

The second technique in the potential expenditure category is the replacement-cost approach (Dixon and Sherman 1990, Huffschmidt et al. 1983, Lutz and Munasinghe 1993, Munasinghe and Lutz 1993). This technique evaluates the cost required to replace productive assets damaged by a project or policy. These costs are then compared with the costs of preventing the damage from occurring. If the replacement costs are greater than the cost of prevention, then the damage should be avoided (this assumes that the benefits of repairing the damage also outweigh the cost of prevention) (Dixon and Sherman 1990). The replacement-cost estimate is not a measure of benefit from avoiding the damage, since the damage costs may be higher or lower than the replacement cost (Munasinghe and Lutz 1993).

A variation of the replacement-cost approach is the shadow project (Dixon and Sherman 1990, Hufschmidt et al. 1983, Lutz and Munasinghe 1993, Munasinghe and Lutz 1993). If a project or policy causes the loss of a nontraditional good or service, the cost could be approximated by evaluating the cost of a supplementary project that provides a substitute or compensation for the lost good or service. This approach is increasingly discussed as a means of operationalizing the concept of sustainability at the project level (Munasingh and Lutz 1993, Tisdell 1993).

Another variation of the replacement-cost approach is the relocation-cost technique (Dixon and Sherman 1990). In this approach, the costs of relocating a physical facility that would be damaged by a project or policy are used to estimate the value of the damage.

The replacement cost and shadow project approaches differ from the mandate to

AID to mitigate for environmental damage from projects. This mandate makes the cost of mitigation a direct cost of the project as opposed to a potential cost.

Dose-Response Relationships

Dose-response methods can be useful in less developed countries where market-based methods dependent upon revealed preferences are not feasible (Markandya 1991). This approach uses scientific data relating physical damage to human and economic factors, such as health, crops, and so forth, and only then is some measure of preference for that effect applied. Thus, this indirect procedure for benefit estimation does not measure direct revealed preferences, but instead, after calculating a dose-response relationship between a "treatment" or "cause", such as pollution, and some effect, such as health damage, indirect approaches then utilize valuations which are applied to the "responses" (Pearse and Markandya 1989).

Examples of dose-response relationships include the effect of pollution on health, depreciation of material assets such as buildings, or ecosystems, and the effect of soil erosion on agricultural yields. In the health example, once the health effects of pollution are established, a value of life and/or of illness can be applied (Markandya 1991).

The dose-response approach tends to be used in situations in which people may be unaware of the effects of the "treatment", such as the effects that pollution causes. It is also useful when eliciting preferences by one of the direct methods is not possible (Markandya 1991).

Multiobjective Analysis

Multiobjective analysis, also called multicriteria analysis, can be used when multiple benefits or policies cannot be easily quantified in monetary terms (Lutz and Munasinghe 1993, Markandya 1993, Munasinghe 1993, Pearse and Markandya 1988). In this regard, it can be viewed as related to cost-effectiveness analysis.

Multiobjective analysis assigns a weight to each objective or benefit, where an objective deemed more important receives a higher weight than an objective deemed of less importance. These nonmonetary weights serve the same function as prices in cost-benefit analysis, reflecting the relative importance of each of the objectives, but they may be derived in any number of ways (asking experts, individuals, decision-makers) rather than from observed market activity. The resulting weighted sum of the objectives B' cannot now be related to costs, other than through a cost-effectiveness index B'/C (Pearse and Markandya 1988).

Multiobjective analysis differs from cost-benefit analysis in several major ways (Pearse and Markandya 1988, van Pelt 1991). Weights other than market prices are used to combine multiple benefits or objectives. The weights involve the relative

priorities of different groups, expressed in ways other than through market activity (where prices are formed). Hence, the most important difference is the recognition that economic efficiency is not the sole objective of policy (although cost-benefit analysis can, in principle, incorporate income distribution). Second, cost-benefit analysis requires that effects be measured in quantitative terms to allow for the application of prices. Multiobjective decision-making can be classified into three groups one requiring quantitative data; one using only qualitative data; and one using both. This can allow a broader group of objectives, such as biophysical impacts of a policy or broad social concerns, which cost-benefit analysis has difficulty in incorporating.

A key concern with multiobjective analysis is choice of preferences required in establishing weights for the different objectives (Markandya 1993). Different groups may assign different priorities to their respective objectives, and may even have different objectives. Hence, it may not be possible to determine a single best solution via the multiobjective approach, although it does help evaluate trade-offs among objectives. Finally, Cocklin (1989), Munasinghe (1993), and Pearce and Turner (1990) provides a more extensive discussion of the technical details required for implementation. Applications to environmental, agricultural, and development issues are reviewed by Romero and Rehman (1987) and Petry (1990).

National Income Accounts and Natural Resources

This approach can be viewed as a supplement to cost-benefit analysis rather than as a replacement for it. It entails properly defining and measuring national income accounts to incorporate environmental and resource costs and benefits (Ahmad et al. 1989; Lutz 1993; Munasinghe and Lutz 1992; Repetto et al. 1989). Economic performance is measured by growth and gross domestic product (GDP) and policy reforms are often evaluated on the basis of their contribution to GDP growth. But GDP measures market activity and values man-made capital while neglecting non-market value added and the value of natural resource and environmental assets (particularly from unpriced natural resources held in common). Moreover, GDP measures do not debit the loss of these assets against current income, or account for the decrease in potential future production from natural resource depreciation. Expenditures to restore environmental assets are often included in national income accounts. However, environmental damages are not, thereby further distorting measures of GDP. The U.S. has instituted satellite accounts to its national income accounts which attempt to measure the change in natural resource and environmental assets along with changes in GDP.

The use of natural resource and satellite accounts is not a substitute for cost/benefit analysis, just as economic impact analysis (input-output) modeling is also not a substitute for cost-benefit. However, many projects use changes in national

income measures (e.g., GDP as an objective criterion or project goal. Inclusion of the satellite accounts would provide those charged with deciding project approval a more complete account of the project's impacts. For example, the Mozambique Private Sector Support Program (PD-AAZ-846) might increase GDP due to an expanding agriculture sector, but what impact does this have on the natural resources in the area? A true cost-benefit analysis for such a project would look at the welfare effect of the increased agriculture (consumer and producer surpluses) and also include welfare effects of biomass shifts due to expanding agriculture.

Benefit Transfer

Benefit transfer involves the application of monetary values obtained for one specific analysis to an alternative policy decision setting. Benefit transfer may be the only feasible way for USAID to evaluate some of its non-traditional projects. Studies specifically related to a project may be too time consuming and expensive to undertake. The ability to transfer findings from similar projects in other areas would at least provide some guidance to the decisionmaker about the expected benefits of a particular project. A number of studies reviewed in Chapter 1 were examples of benefit transfer.

> Recommendation: Given the expense and time associated with estimating the non-market value of natural resource use or policy reform, benefit transfer may be a reasonable alternative for AID economic analyses. However, there must be an investment up front in conducting detailed analyses that can be transferred to other situations. This appears to be the approach taken with the Cornell Food and Nutrition Policy Program.

Benefit transfers are an application of a data set that was developed for one particular use to address a natural resource or policy analysis in an alternative context. Benefit transfer applications may consist of just transferring the technical relationships (i.e., assuming a project will have a similar physical impact which must be transfered to an economic measure) or it may involve transferring the actual values. For example, the physical benefits of tree planting measured in a different area may be assumed to occur in the new area under consideration. Alternatively, the analyst may look at the actual costs and benefits from the tree plantings.

Benefit transfer is considered to be valid under well-defined conditions. Factors to consider in conducting a benefit-transfer exercise should include:

► For what purpose were the original value estimates generated?

► What user groups were considered in generating the initial estimate?

► How does the resource that was affected compare to that considered in the referenced study?

► What were the nature of substitutes [what do you mean by substitutes?] in the initial study area, and how do they compare to the policy study area?

► Does the existing study consider the same or a similar geographic area?

► Are the demographic and socio-economic characteristics of the two areas similar?

► If the source being used presents a composite of existing values based on an earlier literature review, what methods were used to derive these composite values and what was the nature of the underlying studies?

► Were baseline conditions in the existing study similar to baseline conditions in the case at hand?

► Did the existing study address a specific or unique problem that may have influenced the magnitude of the estimates obtained?

► Have general attitudes, perceptions, or levels of knowledge changed in the period since the existing study was performed, such that it would influence the value of the benefit estimate? Are these values likely to be consistent over time?

► Were variables omitted from the original study that are believed to be relevant to the case at hand? To what extent does such omission invalidate results based on benefit transer?

► Were adjustments to the data made in the existing study (e.g., were outliers deleted)?

In all cases the decision-maker should consider all available estimates, each evaluated based on the factors described above. Once a final set of values has been

chosen, consideration should be given to their general magnitudes. If the existing value estimates differ significantly, or if values generated using alternative models differ significantly from one another, consideration should be given to whether they differ in a predictable and consistent manner. In some cases it may be possible to combine these estimates formally through meta analysis (Smith, 1992). Meta analysis looks at a variety of studies on a similar topic, often using different sets of data, and tries to combine them into generalizable results. In all cases, more defensible benefit estimates will result from comparative analysis.

In many cases the defensibility of the transferred economic benefit estimate will depend on the quality of the underlying research. While there are no globally accepted standard criteria by which the quality of existing studies can be judged, it is recommended that use of benefit transfer be carefully reviewed by impartial outside economists.

Sustainability and Project Evaluation

Sustainable economic development is a broad concept with many different interpretations, and several approaches have been used to incorporate the concept of sustainable economic development into economic analysis. These include: (i) the shadow projects approach; (ii) the marginal opportunity cost approach; and (iii) the social discount rate approach. Each approach is discussed below, and should be considered by the AID economist when trying to incorporate the concept of sustainability into project economic analysis.

Shadow Projects Approach

One approach modifies traditional and even extended cost-benefit analysis to allow for sustainability by introducing the constraint that projects be selected so that the depletion or degradation of the stock of natural resources and environmental quality (natural capital) is non-positive overall (Pearce, Barbier, and Markandya 1990). More strictly, the necessary condition for sustainable development is constancy or improvement in the stock of natural resources and in environmental quality (i.e. natural capital depreciation should be zero or negative). This requirement can be applied across the set of projects or policies.[2]

The sustainability constraint amounts to including within any portfolio of investments one or more shadow projects. Shadow projects provide substitute

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[2] If E_i is the environmental damage caused by the ith of N projects, they require $\Sigma_i \leq 0$. That is, netted out across a set of projects or policies, the sum of individual damages should be zero or negative.

environmental services to compensate for the loss of environmental assets under ongoing projects that have negative environmental impacts (Klaassen and Botterweg 1976). Shadow projects are increasingly mentioned as a possible way of operationalizing the concept of sustainability at the project level (Munasinghe and Lutz 1993). The approach involves the design and cost of one or more shadow projects. In other words, if a project is found to deplete natural resources (e.g., an agriculture project that destroys a forested area), another project (the shadow project) is designed to compensate for the loss (e.g., a project that preserves or enhances forests).[3]

Several difficulties limit this method (Tisdell 1993). The most important problem relates to the measurement of environmental damages and depreciation or appreciation of natural capital stock. The measurement of such factors is not straightforward, is subject to uncertainty, and is influenced by value judgements. Due to this limitation and others, the suggestion to modify cost-benefit analysis to directly incorporate sustainability has not been applied by major donors such as The World Bank.

Marginal Opportunity Cost Approach

A second approach, marginal opportunity cost, builds upon the shadow price framework of Little and Mirrlees (1969, 1974) and Squire and van der Tak (1975), where inputs and outputs are valued according to their opportunity costs (Pearce and Markandya 1989). Marginal opportunity cost (MOC) is a comprehensive opportunity cost measure for shadow prices of natural resources. For tradable goods and services (actually or potentially traded internationally), including natural resources and environmental assets, the border price provides the correct shadow price. MOC replaces the usual marginal cost concept and becomes the comprehensive shadow price for nontraded goods and services that fully account for external effects and natural resource usage.

MOC has three components. The first component is the direct cost of the activity measured as an economic opportunity cost. Little and Mirrlees (1974), Squire and van der Tak (1975), Ward, Deren, Tower and Pursell (1986), Dreze and Stern (1987, 1990) Squire (1989), and D'Silva (1991) provide extensive discussions on shadow prices of direct costs. The second component is the external cost (or benefit). Measurement of these external costs or benefits is discussed in detail below. The third component,

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[3]The environmentally compensating project(s), j, would be chosen such that $\Sigma_j PV(A_j) \geq \Sigma_j PV(E_j)$, where PV denotes present value and A_j denotes enhancement to the natural capital stock by the shadow project j. The normal decision rules of cost-benefit analysis would apply to the environmentally depleting projects. These rules would not apply to the shadow projects, although the cost of achieving the sustainability criterion would be minimized.

marginal user cost, arises from intertemporal considerations. Marginal user cost requires expectations to be formed about future patterns of exploitation and about future developments in the demand for natural resources and the supply of substitutes for these resources. For renewable resources, marginal user cost arises only when the resource is used on a nonsustainable basis, thereby reflecting a scarcity premium (Pearce and Markandya). Clark (1976) discusses marginal user cost for renewable resources, and Dasgupta and Heal (1979) for exhaustible resources. In sum, MOC is comprised of: MOC = MDC + MEC + MUC, where MDC is the marginal direct cost, MEC is the marginal external cost, and MUC is the marginal user cost.

While in many ways conceptually appealing, the use of shadow prices, even in more conventional settings is not extensive in practice (Little and Mirrlees 1990), and it is difficult to see how the marginal opportunity cost approach will have practical appeal.

Social Discount Rate Approach

A third approach concentrates on the social discount rate (See Dasgupta and Pearce (1972), Squire and van der Tak (1975) and Lind (1982) for comprehensive discussion of discount rates). Discount rates play a key role in determining the extent to which future generations' interest and preferences are incorporated into project evaluation. Several criticisms have been leveled at discount rates in the environmental critiques of discounting (Pearce, Barbier, and Markandya 1990; Krutila and Fisher 1975; Warford 1989). It is alleged that the conventional discount rate is too high, thereby lowering the weight to future benefits and raising the rate of resource depletion (encouraging early, rather than later, depletion of exhaustible resources). Similarly, since resource depletion and environmental degradation impinge upon intergenerational equity and justice, it is also argued that conventional discount rates raise project benefits, often occurring in the near term, and lower future costs incurred by future generations. That is, future generations are discriminated against since future generations may bear a disproportionate share of costs but receive a relatively smaller share of benefits. It is also argued that higher discount rates discriminate against projects with social benefits that fall well into the future and against projects with social costs (e.g. environmental cleanup or resource restoration) that must be borne in the near future. Higher discount rates may also dampen investment and hence lower the stock of capital available to future generations.

The underlying premise of this argument is that private capital markets are inefficient, particularly with respect to making intergenerational transfers. Arrow and Lind (1970) noted that underinvestment, i.e. the growth of capital, and hence the level of asset transfer between generations, is suboptimal, since private capital markets consider private, rather than social, risk. (Fisher (1973) recognized, however, that where

outputs involve public goods or where allocation decisions imply significant irreversibilities, the divergence between public and private risk is not assured.[what do you mean by "assured"?) Marglin (1963) noted that intergenerational transfers of assets may have a public good quality which is not accounted for by private capital markets. Norgaard (1993), Page (1988), Pearce, Barbier, and Markandya (1990), and Sen (1967, 1982) provide additional discussion.

Environmentalists may argue against permitting pure time preferences to influence social discount rates. Time discounting may be discredited because discounting may be considered irrational, a variant of a discussion by Pigou (1932). Individuals may be considered inappropriate and carry no implications for public policy [this is not clear] (discounting follows from the building block of individuals).

Manipulating the discount rate is improper and requires implicit assumptions about the future time path of benefits and costs (Pearce and Markandya). For example, adding a premium to the discount rate for risk and uncertainty about the environmental consequences of projects implicitly assumes that the future time path is exponential [this is not clear] (Dasgupta and Pearce 1972). Risk and uncertainty or other reasons for premiums or discounts are better handled by adjusting the streams of costs and benefits by information on certainty equivalence. In addition, private discount rates that are substantially higher than social discount rates can encourage excessively high resource extraction rates. Resolving this problem is, therefore, better done by improving the property rights structure or implementing optimal fiscal policies than by indiscriminately lowering either discount rate. In fact, reasons for a high private discount rate in less developed countries are often pervasive throughout the economy. Norgaard (1993) argues that lowering discount rates can even worsen environmental degradation, since lowering the cost of capital, and thus production costs, encourages more consumption in the near term.

Norgaard (1993) further argues that intergenerational equity and sustainable development should be framed as a distribution of welfare and equity across generations. Accordingly, society should transfer wealth (including by fiscal policies) rather than engage in inefficient investments arising from ad hoc manipulations of the discount rate. [This makes no sense, even when you straighten out the grammar] Lowering the social discount rate for environmental projects has been proposed but not for other projects. In practice, this is exceptionally difficult because of problems in defining an environmental project. (Pearce, Barbier, and Markandya 1990)

The discount rate is too blunt an instrument to incorporate private and social time preferences, the welfare of future generations, productivity of capital, and economic growth and savings. A unified discount rate for all policy and investment decisions, including environmental ones, is generally recommended (Dasgupta and Maler 1989; Fisher and Krutilla 1975; Lutz and Munasinghe 1993; Norgaard (1993) Pearce and Markandya (1989); Pearce, Barbier and Markandya (1990); Smith 1988). The

comparison between the environmental and other consequences in each time period is made when net benefits are computed using the pre-determined discount rate. Conceptually, if future generations place great value on the environment, the net benefits will reflect this valuation. Thus, conceptually, the net benefit corresponds to the trade-off between environment and other goods that the generation is willing to make, although this may be a very difficult measurement problem. (Dasgupta and Maler 1989) Environmental effects on future generations might also be tackled by shadow pricing investment, using different weights for different generations. The opportunity cost of capital, perhaps adjusted for any consumption displacement effects, is the standard measure of the social discount rate used in project appraisal (Squire and van der Tak 1975). Other means present in these guidelines can then be applied to adjust benefits and costs. Prince (1985) provides further discussion.

The Option Value Approach

A fourth approach tackles uncertainty and irreversibility by using the concepts of option value and quasi-option value (Arrow and Fisher (1974) and Henry (1974). Many environmental and resource changes and their consequences are both uncertain and irreversible. Usually when there is uncertainty, yet there exist possibilities for learning, it may be beneficial to keep options open or retain flexibility in decision making. (Dixon and Sherman (1990) discuss several variants.) Option value is essentially the premium that consumers are willing to pay to avoid the risk of not having something available in the future. Whether or not option value is positive or negative depends upon the presence of supply and/or demand uncertainty, and on whether the consumer is risk averse or risk loving. (Munasinghe and Lutz 1993). The benefit of knowing that the asset will be there when the option to use it is exercised is known as quasi-option value. This is the benefit that arises from delaying an irreversible decision. It can be characterized as the expected value of information that might be gained by delaying an irreversible decision (Conrad 1980). A sort of option value exists even for a risk-neutral investor (Arrow and Fisher, Pearce and Nash 1981). If the individual in question is not certain of a continued preference for the asset, then the option value can be negative. The more familiar case, in which there is uncertainty about the supply of, rather than the demand for, the asset, creates a positive option value. Either way, option value and quasi-option values adjust the consumer surplus measure to account for uncertainty about either demand or supply or both (Pearce and Markandya 1989). Hanemann (1989) provides a comprehensive technical discussion of these issues.

One approach which builds these issues into benefit-cost methodology was developed by Krutilla and Fisher (1975) for preservation, and extended and formalized by Porter (1982). Net benefits may be written as benefits less direct and external costs and less the net benefits of preservation (i.e. net of any preservation costs which are

likely to be positive, i.e. the damage costs) (Pearce and Markandya). All benefits and costs would be discounted by a conventional discount rate. Benefits are likely to increase with time relative to other benefits in the economy at some rate of demand growth, say g. The net effect of letting preservation benefits grow at g per cent per annum and then discounting them is to discount the benefits by [r-g] percent. Krutilla and Fisher adjust development benefits in reverse, since they will be subject to technological depreciation, at say k percent per year. This produces a net discount rate on development benefits of [r+k] per cent. The discount rate applied to development benefits increased.

Pearce and Markandya note this is the essence of the Krutilla-Fisher approach, although there are additional adjustments not considered here. This procedure does not actually require that preservation benefits be estimated. Instead, net benefits of allowing development (excluding option value) are calculated. The question is then asked what the value of preservation benefits would have to be for the development not to take place. While this approach has the same effect on overall cost-benefit analysis as lowering discount rates, it avoids the problem of distorted resource allocations caused by arbitrarily manipulating discount rates. Finally, Munasinghe and Lutz (1993) recommend, "In the case of projects leading to irreversible damage, cost-benefit analysis should be adapted to the extent possible, to include a measurement of the foregone benefits of preservation in the computation of costs."

Nontraditional Projects and the Distribution of Income

Standard cost-benefit analysis or project appraisal does not, in practice, differentially value the costs and benefits for persons affected differently (Little and Mirrlees 1990, Squire 1989). Standard analysis relies upon the Kaldor compensation test, in which benefits outweigh the costs if the gainers can potentially compensate the losers and the net benefits remain positive. Standard analysis does weight each individual, but does so implicitly, by assigning an equal weight to each person. The procedure to explicitly take into account income distribution by assigning explicit weights based on the relative income or consumption of each person has been developed in great detail (Squire and van der Tak 1975, Ray 1984). The weights are calculated according to the marginal utility of income or consumption of each individual on the basis of some explicit utility function. Persons with income or consumption levels greater than the standard reference level, usually the mean per capita level, receive a lower weighting, since the marginal utility of an additional unit of consumption or income declines faster for these persons than for persons with incomes or consumption below the reference level. That is, persons with greater levels of income experience diminishing marginal utility thereby providing a lower weight.

Standard cost-benefit analysis or project analysis routinely relies upon a descriptive account of the distributional consequences rather than explicit weighting

according to the consumption or income levels of the gainers and losers (this latter has fallen out of practice). However, many projects or public policies whose benefits may fall largely on persons with low incomes or consumption levels may not pass the standard decision criteria, such as having a positive net present value or internal rate of return greater than the discount rate. This outcome then militates against projects or policies designed to enhance the environment or well-being of these poorest groups, whose measured benefits would be very small, but whose utility gains could be substantial (Markandya 1991).

The monetary values for many of these projects or policies may be low in areas where incomes are low, so that the results from standard benefit-cost analysis may be biased against improvements in well-being from nontraditional projects (Markandya 1991). Yet these may be the areas with the greatest need. Markandya discusses an alternative to the weighting of distributional gains as discussed above. Benefits can be measured in terms of willingness to accept income for loss of amenity, rather than in terms of willingness to pay for an improvement. The difference should be small if the income is small or if the increase in welfare is small. However, the improvement for poor households could represent an important part of their welfare so that the difference may be significant.

Other AID Guidance on Economic Analysis

The approach discussed above for economic analysis of natural resource and policy reform is, for the most part, consistent with the general approach suggested in the AID Manual for Project Economic Analysis (1987). The art of valuing non-market benefits has advanced greatly in the seven years since that manual was written. There are also several errors in the manual. The most significant is a statement on page 10 that states that "intangibles by definition cannot be valued". Intangible, is of course, not an alternative way of saying that something cannot be valued. In fact, the example given of health effects from pollution is not even an intangible. Disease and illness is certainly tangible. An intangible might be something like valuing aesthetics, yet even this can be valued.

The section on economic analysis in AID Handbook 3 is quite reticent on the issues discussed in this paper. As in the AID Manual, the general process for conducting analyses, following the impact transmission, identifying who is affected and estimating the net welfare effect on these groups is a sound approach.

ANNEX A

REVIEW OF TECHNIQUES FOR VALUATION OF "NON-MARKET" GOODS

In the past several years there have been tremendous advances in the valuation of non-market benefits. Below we provide a brief overview of the different methodologies. This should be sufficient for the non-economist (e.g., the Mission Director) to understand what can and can not be done given available resources. It is expected that economists used to perform economic analyses of projects involving non-market benefits would be thoroughly familiar with these methodologies.

Direct Questioning Methods (Contingent Valuation Method - CVM)

Overview of technique

The most obvious way to measure non-market values is to ask individuals in some form or another "how much would you be willing to pay to avoid (for example) the development of waterfront property". Measures obtained using this technique rely on individuals' responses rather than information on their behavior (as do both the market methods discussed above and the indirect non-market methods discussed below). The **contingent valuation technique** constructs a hypothetical market that exists only as it is described in the survey, and participants respond to hypothetical changes in environmental quality by expressing, in some form or another, their willingness to pay (or to accept compensation) for the change.

This method is based on the direct solicitation of values from individuals by means of a survey. Randomly selected samples or stratified samples of individuals are given information about a particular problem. Each is then presented with a hypothetical occurrence (e.g. a disaster, a policy action which ensures against a disaster, etc.) and asked how much he/she would be willing to pay (in extra utility taxes, income taxes, or access fees, etc.) either to avoid a negative occurrence or to bring about a positive one. The actual format may take the form of a direct question ("how much?") or may be a bidding procedure, a ranking of alternatives or a referendum vote. The resulting data are then analyzed statistically and extrapolated to the populations that the samples represent.

Contingent valuation studies are conducted as face-to-face interviews, telephone interviews or mail surveys. The former is most expensive but generally considered the best, especially if visual material needs to be presented. Non-response bias is always a concern in all sampling frames.

It is generally believed that the reliability of the contingent valuation method depends on such things as the respondent's degree of familiarity with the good, the information context, the inclusion of information about substitute goods in the questionnaire, the time allowed for consideration and response.

Contingent valuation has been applied to determine how citizens of two developing Latin American countries value water quality (McConnell and Ducci). It will be the only technique to value existence values such as biodiversity (Randall).

Advantages of the technique

The contingent valuation technique can, in principle, be used to estimate the economic value of anything, even if there is no observable behavior available to deduce values through other means. By definition, it is the only method that has any hope of measuring existence values, since existence values are not connected with use and all other methods depend on observing behavior associated with the resource. Besides natural resources, this may be the best technique to value governance and democracy projects.

The technique requires competent survey analysts etc. to achieve defensible estimates, but it is not difficult to understand. The responses must be statistically analyzed, but it is obvious how the results are obtained.

Disadvantages of the technique

This technique appears easy, but it's application is fraught with problems. Much has been written on the possibility of strategic bias by respondents or structural problems in questionnaire design that can also cause bias. Questions must be constructed in ways to maximize the chance of getting truthful and well-informed answers. Question framing, payment formats, interviewer interactions, etc. can all affect results. Additionally, since everyone can not be surveyed, samples must be constructed such that results can be extrapolated to the population as a whole. The entire process is complex and, to hold up in any serious debate, must be accomplished according to state-of-the-art requirements. The debate over CVM has been fueled by the numerous poor applications of the methodology. Because the approach appears so straightforward, it has been applied "carelessly" in a number of studies with less than defensible results.

Done "correctly" or at least by the increasingly exacting standards of the profession, these studies can be very expensive (because of the extensive pre-testing and survey work). The standards have become more exacting because CVM has come under considerable attack by some parts of the economics profession and by industry. Currently, the petroleum industry is challenging the technique, especially as it is applied to measuring existence values. It is important to note that non-use values can be measured by no other technique. Consequently, discrediting CVM effectively eliminates non-use values from environmental valuation.

Data needs

The more information that is known *a priori* about the way people think about the resource in question, the better will be any CVM questionnaire. Information on who uses the resource and who knows about it are critical. When CVM is applied to use values, the economist undertaking the CV survey will want to sample the populations most likely to use the resource. The key point is that, while all the information necessary for assessing an individual's value is collected in the survey, the economist needs help in identifying a representative sample and information that would allow extrapolation to the population. Otherwise, all the information necessary for analysis is provided through the survey.

Indirect techniques

Direct techniques rely on observable behavior to deduce how much something is worth to an individual, even though it is not traded in markets. These methods produce value estimates that are conceptually identical to market values, but must be measured more "deviously" since each individual's behavior in the context of markets is not observable.

Travel Cost Models

Overview of technique

Travel cost is a relatively old technique applied to measure recreational values. It has been improved and made more sophisticated over time. If one understands welfare measurement in markets, then the idea here is quite simple to grasp. We recognize that even though recreational trips are not actually goods purchased on markets, they can be thought of in a similar way. Individuals expend both money and time (which they clearly value) to access a recreational site. Different individuals have different time and money costs and take different numbers of trips. A demand curve for trips can be estimated from this sort of information and appropriate changes in areas used to measure values.

This technique can be used to measure the effects of changes in access costs, the elimination or creation of a site, and changes in the environmental (or other types of) quality at a site. The latter topic has been the subject of a good deal of recent work. Frequently, random utility models, which are an offshoot of the travel cost method, deal better with quality issues (see below).

Issues that require attention include:

(1) providing an appropriate measure of the time costs as well as monetary costs, because time costs are often far more important in recreational consumption;

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(2) characterizing the quality dimensions of the site and taking proper account of substitute sites and their characteristics;

(3) estimating both the individual's decision as to whether to use the site and his/her decision about how much to use the site.

Advantages

This technique is not controversial because it mimics empirical techniques used elsewhere in economics. Economists generally tend to prefer techniques of this sort because they are based on actual behavior rather than on verbal responses to hypothetical scenarios. Individuals are actually observed spending money and time, and their economic values are deduced from their behavior.

In circumstances where these approaches are applicable, they can often be accomplished without enormous expense.

Disadvantages

The greatest disadvantage of travel cost and other indirect techniques is that they can not be employed unless there is some easily observable behavior that can be used to reveal values. This may even be true for use values, especially if the valuation problem is one in which a previously non-existent resource will be provided. Obviously, in the case of non-use values these methods are useless.

A second disadvantage is that they are technically and statistically complicated. Understanding the conceptual measure requires understanding the connection between consumer surplus (measures of changes behind demand curves) and the "maximum willingness to pay" concept. Additionally, data must be employed to statistically estimate increasingly sophisticated econometric models that take into account sample selection problems, non-linear consumer surplus estimates, etc. Finally, resulting estimates have sometimes been found to be rather sensitive to arbitrary choices of functional form of the estimating equation, treatment of time, etc.

Much technical work has been dedicated to improving these methods over time, but they will continue to be subject to the problems that plague all empirical economic estimation.

Data needs

The early travel cost models used information on the proportions of visitors from increasingly distant zones of origin from which their travel occurred (called "zonal models"). Current methodology requires data on individual travellers. Typically this information is collected through surveys. On-site surveys can provide heavy sampling of users but these need to be augmented with surveys of the general population to learn what proportion (with what characteristics) use the resource. This latter survey also provides information that helps the economist estimate the participation decision.

Unfortunately, a travel cost study can only assess the current situation. In order to assess the gains or losses from changes in the recreational resource, economists need travel cost studies done under different circumstances or some way of extrapolating the changing effects. Ideally, an important recreational resource could be subject to a period travel cost study, so that the effect of differing conditions of the resource could better be estimated. This is especially true if one is measuring the damages from a project. The economist would find invaluable a travel cost study that had been completed before the project was undertaken.

In the absence of such ideal studies, the researcher would find useful any information on the historic level of use of the resource, information on number of users, their location of residence, and frequency of use. Additionally, any information that would aid in sample design would be useful - when is the resource most heavily used and by whom?

As with all environmental valuation, the most difficult job of the researcher is connecting the environmental event with the effect on the user. Any insights here are invaluable. In the development case, the analysis would need to be hypothetical. In order for the researcher to use results from his travel cost model, he would need to know how recreationists would be affected by the development activity and how that effect would translate into changes in behavior.

[Why don't you discuss the travel cost model developed by Mercer and Kramer for a proposed National Park in Madagascar? You make reference to it in the bibliography, but no where else.]

Random Utility Models (RUM)
Overview

These models are conceptually linked to the travel cost models. They seek the same sorts of values and use the same sort of logic. However, instead of focusing on the number of trips a recreationist takes to a given site in a season, these models focus the recreationist's choice among alternative recreational sites. This type of model is particularly appropriate when there are many substitutes available to the individual and when the change being valued is a change in the quality characteristics of one or more of his site alternatives.

Advantages

The same advantages that apply to travel cost apply here. Many see this method as the state-of-the-art in recreational demand modelling. Relative to the travel cost model, this approach deals well with substitute sites and environmental quality considerations.

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Disadvantages

The approach has all the disadvantages of the travel cost method and, in addition, it is much more data intensive.

Data needs

The approach has the same types of data needs as travel cost and more. The researcher needs to know what alternative sites are considered by recreationists and all the recreational behavior with respect to all these alternative sites. Additionally, accurate measurement of the characteristics of the alternative set is important.

Hedonic Methods
Overview

Hedonic models are used in economics to capture the relationship between the bundle of characteristics a good has and its price. Their application in environmental economics depends on there being an observable market (such as a housing market or labor market) that might be affected by an environmental quality characteristic of interest.

Hedonic models estimate the implicit price of the characteristics of a good. The price of a house, for example, may be affected by the number of bedrooms, the square footage, the existence of a pool, the proximity to local schools, etc. The price of the house may also be affected by the proximity and/or quality of environmental amenities. Air quality has been found to be a determinant of housing prices in Los Angeles. Whether or not a property abuts a woodland may also matter. Where existing private residential property abuts an area affected by a spill or by some proposed development, hedonic methods may be used to estimate the effect of these disamenities on the price of a house.

It is reasonably straightforward to estimate a hedonic (implicit) price function relating housing prices to the quantities of various characteristics. However, it is much more difficult to derive value measures from these estimated functions. Only under very restrictive assumptions can values be obtained directly from these estimated functions. In most cases a two stage procedure depending on information from multiple markets is necessary.

Advantages

This technique depends on observable data, and relies on the revelation of preferences through market behavior. As such, it suffers from none of CVM's disadvantages. Market data on property sales and characteristics are available through real estate services and municipal sources and can be readily linked with other secondary data sources.

Disadvantages

Most environmental incidents will have only small, if any, effects on housing prices. Even where there are effects, it may be difficult to estimate them using econometric methods because so many factors influence housing prices, and many are correlated.

Even when implicit prices for environmental amenities can be estimated, it is usually very difficult to obtain measures of value from these models. The connection between the implicit prices and value measures is technical very complex and sometimes empirically unobtainable.

Data needs

Data needs include prices and characteristics of houses sold in the housing market of interest.

ANNEX B

BIODIVERSITY

Biodiversity refers to variation in the genetic characteristics of organisms and can exist on several levels: among different species that are members of a community of organisms or an ecosystem; within a species, among different populations; and within individual plant or animal populations (Harrington and Fisher 1982). All three kinds of variation are crucial to the ability of a species to survive and to continue to evolve successfully in response to changes in its environment. The smaller the population, the less the variability among individuals, and the greater the chance of extinction. Biological diversity at all three levels is also essential to the development of new products, such as medicines or agricultural advances. Finally, there are also aesthetic benefits arising from biodiversity. (Harrington and Fisher 1982)

The biodiversity issue arises due to overexploitation of particular species, but more importantly, from destruction of natural habitat (Fisher 1988). Preservation of biodiversity rests upon preservation of the natural environment and the supported natural populations. Fisher (1988) identifies two key elements: irreversibility of development and the accumulation over time of information about the values (if any) that development would preclude.

Solow, Polasky, and Broadus (1993) assume that reductions in biological diversity occur only when species become extinct and provide the first paper to introduce an explicit decision-theoretic framework for dealing with biodiversity preservation. They focus on defining and then measuring, rather than valuing, biological diversity. They consider the contribution of a species to biodiversity based not only on its genetic distinctiveness, but also on the effect that its extinction would have on the extinction probabilities of other species.

Weitzman (1992, 1993) theoretically discusses and then defines an operationally meaningful value of diversity function. Weitzman notes that if diversity cannot be measured, then rational decision-making is limited. Weitzman (1993) shows how "diversity theory" can be applied to analyze conservation policy. Weitzman defines diversity as a measure of collective dissimilarity. Weitzman, along with Solow, Polasky, and Broadus, note that the overall objective in an actual conservation problem might include direct benefits (e.g. use value, existence value) that are not reflected in the diversity function, but that the direct benefits, however appraised, can be added together with the value of diversity function to obtain a more comprehensive objective function. Weitzman (1993) provides an example of the diversity function.

Weitzman (1993) further notes that requirements to do a thorough analysis of the best way to preserve biodiversity include a decent understanding of the relationships

of species to each other, the relevant survival probability distribution functions, and the costs of improving species survival. Without a sense of the magnitude of the appropriate species distances, extinction probabilities, and extinction probability reduction costs, society is unlikely to do a good job of obtaining the maximum diversity out of the limited conservation resources that it is willing to spend on the problem.

Describing the beneficiaries of biodiversity projects is an exercise which reinforces the need for AID to explore the issue of which groups may be counted in measuring project benefits. Most of the impetus for preservation of biodiversity is coming from industrialized countries (Hanneman). In other words, it is the industrialized countries who have relatively high willingness-to-pay for preservation of biodiversity. Typically, measurement of project benefits has been restricted to the country or region where the project is undertaken. Less-developed country inhabitants may have a low willingness-to-pay for biodiversity when they are concerned with basic survival.

As pointed out by Clark (1976), the present value criterion may justify extinction of slowly growing populations of species. From the perspective of society, the social value of a species needs to be evaluated. Even after accounting for the existence value of a species, extinction may be justified extinction. Nonetheless, when uncertainty about the future value of a species is important, additional factors require consideration.

Cost-benefit analysis has been suggested to address the erosion of biodiversity (Bishop and Woodward 1993, Tisdell 1991). Smith and Krutilla (1979) suggest a direct extension of the conventional criteria for optimal public investment to take account of the irreversibilities associated with actions involving natural environments, including actions affection endangered species. Such a model assumes that all benefits and costs are fully described and the nature of uncertainty was enumerated. Along these lines, Brown and Swierzbinski (1989) suggest that not all species should be preserved, and that only those species should be preserved for which expected net benefits of preservation are positive. Dixon and Sherman (1990) note that the quantifiable monetary benefits are frequently less than the total benefits.

Preserving only those species with positive net benefits (only those species for which preservation is potentially efficient), however, may not be sufficient to assure a sustainable economy. This approach also measures the net benefits of preservation given the present structure of endowments as interpreted by the current generation. The benefit-cost test also does not assure that future generations will receive full compensation commensurate with resulting losses from their endowment (Bishop and Woodward).

In contrast, Freeman (1993) asserts that the economic framework, with its focus on the welfare of humans, is inadequate to value biodiversity, ecosystems, or reduction of ecological risks. Freeman maintains that economists may be able to evaluate costs of policies, but, except where nonuse values [do you mean nonuse values?] are involved and where people use ecosystems (such as commercial fisheries or recreation), economists will

not be able to develop comparable welfare measures of benefits. Freeman (1993) states that contingent valuation is the only method available for estimating nonuse values and the values of ecological stability and biodiversity, where biodiversity refers to ecological functions that do not affect human welfare directly and for which people do not have a willingness to pay. In this regard, Weitzman argues that the value of diversity function can be combined with direct benefit values.

The concept of sustainability has also been suggested as an alternative rule to value environmental projects when more standard approaches, such as cost-benefit analysis, are unacceptable or inappropriate (Markandya 1991). If development is to be sustainable in the long term, key environmental resources, such as biodiversity or ecosystems providing a multitude of ecological functions, need protection, irrespective of their current value. Frequently, their current value cannot be properly assessed in any event.

The theory of a safe minimum standard, designed to allow for uncertainty about the future repercussions from species extinction, is also relevant to issues of biodiversity and the protection of natural areas such as national parks, natural or scientific reserves, or wildlife sanctuaries (Ciricacy-Wantrup 1968; Bishop, 1978; Dixon and Sherman 1990; Tisdell 1993). The safe minimum standard approach modifies the minimax criterion. The decision maker adopts the strategy which maximizes the minimum possible gain or which minimizes the maximum possible loss to entail the highest possible avoidance of risk. The approach recognizes that there is an unknown probability, i.e. uncertainty, about the likely value of species in the future and hence the possible losses from the extinction of a species. It also recognizes that the likely future outcomes from current policies are poorly understood. The safe minimum standard principle advocates avoiding the potential losses unless they would involve an unacceptably large known cost. More specifically, if the size of the possible loss from species extinction exceeds the cost of maintaining the species at a safe minimum population level, the minimax strategy opts for species preservation at the safe minimum level. Otherwise, extinction is the minimax strategy (Tisdell 1993). Dixon and Sherman state (p. 21), "Essentially the decision becomes a question of accepting some known cost today to prevent a potentially larger cost in the future." Bishop (1978) argues that the cost of preserving many species is low in relation to the potential gain foregone by not preserving them at the safe minimum level. Finally, Tisdell (1993) notes that current generations will bear the lion's share of the cost of saving a species from extinction but that future generations may be the main beneficiaries, and that intergenerational income distribution issues arise.

There are several limitations to the safe minimum standard approach (Bishop 1993; Bishop and Woodward 1993). It seems unlikely that a first-best solution can be achieved by this approach. Because of ignorance about which species will ultimately prove valuable and which will not, and given that the approach depends upon the

current generation's judgement as to what represent intolerable costs, the optimum number of species will not be gained. Economic development opportunities that would have yielded positive net benefits to both present and future generations but that would have caused extinctions may be abandoned. Moreover, overly zealous application could make both present and future generations worse off. The approach would help limit extinction to those that could be saved only by bearing unacceptably high costs or through unacceptable sacrifices in other social objectives.

The outcomes of some decisions or projects affecting biodiversity may be irreversible, such as those leading to species extinction. The passing of time brings information about the consequences of these actions, creating a premium on actions that preserve the flexibility to exploit this information. If a current decision is physically or economically irreversible, that flexibility is abandoned (Hanneman 1988). Hence, quasi-option value can be a particularly important concept for projects affecting biodiversity. Uncertainty about the benefits of environmental preservation or degradation derived from the expansion of future knowledge leads to a positive quasi-option value. If information growth is contingent upon project implementation, then quasi-option value is positive when the uncertainty concerns the benefits of preservation, and negative when the uncertainty is about the benefits of the project (Munasinghe and Lutz 1993).

The level of aggregation for valuation and project analysis is also important (Hanneman 1988). Individual species or groups of species could be analyzed. Alternatively, the ecosystem as a whole could be evaluated. In principle. is is an empirical issue, with the solution dependent upon two factors: the way in which individuals perceive and care for natural environments (aspects important to them) and the way the ecosystem functions (the biological linkages). Because species generally do not exist independently, species on which others depend have a contributory value in addition to their direct uses. Thus full measures of value of a species requires determining the values of all other species dependent upon it. (Norton 1988).

Applications of the travel cost model to estimate the value of nature tourism requires a significant reformulation of traditional travel cost models (Mercer and Kramer 1992; Munasinghe 1993). The basic model specifies the problem in terms of valuing single-purpose, single destination day-trips for a typical recreation experience at a site similar to many others. The basic model can directly estimate the demand of local recreators. The international model must contend with the decision to pursue nature tourism and at a particular site by foreigners flying great distances, utilizing various modes of travel to visit numerous sites in a country, and enjoying a number of other, recreational and nonrecreational activities in the country. Incorporation of these additional factors to give an international travel cost model are reviewed in detail by Mercer and Kramer (1992) and summarized by Munasinghe (1993).

A simple biodiversity index can be used to analyze environmental impacts of some projects when there are severe constraints on data, resources, and time (Munasinghe

1993). Detailed site-specific information at potential project sites is frequently unavailable. Hence, the only quantification of biodiversity impacts at this level of aggregation may be a probabilistic estimate giving the decision-maker information about the likelihood of adverse effects on endemic species, significant impacts on ecosystems of high biological diversity, or degradation of a habitat already in a marginal condition.

The simple biodiversity index contains several components (Munasinghe 1993). First is the nature of the affected ecosystem. The main ecosystems are ranked and assigned a value, w_j, capturing the relative biodiversity value of different habitats. Second is relative valuation, since the value of area lost is a function of the proportion of lost habitat. The biodiversity index associated with site i, B_i, is then: $B_i = \Sigma_j A_{ij} w_j$, where A_{ij} is the area of ecosystem of type j at site i.

Cost-effectiveness analysis (discussed below) can also be applied when the objective of protecting biodiversity a or broad ecosystem has been selected on other grounds, and the choice lies among alternative approaches.

The opportunity cost approach is another alternative that can be used when other techniques are ineffective or inappropriate (Dixon and Sherman 1990). The approach involves identifying what will have to he given up to protect a unique resource. The net economic benefits of a biodiversity project, such as protection of a natural habitat, are compared with the qualitative benefits of protection. If the net economic benefits of the alternative use are negative or positive but low, protection may be justified, since the economic opportunity cost is slight. The decision is complicated when the economic costs are large. The opportunity cost approach can also be used to evaluate different sites for a proposed development project (Dixon and Sherman 1980). An alternative site may be as advantageous for the project as the natural habitat, but the reduction in project benefits associated with the alternative site may be more than outweighed by the benefits of protecting the original site. The opportunity cost approach evaluates the difference in project benefits associated with the two sites and compares it to the benefits of protecting the original site.

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GLOSSARY

benefit-cost analysis - A technique to compare the relative economic efficiency of different states of the world usually brought about by undertaking projects or policies. A comparison is made between gross benefits of a project or policy and the opportunity costs of the action. Benefits and costs are measured as changes in consumer and producer surpluses accruing to individuals in society.

biodiversity - [Need to complete this, or delete it. I recommend deleting it.]

consumer surplus - A money measure of an individuals' or groups' welfare based on their consumption of a good or service or the existence of a particular state of the world. The difference between the maximum the individual is willing-to-pay for consumption of the good and the amount that has to be paid.

contingent valuation - a methodology to measure, in monetary terms, change in welfare by describing a hypothetical situation to respondents and eliciting how much they would be willing to pay either to obtain or to avoid the situation.

cost-effectiveness analysis - Also known as least-cost analysis. Selects the least-cost alternative to achieving a given objective or selects the best physical benefits that minimize costs. Cost -effectiveness analysis measures the costs but not the benefits for a given objective in monetary terms. Cost-effectiveness analysis cannot indicate whether the benefits are worthwhile or not. This determination must be made on some other basis.

discount rate - The rate which permits the calculation of the value today of an amount to be received or paid out in the future. The process of finding the present value is generally referred to as discounting.

environmental valuation - procedures for valuing changes in environmental goods and services, whether or not they are traded in markets, by measuring the changes in the producer and consumer surpluses associated with these environmental goods.

existence value - see non-use value

hedonic method - A methodology for estimating the relationship between the price of a good (e.g. housing) and the characteristics of the good (e.g. number of bedrooms, air quality, proximity to amenities, etc.). The hedonic method can sometimes be

used to value changes in characteristics.

input-output model - A methodology that models the linkages between input supplies, outputs, and households in a regional economy that can be used to predict the impact of changes on economic activity (e.g. industry revenues and household incomes) within the region.

least-cost analysis - See cost-effectiveness analysis.

market benefits - Benefits from goods or services bought and sold in normal commerce, such that there is a revealed price that reflects consumers' willingness-to-pay for the quantity offered and suppliers marginal production costs.

non-market benefits - Benefits that accrue to individuals for goods, services, experiences or states of nature that are not normally traded in commerce.

non-use value - see use value. The value of knowing that something exists in a particular state, even though there is no sensory contact with the resource.

option price The measure of the ex ante value of a prospect. The option price values what a person would pay for future benefits today.

option value The difference between expected consumer surplus and option price. The option value may be positive, negative, or zero. More intuitively, option value is essentially the premium consumers are willing to pay to avoid the risk of not having something available in the future; it provides a potential use value.

opportunity cost - The highest value a productive resource, such as labor, capital, land or a natural resource, could return if placed in its best alternative use

producer surplus - Total revenue minus the opportunity cost of production.

quasi-option value - The benefit from preserving a resource in the present in expectation that additional information will be forthcoming about the value of benefits or costs associated with the resource. The quasi-option value is the value to avoiding irreversible decisions.

random utility model (RUM) - An extension of the travel cost method which explicitly considers an individual's decision to participate and the selection among alternative recreation sites.

shadow prices - [this should be defined]

shadow projects - Hypothetical projects to provide substitute environmental services to compensate for the loss of environmental assets under ongoing projects that have negative environmental impacts. Shadow projects are increasingly mentioned as a possible way of operationalizing the concept of sustainability at the project level. The approach involves the design and cost of one or more shadow projects.

travel cost method - A methodology which relies on travel-related costs as a surrogate for price in a non-market situation in order to estimate demand and money measures of willingness-to-pay.

use value - Value derived from either the consumption of a good or the utilization of a service, or that otherwise involves some sensory contact with the resource. For example, whale-watching in not consumptive, but involves visual contact with the whales.

value - What one is willing to give up in order to obtain a good, service, experience, or state of nature. Economists try to measure this monetarily.

welfare economics - A field of inquiry within the broad scope of economics that is concerned with money measures of individual and social well-being, particularly with changes in well-being due to the implementation of public policies.