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USAID Environmental Workshop on Performance Measurement

March 30-31, 1995

Arlington, VA

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USAID ENVIRONMENTAL PERFORMANCE MEASURMENT WORKSHOP
MARCH 30-31, 1995
ARLINGTON, VIRGINIA

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AGENDA

US AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID):
ENVIRONMENTAL PERFORMANCE WORKSHOP
DAY 1

-Thursday March 30-

9:00--9:10	Welcome: Introduction and General Remarks	(AUD)	Prickett
9:10--9:20	Performance Measurement Perspective	(AUD)	Ballantyne
9:20--9:45	Workshop Goals and Agenda	(AUD)	Gale
9:45--10:15	USAID Taking Stock: PRISM	(AUD)	Gale/Martin
10:15--10:30	USAID Country-Level Perspective	(AUD)	Nissly
10:30--10:40	Coffee/tea/soda	(CAF)	
10:40--11:15	Indicator Overview	(AUD)	Tunstall
11:15--11:30	Indicators: Eastern European Perspective	(AUD)	Shaikh
11:30--11:45	EPA Perspective	(AUD)	Devonald
11:45--12:00	Project-Level Insights	(AUD)	Fiebig
12:00--12:15	Questions and Answers	(AUD)	Panel
12:15--1:15	LUNCH and DISCUSS	(CAF)	
1:00--1:15	USAID Managing-for-Results: Overview	(AUD)	Pryor
1:15--3:15	Breakout Session #1 (Indicator Scan)	(CLA)	Teams
3:15--3:30	Coffee/tea/soda	(CAF)	
3:30--4:30	Group Report-Outs	(AUD)	Teams
4:30--5:00	Day 1 Wrap-Up	(AUD)	Panel

Day 2
-Friday March 31-

9:00--9:10	Review/Revise Day 2 Agenda	(AUD)	Gale
9:10--9:30	Biological Diversity	(AUD)	Frumhoff
9:30--9:50	People Level Measurement	(AUD)	Urban
9:50--12:00	Breakout Session #2 (Indicator Array)	(CLA)	Teams
12:00--1:00	LUNCH and DISCUSS	(CAF)	
1:00--1:30	Group Report-Outs/ Questions and Answers	(AUD)	Panel
1:30--3:30	Final Breakout Session (Indicators Selection)	(CLA)	Teams
3:30--3:45	Coffee/tea/soda	(CAF)	
3:45--4:45	Final Report Outs, Discussion and Recommendations	(AUD)	Teams
4:45--5:00	Wrap Up and Next Steps	(AUD)	Panel

List of Speakers
USAID Environmental Performance Workshop
March 30 and 31, 1995

Janet Ballantyne,
Center for Development Information and Evaluation, USAID

F. Kim Devonald,
U.S. Environmental Protection Agency

William Fiebig,
Desfil/Rodale Institute

Peter Frumhoff,
Department of Zoology, University of Maryland

Steven Gale,
Center for Development Information and Evaluation, USAID

Roberto Martin,
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Curt Nissly,
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Glen Prickett,
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Tony Pryor,
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Asif M. Shaikh,
International Resources Group

Dan Tunstall,
World Resources Institute

Anne Marie Urban,
Women In Development Office, Global Bureau, USAID

USAID ENVIRONMENTAL WORKSHOP ON PERFORMANCE MEASUREMENT
MARCH 30 AND 31, 1995

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- *Final Implementation Guidelines*
- *USAID Evaluation News*
  Issue on Performance Measurement
  Tracking AID's Environmental Programs

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- *Annual Report to the Administrator on Program Performance (Core Report)*, Feb. 1995
- *Annual Report on Program Performance*, 1994

Section III: **Perspectives on Environmental Measurement from our non-USAID Colleagues**

- *Developing and Using Indicators of Sustainable Development in Africa: An Overview* by Dan Tunstall, World Resources Institute, 1994
- *The Bank's Work on ESD Indicators: A Source Guide*, by John O'Connor, World Bank, 1994
- *Indicators of Ecologically Sustainable Development: Towards New Fundamentals*, by H. Jack Ruitenbeek, November 1991

Supplemental ~~Envelope~~

-Breakout Session Orientation Information
-Data Resources from WRI/EPA Database
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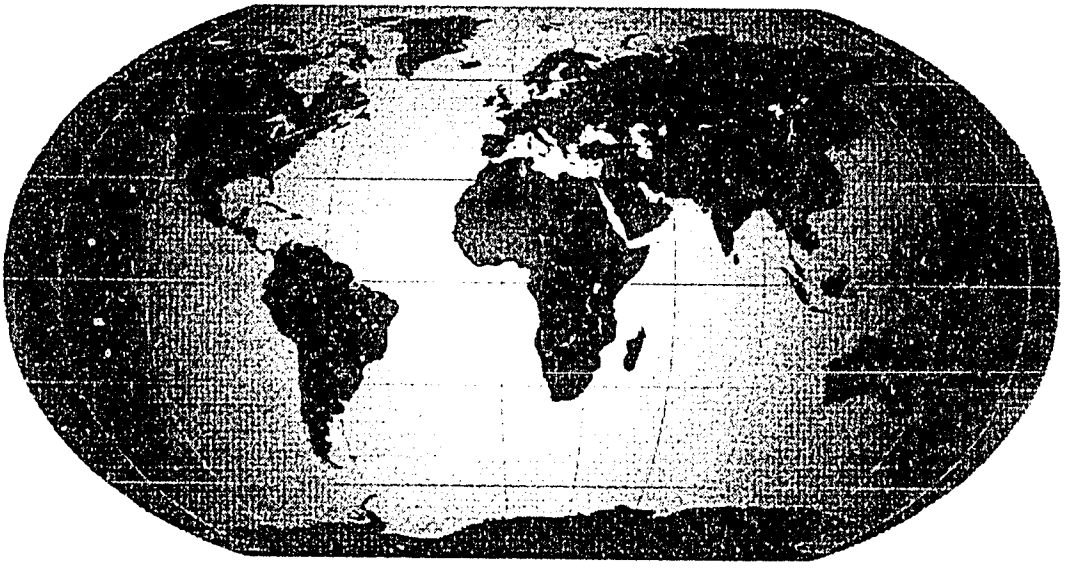
-SANREM Workshop Selected Proceedings (Arlington, VA; August, 1994)

Strategies for Sustainable Development



U. S. Agency
for International
Development

March 1994

USAID's Strategy for Sustainable Development: An Overview

THE CHALLENGE

The United States Agency for International Development was created in 1961 with two purposes in mind: to respond to the threat of communism and to help poorer nations develop and progress. Both were legitimate strategic roles for the Agency; both were grounded in the belief that it was possible to defend our national interests while promoting our national values.

In these capacities, USAID helped the United States achieve critical objectives. It advanced a foreign policy that embodied a commitment to justice and liberty, a desire to bring the benefits of democracy to people throughout the world, a willingness to be a helpful neighbor, a humanitarian response to people in need, and a determination to lead. Over three decades, USAID achieved considerable success fulfilling these strategic mandates.

With the end of the Cold War, the international community can now view the challenge of development directly, free from the demands of superpower competition. The international community in general and the United States in particular have an historic opportunity: to serve our long-term national interests by applying our ideals, our sense of decency, and our humanitarian impulse to the repair of the world.

It is not wishful thinking to believe that we can constructively address the pollution of the seas and the air, overburdened cities, rural poverty, economic migration, oppression of minorities and women, and ethnic and religious hostilities. On the contrary, the cost of not acting, of having to deal with the global impact of imploding societies and failed states, will be far greater than the cost of effective action. Investment in development is an investment in prevention.

Serious problems of development will yield to effective strategies: This is a lesson of the last 30 years. Many poor nations have experienced unparalleled economic growth during this time. Some have become predominantly middle-class societies; others are well along in similar transformations. In many nations, poverty has declined significantly. Foreign assistance has accomplished much: Vast resources and expertise have been invested to help poor countries develop, and millions of lives have been made better as a result.

Why then is the issue of development so urgent now? It is no exaggeration to suggest that the challenges we face constitute potential global threats to peace, stability, and the well-being of Americans and people throughout the world.

The threats come from a multitude of sources:

- The continuing poverty of a quarter of the world's people, leading to the hunger and malnutrition of millions and their desperate search for jobs and economic security.

- Population growth and rapid urbanization that outstrip the ability of nations to provide jobs, education, and other services to millions of new citizens.

- The widespread inability to read, write, and acquire the technical skills necessary to participate in modern society.

- New diseases and endemic ailments that overwhelm the health facilities of developing countries, disrupt societies, rob economies of their growth potential, and absorb scarce resources.

- Environmental damage, often arising from population pressures, that destroys land, sickens populations, blocks growth, and manifests itself on a regional and global scale.

- And finally, the threat comes from the absence of democracy, from anarchy, from the persistence of autocracy and oppression, from human rights abuses, and from the failure of new and fragile democracies to take hold and endure.

Americans cannot insulate themselves from these conditions. Pollution elsewhere poisons our atmosphere and our coastal waters and threatens the health of our people. Unsustainable population growth and spreading poverty can lead to mass migrations and social dislocations, feeding terrorism, crime, and conflict as desperate people with little to lose attempt to take what they want by force.

These threats pose a *strategic* challenge to the United States. If we do not address them now, we shall have to pay dearly to deal with them later.

To respond in a meaningful way, the United States must articulate a strategy for sustainable development. It must forge a partnership with the nations and the people it assists. It must focus on countries where its help is most needed and where it can make the most difference. It must make the most of limited financial resources and employ methods that promise the greatest impact. And the United States must bring all its resources to bear — not only its money, but its expertise, its values, its technology, and most of all, the involvement of ordinary Americans.

Effectively delivered, development assistance provides a powerful means to address, ameliorate, and even eliminate the problems of rapid population growth, environmental degradation, endemic poverty, debilitating hunger, mass migration, and anarchy. We cannot "develop" nations, but we can help them unleash their productive potential and deal effectively with the challenges of development. As President Clinton has affirmed, foreign assistance is a central component [illegible] effective foreign policy. Development cooperation is not just a tactic, but an integral part of our vision of how a community of nations, some rich and some poor, should function.

Because development assistance is designed to help other nations deal with the problems of national life peacefully and productively, our work is both altruistic and self-interested. Successful development creates new markets for our exports and promotes economic growth in the United States. America's poor increasingly benefit from development methods pioneered abroad, such as microenterprise and childhood nutrition interventions. Moreover, foreign assistance facilitates international cooperation on issues of global concern.

USAID lacks the resources to implement all the programs outlined in these papers, and budgetary pressures are forcing our nation to make hard choices among worthy investments. Yet we believe that those choices cannot be made unless the full extent of the threat is understood. These papers are both battle plans and advocacy docu-

ments. They articulate a strategic vision that will guide our work. They also are designed to focus attention within the Executive Branch, in Congress, among the American people, and within the donor community on the crucial role that promoting sustainable development must play in our foreign policy.

The current situation demands nothing less. It is unrealistic to expect that international conflict, oppression, and disorder can be eradicated. But it is not unrealistic to try to address those problems by providing nations, communities, and individuals with opportunities for development. The ultimate dividend should be nothing less than a more peaceful, more prosperous world.

OPERATIONAL APPROACHES

USAID recognizes that its success will be determined by the way it approaches its development mission and responds to urgent humanitarian needs. To meet the challenges of the post-Cold War world, USAID will employ certain operational methods in all its endeavors: support for sustainable and participatory development; an emphasis on partnerships; and the use of integrated approaches to promoting development.

Sustainable development is characterized by economic and social growth that does not exhaust the resources of a host country; that respects and safeguards the economic, cultural, and natural environment; that creates many incomes and chains of enterprises; that is nurtured by an enabling policy environment; and that builds indigenous institutions that involve and empower the citizenry. Development is "sustainable" when it permanently enhances the capacity of a society to improve its quality of life. Sustainable development enlarges the range of freedom and opportunity, not only day to day but generation to generation.

When sustainable development is the goal, the focus moves from projects to the web of human relations changed by those projects. Sustainable development requires investments in human capital — in the education, health, food security, and well-being of the population. Sustainable development sparks changes within society, from the distribution of power to the dissemination of technology. It continually challenges the status quo.

Sustainable development mandates **participation.** It must be based on the aspirations and experience of ordinary people, their notion of what problems should be addressed, and their consultations with government, development agencies, and among themselves. It must involve, respond to, and be accountable to the people who will live with the results of the development effort. It must help them build institutions of free discourse and inclusive decision-making.

Thus, the fundamental thrust of USAID's programs, whether in democracy building, environment, economic growth, or population and health, will aim at building indigenous capacity, enhancing participation, and encouraging accountability, transparency, decentralization, and the empowerment of communities and individuals. Our projects will involve and strengthen the elements of a self-sustaining, civic society: indigenous non-governmental organizations (NGOs), including private voluntary organizations (PVOs), productive associations, educational institutions, community groups, and local political institutions. This approach will make empowerment an integral part of the development process, and not just an end result.

Partnerships begin with collaboration between donors and host nations. Donors must recognize that development, in every sense, depends on the developing country itself. Donors *assist*. They can help, facilitate, even accelerate, but the major task must be carried out by the host nation, not

the donor. Sustainable development is built upon a sense of ownership and participation. It is not something that donors do for developing countries; it is something that donors help the people of developing countries do for themselves.

The notion of partnership imposes certain responsibilities on host governments. In determining where it will invest its resources, USAID will consider whether the host government permits development agencies and NGOs full access to the people; whether it invests its own resources in development; whether it encourages development through an enabling environment that comprises sound policies and responsive institutions; and whether it fosters local empowerment, particularly of women and members of minorities, as part of the development process.

An increasing portion of development work is being carried out by NGOs, including U.S.-based PVOs, indigenous NGOs, institutions of higher learning, and professional and academic groups. These organizations possess unique skills and contacts; they are USAID's natural partners in development and their work is reinforced by the private sector. Improved coordination with these agencies will permit USAID to do the things it does best and concentrate the skills of its employees where they are most needed.

USAID recognizes that the effectiveness of these organizations depends in large measure on their institutional autonomy. USAID cannot and should not micromanage these organizations. However, to ensure that programs achieve their objectives, USAID will insist upon a critical evaluation of project design, implementation capabilities, and past field performance. It will maintain oversight and communicate regularly once projects have commenced.

Donors must reinforce each other and coordinate at every stage of the development process. USAID can improve its own effectiveness by cooperating with other donors in a multitude of ways, including: joint assessment of development problems and the threats they represent; cooperative planning and division of responsibility; allocation of resources to reinforce other development efforts; pooling of financial resources where possible and appropriate; sharing of technical resources and expertise; rapid transfer of information about methods and results; and collaboration and communication in the field and collectively with host governments.

Partnership also includes leveraging. In its narrowest sense, leveraging involves the pursuit of matching funds. Much of our leveraging work will continue to be done in coordination with multilateral development banks (MDBs). USAID also will encourage other donors to contribute to worthy projects and to become involved in areas that deserve support but where we lack funds to operate. The Agency will also encourage the active participation of private enterprise. A strategy for development should seek to increase the number and kind of participants in the development process, and efforts to this end are a legitimate part of USAID's mission.

Finally, USAID will use **integrated approaches and methods.**

Integration begins with policy. USAID conducts its programs under the direction and guidance of the Secretary of State and attaches the highest priority to coordinating its work with the needs and objectives of the Department of State and the U.S. Ambassador and the country team, wherever its missions operate.

The fundamental building block of USAID's programs will be integrated country strategies. These strategies will take into account the totality of development problems confronting the society. They will be developed in close cooperation with

host governments, local communities, and other donors and will consider how social, economic, political, and cultural factors combine to impede development. They will seek to identify root causes and the remedies that can address them. We intend to minimize so-called "stovepipe" projects and programs that operate without regard for other development efforts or larger objectives.

USAID will pay special attention to the role of women. In much of the world, women and girls are disproportionately poor, ill, and exploited. Of necessity, the development process must focus on their social, political, and economic empowerment. We will integrate the needs and participation of women into development programs and into the societal changes those programs are designed to achieve. Women represent an enormous source of untapped talent, especially in developing nations. The success of women — as workers, food producers, health providers and teachers of their children, as managers of natural resources, and as participants in a democratic society — is essential to successful development. A development process that fails to involve half of society is inherently unsustainable.

Development assistance must address the specific needs of women in developing nations: health, housing, education, equal access to productive resources and employment, participation in society, and empowerment. In their design and implementation, programs must take gender issues into account and pay particular attention to the needs of women in poverty. The ultimate success of our work will be determined by the impact it has upon the lives of the women and men it is designed to assist.

AREAS OF CONCENTRATION

The United States must commit itself to act, must act in concert with other donors, must act where it can have maximum effect, and must draw on its strengths. These strengths determine where USAID will concentrate its resources.

USAID's programs will be undertaken in three types of countries:

- Countries where USAID will provide an integrated package of assistance — these will be termed sustainable development countries. Assistance to these countries will be based on an integrated country strategy that includes clearly defined program objectives and performance targets.

- Countries that have recently experienced a national crisis, a significant political transition, or a natural disaster, where timely assistance is needed to reinforce institutions and national order. These are classified as transitional countries.

- Countries where USAID's presence is limited, but where aid to non-governmental sectors may facilitate the emergence of a civic society, help alleviate repression, meet basic humanitarian needs, enhance food security, or influence a problem with regional or global implications. In such countries, USAID may operate from a central or regional base, may focus on policy and institutional changes in the public sector, or may support the work of U.S. or indigenous NGOs or institutions of higher education.

Within these nations, USAID will support programs in four areas that are fundamental to sustainable development: Population and Health, Broad-Based Economic Growth, Environment, and Democracy. Progress in any of these areas is beneficial to the others. This is especially true with rapid and unsustainable population growth, which consumes economic gains, deepens environmental destruction, and spreads poverty.

Problems of the environment, population, health, economic growth, and democracy also have a transnational impact. They require approaches that consider the global impact and that are not confined to individual states. Investments in these areas thus must be seen as primary prevention of the crises, deep-seated poverty, and despair that fuel civil unrest and international turmoil.

The United States in general and USAID in particular have extensive skills in each of these key areas. Moreover, USAID's partners in development — American PVOs, universities, and training organizations, and the American private sector — are particularly experienced in these areas.

Finally, solutions to these problems will help create self-sustaining, civic societies. Such solutions are characterized by local empowerment, the involvement of the recipients of aid in their own development, decentralization of decision-making, and the establishment of institutions of consensus-building and conflict resolution. They mandate the creation and involvement of indigenous NGOs — intermediary organizations that enhance popular participation, that deepen the benefits to society, and whose very existence can promote peaceful change. Such solutions are the essence of sustainable development.

USAID will continue to carry out its other traditional mandate: providing emergency humanitarian assistance and disaster relief with dollars, technical expertise, and food assistance. Emergency humanitarian assistance and disaster aid are integral to the process of promoting sustainable development. Emergency humanitarian assistance relieves suffering and stabilizes nations that have experienced natural disaster or famine. Typical humanitarian crises such as famine, civil conflict, and the inability to respond to natural disaster increasingly owe directly to failures of development. Emergency humanitarian assistance is a necessary, stop-gap response that helps nations recover to the point where they can address the larger issues of development.

As part of its humanitarian assistance and disaster relief function, USAID will acquire the capability to respond rapidly to the needs of countries in crisis. This is particularly critical to USAID's long-term development mission. A gap in development assistance currently exists: Emergency relief helps nations that have suffered acute crisis or natural disaster; programs of sustainable development address the long-term needs of developing societies. But nations that are trying to emerge from crisis or make a transition from authoritarianism to democracy often have urgent, short-term political requirements that are not addressed by either traditional relief programs or programs of sustainable development.

USAID can help mitigate these problems in two ways:

First, by helping countries reestablish a degree of food self-reliance through the distribution of such things as tools, seeds, and other agricultural supplies essential to begin planting and to reinvigorate the agricultural sector.

Second, by helping to reinforce and rebuild institutions. The transition from disaster or civil conflict is itself a crisis. From the political point of view, it is best to address such crises early, before famine and social disorder perpetuate and the momentum of civil conflict becomes irresistible, and before the cost of reconstruction grows geometrically. From the developmental point of view, it is best to arrest conflict and buttress institutions before the social structure collapses and takes with it the coherent pieces of an economy and a civic society that could grow and modernize.

MEASURING RESULTS

The success of foreign assistance is determined by its impact upon developing nations. Inputs are meaningless without reference to effects.

With this in mind, USAID will measure its results by asking how projects and programs achieve discrete, agreed objectives. This is a demanding approach that forces everyone involved in the foreign assistance process to focus on how projects actually affect the way people live and to distinguish self-sustaining accomplishments from ephemeral ones.

This approach also forces people within USAID to work as a team in designing, implementing, and evaluating projects and programs. It obligates them to cooperate with contractors and grantees; with NGOs, universities, and colleges; with the private sector; with other donors; with multilateral institutions; with host governments; with local authorities; and most important of all, with the citizens of developing countries, the intended beneficiaries of these programs.

While no program can touch every aspect of life within a society, individual programs in each of USAID's areas of concentration need to be structured and implemented to produce affirmative answers to these kinds of questions:

Is the program consistent with the interests and values of the American people?

Does the program or project produce measurable, positive effects? Does it lower population growth rates, create jobs and incomes, augment food security, enhance public health, improve air and water purity, slow the loss of soil and soil fertility, arrest the loss of biodiversity, create indigenous democratic institutions?

Does it address the actual needs of the local people as they themselves define them? Does it consult local people to identify related problems and opportunities?

Does the program build indigenous capacities and permanently enhance the capacity of the society to improve the quality of life?

Does the program involve and empower the people who are supposed to benefit from it? Do they participate in planning, allocation of resources, selection of methods, management, oversight, and assessment of accomplishments? Does the program help create the institutions of a civic society? By its design and operation, does the program help establish and strengthen indigenous NGOs?

Does the program avoid duplication and incorporate lessons learned by the development community? Are the specific ways in which the program affects global and transnational problems shared locally, nationally, and regionally?

Does the program create economic opportunities for different groups in society? Does it generate economic opportunities for American business? Are USAID mechanisms used to identify and disseminate these opportunities to the agencies, companies, and individuals in the country, in the region, and in the United States who might benefit from them?

By applying standards such as these, USAID can ensure that its development programs help the United States respond to the strategic threat of failed development. These standards will shape USAID's approach to each of the areas of strategic concern, as is evident in the five accompanying papers. The value of these standards will be evident in the attitudes they affect within the Agency and the development community, in the development effort that ensues, and in the global improvement in the quality of life.

Protecting the Environment: USAID's Strategy

THE CHALLENGE

Environmental problems increasingly threaten the economic and political interests of the United States and the world at large. Both industrialized and developing nations contribute to the threat.

Human activities are disrupting the Earth's global life support systems — the atmosphere and the planet's wealth of biological resources. Atmospheric concentrations of greenhouse gases continue to rise, with potentially catastrophic consequences for the global climate. The loss of untold numbers of plant and animal species and their habitats impoverishes the natural world for future generations and eliminates raw materials for advances in medicine, agriculture, and other fields.

At the local level, environmental degradation poses a growing threat to the physical health and economic and social well-being of people throughout the world. Explosive and poorly managed urbanization has contributed significantly to air, water, and soil pollution worldwide. The erosion and degradation of soils, loss of fertility, deforestation, and desertification beset rural communities and undermine food production, cause malnutrition, and impel migration. Water shortages cause conflicts among industrial, agricultural, and household users within countries and among nations.

The impact on developing nations can be measured in graphic human and economic terms. Widespread soil degradation is reducing the capacity of many countries, particularly in the tropics, to achieve food security. In Eastern Europe and the former Soviet Union, air-borne pollutants are the likely cause of high levels of morbidity and respiratory illnesses. Water pollution alone accounts for some 2 million preventable deaths and millions of illnesses each year. Environmental degradation can reduce national incomes by 5 percent or more.

America's own well-being is directly threatened by environmental degradation around the world. We cannot escape the effects of global climate change, biodiversity loss, and unsustainable resource depletion. The consequences of local environmental mismanagement — increasing poverty, social instability, wars over resources — endanger our political and economic interests. The quality of life for future generations of Americans will in no small measure be determined by the success or failure of our common stewardship of the planet's resources.

The scope of the problem is clear:

Environmental problems are caused by the way people use resources. Workable solutions must focus on how humans and their economic interests interact with the natural environment and its resources. They must address how people perceive the environment and how they utilize it; how they judge the costs of using resources; and how political, industrial, and agricultural processes either damage or protect the environment.

Environmental damage often is driven by poverty and food insecurity. These two factors deprive people of the possibility of making rational choices about how to use resources. They force individuals and communities to choose short-term exploitation over long-term management.

Environmental problems reflect the imperfections of private markets. Adam Smith's "invisible hand" is not always a "green" hand. Government policies often distort markets and encourage excessive exploitation of natural resources. Public interventions to correct market failures and eliminate market distortions often are necessary to protect the environment. Effective public institutions that create and monitor an environment favorable to sustainable resource use are critical. This, in turn, requires active public participation in the setting of standards, monitoring, and enforcement. Market-based approaches should be pursued wherever possible and appropriate; since solutions ultimately must make economic sense, regulatory institutions, the policy environment, and incentives must help define what is economically rational and what is not.

Environmental problems have systemic effects. The impact of most environmental problems is ultimately regional or global, so the solutions must transcend borders. Interventions produce the best results when they simultaneously address the problem locally, nationally, regionally, and globally.

Environmental damage often is irreversible. Thus, the need for action is urgent. Early intervention is critical to preventing the extinction of a species or limiting the impact of pollution on public health. Debates over ways to save biodiversity after the tropical forest is gone or how to clean up a river after children have been hurt are moot. Worse, the failure to act makes it more difficult to respond effectively to future environmental problems.

At the 1992 United Nations Conference on Environment and Development (UNCED), both rich and poor nations agreed that economic growth and environmental stewardship must both be pursued to avoid a catastrophic overload of the Earth's carrying capacity in the next century. Economic growth cannot be sustained if the natural resources that fuel that growth are irresponsibly depleted. Conversely, protection of the environment and careful stewardship of natural resources will not be possible where poverty is pervasive. This is the conundrum and the opportunity of sustainable development.

STRATEGIC GOALS AND AREAS OF CONCENTRATION

USAID will pursue two strategic goals:

- Reducing long-term threats to the global environment, particularly loss of biodiversity and climate change.
- Promoting sustainable economic growth locally, nationally, and regionally by addressing environmental, economic, and developmental practices that impede development and are unsustainable.

USAID will concentrate on the following kinds of problems:

Globally, it will focus on the growing sources and diminishing sinks of greenhouse gas emissions and on impoverishment of the planet's biological diversity at the genetic, species, and ecosystem levels.

Locally, it will focus on the abiding impairment of human health due to air, water, and soil contamination from industrial, agricultural, and household activity; unsustainable exploitation of forests, wetlands, coastal zones, coral reefs, and other ecosystems that provide vital ecological services;

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degradation and depletion of water resources; unsustainable agricultural practices; inefficient and environmentally unsound energy production and use; inadequate management of household and municipal wastes in growing urban areas; regulatory, statutory, enforcement, and policy issues; and social and economic patterns, including the lack of local participation and empowerment, that contribute to the aforementioned problems or impede solutions.

OPERATIONAL APPROACHES

USAID will pursue an integrated approach to environmental issues as outlined in Agenda 21 of the UNCED (Earth Summit) guidelines for ecologically sustainable development. The causes of environmental degradation often are the result of underlying pressures of poverty and rapid population growth. Programs in every sphere of development — environment, economic growth, population and health, democracy — must be designed with conscious regard for their impact on the natural environment and their potential for improving environmental stewardship locally, nationally, regionally, and globally.

USAID will strengthen its institutional capacity to ensure that all Agency-supported efforts, whether projects or program-related investments, are environmentally sound. Where necessary, it will require mitigating measures or project redesign.

Solutions begin at the local level, even for environmental problems with global implications. Lack of education, antiquated and inappropriate technologies, the local regulatory environment, economic policy distortions, and the absence of economic and social incentives to protect the environment all contribute to the continuation of damaging practices. USAID's environmental assistance programs thus must empower individuals and communities to act; they also must facilitate collaboration among government agencies, the private sector, and local groups. Such empowerment efforts must specifically reach out to include women and members of minority groups. Experience has shown, for example, that improving education for girls may be one of the most effective, long-term environmental policies in Africa and other parts of the developing world.

USAID will promote the involvement of citizens in identifying problem areas, suggesting and designing solutions, overseeing implementation, and evaluating results. USAID will actively support environmental initiatives by local governments, communities, and non-governmental organizations (NGOs) to help articulate local concerns and involve individuals and communities in decisions that affect the local and global environments.

Close coordination and communication with the host government are essential to all development work; they are especially critical here. Environmental projects invariably involve diverse political actors, economic forces, and social groups. USAID will work to create and strengthen consultative, management, review, regulatory, and monitoring capacities at the regional, national, and local levels, in order to avoid misunderstandings and build consensus about plans and action.

To sustain the environmental impact of its work, USAID will encourage the development of an institutional and policy capacity within recipient countries. This improved capacity will help facilitate the flow of information, encourage consultations in-country, support economically efficient and environmentally sound policies, and promote the development, transfer, and adoption of technologies that enhance environmentally sound growth. Since many environmental problems (and solutions) are regional in nature, USAID will encourage regional approaches, including ongoing

coordination, establishment of priorities, allocation of responsibilities, exchange of techniques, and sharing of technical resources.

USAID will coordinate its efforts with other members of the donor community. It will pursue partnerships with the U.S. and international environmental community of universities, private voluntary organizations (PVOs), professional and academic groups, scientific organizations, and the private sector to identify priority areas and appropriate methods, share responsibilities and technical resources, reinforce the efforts of other donors, and avoid duplication. Agency field missions will work to strengthen local markets for U.S. environmental technology services and equipment through capacity building, local environmental management, training, and dissemination of information.

PROGRAMS AND METHODS

USAID will focus on programs that address these issues and use these methods:

Global Issues: In the area of **climate change,** USAID will identify key developing and former Soviet bloc countries that are, or will become, significant contributors to global greenhouse gas emissions. USAID will work with these countries on a case-by-case basis to develop appropriate action plans to reduce sources and enhance sinks of greenhouse gas emissions, through activities consistent with local environmental and economic goals. As appropriate, efforts in this area will include energy efficiency improvements; expanded use of renewable energy technologies; limiting deforestation, the burning of forests and agricultural lands, and other carbon-emitting land-use changes; and introduction of new agricultural practices to reduce methane emissions.

USAID's approach to **biodiversity** will focus on promoting innovative approaches to the conservation and sustainable use of the planet's biological diversity at the genetic, species, and ecosystem levels. "Biodiversity" refers to the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems, and among the ecological complexes of which they are part. This includes diversity within species, between species, and among ecosystems. We are only beginning to fully understand the economic value and biological underpinnings of biodiverse areas.

Protecting biodiversity is a complex and multifaceted challenge. It involves promoting sustainable economic uses of biological resources, strengthening systems of parks and protected areas, and supporting ex-situ efforts such as herbaria, gene banks, and zoos. Geographically, USAID will maintain a special focus on two types of areas: those richest in biodiversity and facing the greatest threat; and those that are least disturbed and present the greatest opportunity for long-term conservation. USAID also will support conservation and sustainable use of biological resources where this is judged to be a priority for sustainable development at the country level.

Substantively, USAID will focus on developing sustainable economic uses of biological resources; building local capacity for the management of biodiverse areas, including management of parks and protected areas; supporting innovative, non-governmental conservation and research programs; encouraging the involvement of indigenous peoples and local communities at every stage of decision-making; and facilitating the setting of conservation priorities that respect the rights of indigenous peoples at the local, national, and regional levels.

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Country Issues: USAID's approach to national environmental problems will differ on a country-by-country basis, depending on a particular country's environmental priorities — as determined by the host government and local communities and citizens — and USAID's overall country program. All country strategies will include assessments of these elements:

Improving agricultural, industrial, and natural resource management practices that play a central role in environmental degradation. As appropriate, USAID-supported programs will target objectives such as:

- Conservation of soil and water through improved tilling practices, erosion planning and control, integrated pest management, reductions in the use of pesticides and in fertilizer and pesticide runoff, efficient design and management of irrigation systems, and protection of aquifers and integrated water resource planning and management.

- Reduction of industrial- and energy-related environmental degradation through the adoption of pollution prevention strategies and pollution control systems in industry, and through energy efficiency programs, renewable energy applications, fuel switching, and installation of environmental controls in the energy sector.

- Amelioration of rural and urban natural resource management problems and land-use problems through efforts to limit deforestation and promote reforestation; support for conservation and environmentally sustainable uses of forests, coastal zones, and other important ecosystems; and in urban areas, improved water resources management, land-use, sewage and waste disposal, and transportation planning.

Strengthening public policies and institutions to protect the environment. As appropriate, USAID will support such activities as:

- Reform of national economic policies, development strategies, and market mechanisms to end unintended or misguided environmental damage, promote conservation, and encourage sustainable resource management.

- Development of a comprehensive environmental policy framework, including laws, regulations, and standards at the national and local levels, as appropriate.

- Promotion of procedures for measuring, assessing, monitoring, and mitigating the environmental impact of economic growth.

- Improved enforcement of environmental laws and regulations through increased funding and technical training for regulatory agencies, enhanced public participation, and development of non-governmental advocacy groups.

- Creation or strengthening of competent environmental institutions within government, the private sector, the NGO community, and academia.

- Creation of environmental data bases and natural resource inventories.

Bilateral and multilateral interventions. USAID also will work bilaterally and multilaterally, pursuing dialogues with governments on environmental issues, such as environmental regulations, natural resource usage, and energy pricing policies; dialogues with international agencies, especially agencies of the United Nations and international financial institutions, on the environmental impact of lending practices in developing

nations; and the design and implementation of innovative mechanisms to support environmental work, including the establishment of trust funds and endowments and the design and completion of debt swaps and debt forgiveness.

Environmental research and education. As resources permit, USAID will continue its support for applied research on key environmental issues; non-capital intensive elements of technology transfer, such as institutional cooperation, scientific exchanges, development of human resources, and policy development; and support for public education on issues affecting the environment.

MEASURING RESULTS

USAID will insist on measurable results from its programs. It is not enough to measure project inputs, funds spent, etc. The sole standard of success is the impact that programs have on host nations, their societies, and the lives of citizens. Detailed performance criteria for environmental activities will be developed in consultation with expert and interested outside parties. As appropriate, the following types of questions will be asked of environmental programs supported by USAID:

In the area of climate change: Are greenhouse gas emissions being reduced in countries that contribute most to the problem? Have these countries identified sources and sinks of emissions and implemented national action plans that address key sectors, e.g., energy, forestry, agriculture?

In the area of biodiversity: Have levels of biodiversity in key geographical areas been conserved? Have conservation plans and strategies been implemented for these areas, including provision for protection of parks and sensitive areas and support for sustainable economic activities for inhabitants of these areas and their buffer zones? Do these plans enjoy the support of local people, such that they can be maintained over time? Have national and regional biodiversity strategies that address underlying social and economic forces been implemented, including both in-situ and ex-situ approaches? Have economic policy distortions that encourage excessive exploitation of critical habitats been reformed?

In countries where the concern is environmentally harmful agricultural practices: Have agricultural activities in fragile lands been reduced? Has soil management improved, as demonstrated by better soil tilth and nutrient content and reduced soil erosion? Has the use of inappropriate pesticides been ended? Has pollution from chemical runoff been reduced? Have integrated pest management techniques been disseminated and adopted? Have government subsidies or other policies encouraging environmentally harmful agricultural practices been reformed? Has an indigenous research capacity committed to the development of environmentally sustainable agricultural technology been developed? Do local farmers, both male and female, benefit from this research and from permanent lines of communication with international agricultural experts and institutions?

In countries where the concern is environmentally harmful urbanization practices: Have urban land-use plans been developed in consultation with affected businesses and communities and implemented? Have local governments adopted, implemented, and enforced integrated solid and liquid waste management programs? Are the levels of primary, secondary, and tertiary sewage treatment before discharge increasing?

In countries where the concern is environmentally harmful industrial and energy practices: Have ambient levels of air and water pollution been reduced in target airsheds and water bodies? Have pollution-related public health conditions, including the incidence of lead- and

heavy metal-poisoning, improved? Have industries implemented pollution prevention and control strategies? Have government subsidies or other policies that encourage inefficient and environmentally harmful industrial practices or activities been reformed? Have policies for energy efficiency, renewable energy, and fuel switching been implemented? Have energy production facilities adopted appropriate environmental controls?

In countries where the concern is environmentally harmful natural resources management and land-use practices: Have rates of deforestation been reduced? Have subsidies or other policies that encourage deforestation been reformed? Have conservation strategies been implemented for watersheds, critical ecosystems, and habitats for rare, threatened, or endangered species? Have national forestry policies been reformed to discourage unsustainable forestry practices? Have rates of destruction for other critical ecosystems, e.g., wetlands, coral reefs, and coastal zones, been reduced?

In poorer countries where the concern is strengthening environmental policies and institutions: Have culturally appropriate incentives to encourage the conservation of resources been established? Has a comprehensive environmental policy framework been adopted? Have regulatory agencies been established and are they functioning effectively? Have local NGOs been created or strengthened and do they participate at all levels of environmental planning and monitoring? Has the environmental research capacity of indigenous institutions been enhanced?

In advanced developing countries and economies in transition where the concern is strengthening environmental policies and institutions: Are national economic development strategies consistent with environmental goals? Has a comprehensive environmental policy framework been established that is appropriate to changing economic and social circumstances? Are regulatory institutions well funded, staffed, and trained? Do NGOs, including PVOs, academic research institutions, and community groups participate in all levels of environmental planning and monitoring?

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GUIDELINES FOR STRATEGIC PLANS

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I. ACHIEVING RESULTS: THE STRATEGIC MANAGEMENT PROCESS

USAID has embarked on an ambitious effort to shift its focus of attention from directing inputs to managing for results. Building on the Agency's strategy statements, which identify five priority areas, these Implementation Guidelines are part of the new programming process that emphasizes clear strategic objectives and marshalling USAID resources, both financial and human, to achieve results. Efforts are underway under PPC leadership to develop an agency-wide strategic plan which will build on the strategies articulated by the various branches of USAID, focused around the five pillars of sustainable development.

The Agency now requires, under the Agency Directive on Setting and Monitoring Program Strategies (issued in May 1994), that each operational unit (i.e. mission or USAID/W office) to develop a strategic plan that distinguishes areas of focus, implementation modalities and evaluation criteria for progress. These strategic plans are the underpinning for both allocating resources and assessing performance. This enables the Agency to direct resources to where they are most likely to contribute toward achieving the Agency's priority sustainable development objectives. These Guidelines are designed to facilitate USAID's ability, at all levels, to develop strategic plans that are consistent with the Agency's focus on sustainable development.

Participation is key to the development of strategic and action plans. A broad range of development partners is required to ensure that the strategic direction of USAID's assistance is congruent with the needs of the counterparts, appropriate interventions are selected, program ownership is developed and fostered, and implementation guidance is available and utilized. Development assistance works best when it fully takes into account the priorities and values of affected groups. Therefore, genuine participation must be an essential hallmark of USAID planning and program implementation.

Country Strategic Plans: The purpose of these Guidelines is to help shape the development of country strategic plans, which lie at the heart of this new programming process. All operational units are expected to have a strategic plan in place at all times. These multi-year plans (typically 5-8 years) will establish the basic framework for programming USAID assistance and demonstrating results of our programs.

The strategic plan encompasses all USAID assistance to a country, including centrally managed field support resources and non-emergency food aid. The plan must clearly articulate the types of support the mission program requires from USAID/W. The plan describes the key features of the assistance environment and outlines a USAID program strategy (including strategic objectives, key problems to be addressed, programmatic approaches, performance indicators, baselines and targets, key assumptions, and essential research required). Since participation is a priority for the Agency, missions are strongly encouraged to develop their plans in coordination and active collaboration with their local counterparts, as well as appropriate members from

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USAID/W (i.e. regional bureaus, global).

In the current reality of decreasing international aid resources, USAID missions should develop their plans within the context of a broad donor collaboration effort. Missions should seek donor consensus on sustainable development priorities, policies and programs in order to maximize the effective use of scarce resources. Mission plans should identify to the extent possible the scope of the development problems to be addressed by the donor community, and the estimated resources available by secor and program. Plans should explicitly identify how they will complement other donor resources, particularly focusing on technical leadership and collaboration in the priority USAID areas. Joint donor conditionality and policy reform should be included in the document, where relevant.

Regional and Central Strategic Plans. Strategic plans for regional bureaus as well as the Global bureau shall be developed by the operational unit which has programmatic management responsibility for those activities, and shall cover all activities handled by that unit (i.e. Office of Health and Nutrition for child survival). These will look different from country strategic plans, but have the same purpose of articulating clear objectives and identifying performance indicators and targets that can be used to assess progress and hold managers accountable for achieving agreed upon results.

Annual Action Plans. The document on which annual reviews will be based will be the annual action plans. They will be developed by all operating units, based on the strategic plans. The missions, in collaboration with the Global, Regional Bureaus and PPC will develop and revise plans for approval by USAID/W (Regional Bureaus and PPC). These plans will feed into the agency-wide budget planning and allocation process. The action plans will need to describe actions and resources required to implement their strategic plan in the current fiscal year and the two successive budget years. Based on USAID/W guidance concerning resource availabilities and the Administration's priorities, these will be updated annually, providing a rolling set of three-year plans for strategy implementation.

USAID/W Review and Approval. All strategic plans and action plans will be reviewed and approved by USAID/W (PPC, M, and operating bureaus). Assessment of the plans will include: clarity, logic and feasibility of the strategy; compliance with Agency policy; clear delineation of expected results and evidence of results performance; and appropriateness in light of expected resource availabilities. The strategic plan will provide the basis for the "management contract" between the field and Washington.

Performance Monitoring. Using strategic objectives, performance indicators and targets identified in the strategic plans and action plans, each operational unit will conduct progress reviews at least once a year to determine whether satisfactory progress is being made toward achieving its strategic objectives. USAID/W will conduct periodic program performance reviews of the Agency's major portfolios to identify any emerging

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issues which may warrant senior management attention. These will be supplemented by periodic in-depth assessments. Drawing on the results of progress reviews, the Agency will prepare an annual consolidated report on program achievements.

II. USAID GOAL: SUSTAINABLE DEVELOPMENT

Sustainable development is a dynamic process, not a fixed objective. It requires building lasting individual, institutional and societal capacity to respond to changing circumstances, new needs and evolving opportunities. Countries where sustainable development is occurring are those where there are both the human resources and the institutions to manage social change (including disasters and emergencies) effectively. To be sustainable, development must be increasingly reliant on indigenous human, institutional and financial resources and capabilities. Conditions that indicate a lasting indigenous capacity to manage social change effectively and sustain development progress include:

1. *population growth that is consistent with the economic and ecological carrying capacity of countries and regions;*

2. *responsible stewardship* of the natural resource base;

3. *broad-based participation* in political and economic life;

4. *rising living standards and reduced food insecurity and poverty* for both current and future generations;

5. effective local *capacity to prepare for and respond to natural and manmade disasters.*

Progress in these areas is interrelated. Experience demonstrates that in general it is not possible to continue to make sustained progress in only one or two areas if no progress is achieved in the others. For this reason, USAID assistance will look for synergies, where programs in one area will reinforce those in another. To the maximum extent possible, country strategies should be integrated, building on an analysis of overall development progress and a careful assessment of the ways in which USAID's priorities support broad based development.

This does not mean that USAID country programs are expected always to include activities to address development constraints in all five priority areas. Strategic plans should show where USAID can provide vital support and assistance that will enable people to solve their own critical problems, how these USAID-funded efforts fit together, and how they relate to what other donors are doing.

Throughout these analyses, USAID places a high priority on equity and distributional dimensions of development. How do performance, prospects and

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opportunity relate in particular to poor, disadvantaged and marginalized groups, particularly women and minorities? Supporting clear, timely and sustained improvements in the capacities of these groups to participate fully in expanding economic opportunities should be an important objective in designing USAID programs. The sustainability of USAID initiatives, whether in research or other development programs, is reflected in the indigenous capacity to identify problems, propose and test clear and rational solutions, and carry out the necessary actions.

III. DEVELOPING USAID STRATEGIC PLANS

Within the framework of USAID priorities, country strategic plans should assess opportunities and constraints, and identify strategic objectives. These objectives will establish the context for specific USAID activities and the standards against which their success will be judged. Although the final strategy document itself should be brief, it should be based on careful analysis of the factors noted below. Where these key indicators suggest a serious development constraint, the presumption is that country strategic plans must show how USAID will help address them, absent a compelling argument to the contrary (e.g. scarcity of AID resources; other donor activities; absence of a supportive policy stance or sufficient capacity on the part of the recipient). This presumption is particularly strong with regard to USAID global priorities of population, global warming and biodiversity. (However, this does not preclude USAID activities in areas where these indicators suggest that conditions are not so acute.)

A. Key Factors in Population and Health. The presence of any of the following key factors indicates that this sector is a major constraint to sustainable national development. If this is the case, the country strategy must give serious consideration to formulation of strategic objectives which address family planning, child survival and reproductive health:

- Unmet need for contraception (i.e., women who do not currently wish to become pregnant but are not currently using contraception) at or above 25% of married women of childbearing age.
- Total fertility rate at or above 4.
- Under five mortality rate at or above 150 per thousand live births.
- Maternal mortality ratio at or above 200 maternal deaths per 100,000 live births.
- Prevalence of STDs at or above ten percent among women aged 15-30.
- Stunting (height for age at least two standard deviations below mean) found in at least twenty-five percent of children under 5.

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In addition to these factors, efforts to combat the global HIV/AIDS epidemic require analysis of a separate set of factors. If the STD indicator or either of the following factors are present, then priority consideration should be given to development of a strategic objective directed at the prevent of HIV/AIDS:

- General HIV prevalence in low risk groups at or above one percent.
- HIV prevalence in a high risk group at or above ten percent.

Global Population and Health Priority Countries. USAID has identified global population growth as an issue of strategic priority for the agency as a whole. In addition to the analyses noted above, particular attention will be given to the development of strategies directed at family planning, child survival and reproductive health in those countries which have the largest numbers of women with unmet need for contraception (See Annex A for further discussion).

B. Key Factors in the Environment. The presence of any of the following factors indicates severe environmental degradation. Strategic plans that will help address the root causes of these problems should receive serious consideration. Many of these factors in many countries are not currently measured; expert judgement will often be required in lieu of actual data.

- Quantifiable losses in GDP of 5% or more due to natural resource depletion (deforestation, depletion of fisheries, soil erosion, overgrazing of rangeland) and/or pollution (work time lost from disease and death, environmental restrictions on industrial activity and transport, costs of mitigation and remediation).
- Rapid rate of degradation (e.g. 1% p.a.) of key ecosystems, e.g.:
  - -- deforestation.
  - -- conversion of wetlands.
  - -- loss of coral reefs.
  - -- conversion of savannah.
- Unacceptable environmental health risks, e.g.:
  - -- annual mean concentration of fecal coliforms in highly used water bodies exceeds 1000 per 100 milliliter sample.
  - -- annual mean concentrations of suspended particulate matter and sulfur dioxide in major urban areas exceed 300 and 100 micrograms per cubic meter, respectively.

However, existence of severe problems is not a necessary condition for missions to identify environmental strategic objectives. Other key factors that also need to be

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considered include:

- Economic, ecological, and public health significance of undegraded resources (e.g. standing forests, wetlands, coral reefs, watersheds, topsoil, surface waters) and degree of potential threat.

- Public health and ecological implications of trends of urbanization, industrial development, and population/demographic changes.

- Priority given to strengthening environmental policies and programs by local partners, both governmental and non-governmental.

Global Climate Change and Biodiversity Priority Countries. USAID has identified global climate change and the loss of biodiversity as priority issues that are global in scope; issues where action in once country directly affects all others. For global climate change, USAID has identified ten key countries or regions: Brazil, India, Indonesia, Kasakhstan, Mexico, Philippines, Poland, Russia, Ukraine and Central Africa. Absent compelling arguments to the contrary, strategic plans for these countries should identify as an objective or sub-objective the reduction in rates of growth of greenhouse gas emissions.

For biodiversity, USAID is currently in the process of identifying high-priority regions for biodiversity conservation. Subsequent guidance will address this issue.

C. Key Factors in Democracy. If any of the following factors are present, then serious consideration should be given to formulating strategic objectives to address political and institutional constraints to sustainable development:

- incidents of torture and disappearances in countries where, for various reasons, the agency has decided to proceed with a sustainable development program - a determination should be based on Embassy reporting, Department of State country reports, UN documents, and information provided by credible human rights groups;

- elections in which not all political parties participate or where the results of the last election were not accepted by the competing parties;

- government denial of permission for political parties, labor unions, civic action groups and the independent media to register or operate freely;

- more than 50 percent of the population does not believe that the judiciary is independent or that they can effectively utilize the judiciary to resolve disputes;

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- women constitute less than three percent of elected national officials or women turnout in elections is less than 80 percent that of men; and

- failure to prosecute military and police officials accused of serious human rights abuses.

Existence of other problems in the democracy sector also might suggest a USAID response, particularly where continuation of the problem would have consequences for programs in other sectors. This would include:

- a legislature in which a majority of the members have never served before;

- a weak legal system, which acts to discourage investment and other business dealings; and

- an overly centralized system for policy formulation and implementation.

D. Key Factors in Economic Growth. Presence of any of the following indicates severe economic growth problems, and suggests that serious consideration should be given to programs to address the root causes.

- Incidence of poverty greater than 30%, widespread food insecurity, and per capita income below $500

- Annual per capita economic growth less than 1.5% over past ten years

- Persistent macroeconomic instability, as indicated by continuing need for IMF assistance and major adjustment programs over past 5-10 years

- Inadequate health care as indicated by life expectancy of less than 61 years

- Illiteracy above 40 percent, and female illiteracy greater than 1.25 times the total

- Primary education enrollment rates less than 85%. Ratio of girls enrolled is less than 80% of total ratio.

E. Key Factors in Humanitarian Assistance. Humanitarian Assistance is integral to sustainable development, and in preparing strategic plans it is important to recognize the critical linkages between development and humanitarian assistance prgrams. Effective grass-roots development programs are often the best long-term means for addressing humanitarian concerns and preventing disasters. In preparing strategic plans USAID should assess a country's vulnerability and capacity to respond to natural and manmade disasters and examine factors such as food insecurity and extreme poverty which place

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vulnerable groups at high risk.

In countries which are "disaster prone" and have limited response capability, careful consideration should be given to developing objectives to reduce vulnerability through disaster prevention, mitigation and preparedness measures. Factors which characterize these countries include:

- Historical incidence of recurrent natural disasters resulting in significant loss of life, infrastructure, and capital resources.
- Political and social instability and/or history of civil strife.
- Inadequate emergency management procedures and resources dedicated to prevention, mitigation, and preparedness.
- Poorly controlled industrial and nuclear processes which pose serious environmental threats.
- Weak local non-governmental and civil organization structures, and limited capacity of local organizations to respond to disasters or civil strife.

Formulating Humanitarian Assistance objectives should also be considered when there are significant groups at high risk and requiring immediate assistance as a result of the following factors:

- Significant food insecurity as evidenced by:
  - -- Inadequate household income to purchase foods adequate to meet basic nutritional requirements.
  - -- Chronic seasonal or regional deficits in the availability of staple foods due to economic or environmental factors.
  - -- Effective food utilization seriously jeopardized by specific health, sanitation, and cultural constraints.
  - -- High prevalence of malnutrition among pregnant and lactating women, infants and young children and a high incidence of morbidity and mortality related to micronutrient deficiencies.
- Extreme poverty as evidenced by disproportionate amounts of household income, 50% or more, spent on staple foods or a high percentage of households categorized in the lowest income stratas.
- Absence of public or private safety nets which ensure availability, equitable redistribution and access of the poor to sufficient nutritious foods to maintain health and productivity.

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- Structural adjustment or other policies which result in economic dislocations and reduce access to food, health and other social services.

- Natural disasters or civil strife which have resulted in population dislocations, loss of jobs and income, destruction of property, and or reduced food production/availability.

Countries in Post-Crisis Transitions. Aiding countries which are in a transitional situation after emerging from a national conflict, a political upheaval, or a natural disaster is a new priority under the Agency's Humanitarian Assistance Strategy. In identifying these countries and establishing strategic objectives careful consideration will be given to factors such as the need to demobilize and reintegrate troops and to resettle refugee populations, restoration of basic security and infrastructure, and the strengthening of economic and administrative structures and political institutions.

IV. CRITERIA FOR ASSESSING STRATEGIC PLANS

Integration. USAID objectives identified by strategic plans should be mutually supportive of the common objective of sustainable development. The strategy should provide the framework that integrates discrete activities and highlights complementary impact. Strategic programs should look beyond individual projects to cross-cutting, systemic effects that create or exploit identified synergies.

People-level impact. USAID seeks to build the capacities and expand the opportunities of the poor majority of the developing world. Strategies should show (in specific and measurable terms) how the social, economic, environmental and political changes USAID supports will clearly help improve the lives of these women, men and children.

Tractable problems with reasonable prospects for success. Not all development problems can be solved. For example, it is not realistic to expect to eliminate all poverty. Furthermore, even when significant need is clearly established, there are not always the opportunities for USAID assistance to be used effectively. Lack of political commitment, inappropriate policy frameworks or the absence of any recognized successful approach may all limit the opportunities for productive USAID investments. USAID will ask whether there are proven models or approaches to address particular problems successfully. Where there is no demonstrably successful approach, USAID strategies should be carefully constructed as experiments, complete with specification of anticipated results and a clear process to learn from the experience.

Broad systemic changes. USAID strategies should be designed to have broad systemic impact, rather than consist of isolated, self-contained interventions. Such systemic impacts are likely to include changes in society rules and policies influencing public and private resource allocations, possibly through demonstrating the success of

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innovative approaches.

Sustainable improvements. USAID strategies must show how results will be sustained, including human capacities and prospects for institutional, political and financial sustainability over the long term. Improvements in social indicators that are wholly dependent on USAID assistance, without realistic prospects for independence, do not contribute to sustainable development.

Clear results commensurate with costs. Strategies should identify expected impacts; explain how these will be achieved; and demonstrate that these results bear a favorable relationship to costs. Program outcomes must be expressed in terms of measurable outcomes of activities which contribute to the achievement of strategic objectives.

USAID comparative advantages. USAID will not attempt to address needs that are being adequately addressed by another donor or donors. Country strategies should show how USAID's field-based structure, experience and technical expertise provides an important advantage for our assistance efforts

Partnerships. Strategic plans should how USAID will vigorously pursue opportunities to collaborate on mutually supportive activities (and avoid duplication and overlap) with other development efforts. This includes programs of other public and private entities, including bilateral donors, international financial institutions, private voluntary organizations, higher education institutions and private sector donors.

Participation. Strategic plans should be developed in a participatory manner, drawing on the insights and experiences of a wide range of USAID development partners, particularly those truly representing segments of society that are currently marginalized. Specific activities should also incorporate participation that will strengthen and improve the implementation of USAID programs.

Research. Strategic plans should include the identification of research plans to be addressed to solve key development constraints. Research should not be conducted for the single purpose of capacity building but should include capacity building where possible.

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References:
SUPPLEMENTARY GUIDANCE

These Guidelines build on, and should be read in the context of a series of directives which have been issued over the past year. These include:

(i) the Administrator's Statement of Principles on Participatory Development (dated November 16, 1993), emphasizing USAID's renewed commitment to building opportunities for participation into development processes at all levels;

(ii) the Administrator's "Framework Cable" (STATE 023472 dated January 28, 1994) which outlines idea of a strategic plan as central to programming USAID funds;

(iii) the "Guidance for FY96 Programming Process" (STATE 104235 dated April 20, 1994) which mandates strategic plans as fundamental to the programming process; outlines generic requirements for strategic plans, annual action plans, and AID/W review process; and includes feedback on results to help guide allocation of funds based on performance; and

(iv) the Agency Directive on Setting and Monitoring Program Strategies (May 31, 1994) which formally establishes strategic plans from operating units as the basic framework for programming assistance and reporting the results of USAID programs.

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TECHNICAL ANNEX B:
ENVIRONMENT

I. SETTING PRIORITIES FOR COUNTRY-LEVEL PROGRAMS

II. ENVIRONMENTAL PROCEDURES

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I. SETTING PRIORITIES FOR COUNTRY-LEVEL PROGRAMS

Based on nearly two decades of experience, USAID has developed a strong program of environmental activities at the country level. These guidelines do not attempt to overhaul USAID's approach. Given the agency's increasingly limited resources and the increasing activity of other donors, however, a more analytical, transparent, collaborative, and participatory process of priority-setting at the country level is required. Simply put, USAID must be able to demonstrate to ourselves and to our stakeholders that we are not trying to do everything, and spreading ourselves too thin to be effective in the process.

Country strategic plans submitted for approval in FY95 and future years should be based on a comprehensive assessment of environmental threats and opportunities, using the priority-setting framework described in this annex. Assessments should address the "Key Factors in the Environment" identified in the main body of these guidelines and, where feasible and appropriate, include targeted research to improve empirical understanding of these factors. Environmental strategic objectives identified in country strategic plans should be selected according to the priorities identified through these assessments.

A. Country Level Environmental Objectives

USAID's Strategies for Sustainable Development identifies two strategic goals:

- Reducing threats to the global environment, particularly loss of biodiversity and climate change; and
- Promoting sustainable economic growth locally, nationally, and regionally by addressing environmental, economic, and developmental practices that impede development and are unsustainable.

This annex provides guidance on the agency's efforts to pursue the second of these two goals at the country level.

In USAID's core "sustainable development countries" we will pursue three environmental objectives:

- To safeguard the environmental underpinnings of broad-based economic growth;
- To protect the integrity of critical ecosystems; and

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- To ameliorate and prevent environmental threats to public health.

(Examples are provided in the main body of these guidelines under "Key Factors in the Environment.")

In identifying environmental strategic objectives at the country level, USAID will assess the full range of environmental and natural resource threats and seek to prioritize them against these three objectives. Section C of this annex provides guidance for setting priorities.

USAID pursues its global environmental goals (conservation of biodiversity and mitigation of global climate change) in selected "key" countries, as described in Strategies for Sustainable Development and in the main body of these guidelines. This annex does not address these global goals. Separate guidance on USAID's climate change activities can be found in our June 1994 report to Congress, Global Climate Change: The USAID Response. PPC and G/ENV intend to provide subsequent strategic guidance on biodiversity.

B. Indicators of Environmental Degradation

The main body of these guidelines identifies "Key Factors in the Environment" that indicate severe environmental degradation. These indicators correspond to the three environmental objectives described above. Where any of these factors are present, USAID will give serious consideration to programmatic interventions that seek to address their root causes.

Many of these factors in many countries are not currently measured. Expert judgement will often be required in lieu of actual data. Moreover, these guidelines include only a limited number of illustrative indicators. For example, measures of fecal coliform concentrations are only one of many indicators of water quality. Again, these indicators should be taken as illustrative and should be applied along with others on a case-by-case basis using expert judgement.

Where data is limited, missions, with support from G/ENV, should seek to work with host country counterparts and other donors to strengthen empirical understanding of these factors through strategically targeted research. For example, research efforts in environmental accounting can produce rough estimates of GDP losses from environmental degradation, which can aid policy-making and priority-setting by host countries, USAID, and other donors.

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C. Setting Priorities

USAID, in its core "sustainable development countries," will pursue the three environmental objectives described above by addressing the root causes of high-priority environmental problems that can be effectively and sustainably impacted by our assistance. In preparing country strategies, missions, with support from G/ENV, will assess the full range of environmental threats and identify priorities using the integrated assessment approach outlined below. Where possible, USAID should support priorities identified by host country governments, NGOs, and other donors through participatory processes, such as National Environmental Action Plans. At minimum, relevant government agencies and a broad range of NGOs should be involved in USAID's priority-setting exercise.

USAID missions are expected to evaluate -- at least qualitatively -- the severity of environmental problems in terms of the three environmental objectives identified above. Environmental strategic objectives in country strategic plans must relate to at least one of the three objectives. Country strategic plans must also describe how a chosen priority relates to the activities of other donors and how sustainable impacts can be assured through domestic policies, priorities, and resource allocations. If a mission concludes that it cannot pursue an environmental strategic objective, it should consider opportunities to address priority environmental issues through its pursuit of strategic objectives in other sectors (e.g. support for environmental advocacy NGOs, support for economic policy reforms that encourage sustainable management of natural resources).

USAID regional bureaus may prepare regional strategies that provide further guidance for country strategic plans. Regional strategies should also demonstrate an integrated response to the three objectives described above -- safeguarding the environmental underpinnings of broad-based economic growth; protecting the integrity of critical ecosystems; and preventing environmental threats to public health.

Missions' assessments of environmental priorities should include the following three steps: (1) assess the relative severity of environmental problems according to USAID's three country-level environmental objectives; (2) evaluate the potential effectiveness and sustainability of strategies available to address these problems; and (3) identify USAID's best opportunities for sustainable impact. These steps should be regarded as sequential screens that result in the identification of priority environmental problem areas that USAID can address effectively and sustainably. This analysis should form the basis for the selection of environmental strategic objectives in country strategic plans.

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Guidelines for this three-step analysis follow. Missions are encouraged to experiment and adapt this analytical framework to serve their needs and circumstances.

Step 1: Assess the relative severity of environmental problems according to USAID's three country-level environmental objectives.

Setting country-level environmental priorities begins with an assessment of which environmental problems represent the most severe threats to economic growth, critical ecosystems, and public health. The nature of this assessment can range from a quick and inexpensive synthesis of existing information, stakeholder opinion, and professional judgement, to a formal comparative environmental risk assessment including targeted research. USAID country assessments will likely fall in between these two extremes, involving a multi-week focussed assessment by an inter-disciplinary team of experts, but typically not involving new research. In any case, the relative severity of environmental problems will typically be classified no more precisely than "high," "medium," "low," "tolerable," or "uncertain."

Figure 1 presents a suggested format for assessing the severity of environmental problems according to USAID's three environmental objectives. The examples of environmental impacts and their levels of severity are only illustrative, and the cutoffs between problem classes (high, medium, low, tolerable) are somewhat arbitrary. Thus, the scheme is not intended to be followed rigidly but should assist missions in constructing their own frameworks to prioritize among disparate environmental issues.

Environmental problems classified "high" under all three objectives would rank highest in an integrated assessment, followed by those ranked "high" under two objectives, and so on. As a general rule, a problem ranked "high" under any single objective or as intolerable (high, medium, or low) under more than one objective should be thoughtfully considered. Missions may also want to weight certain problems according to their impacts on particular human populations (e.g. women, indigenous peoples, the poor) or productive sectors (e.g. leading exports, major food crops) of special interest to USAID or the mission.

The relative severity of problems need not necessarily dictate environmental priorities and assistance strategies. Some severe problems may be intractable or so costly to ameliorate that greater environmental benefits may flow from tackling problems of lesser magnitude. Conversely, some problems may rank low in severity precisely because prior investments in environmental management have been effective. Maintaining such investments may thus be judged a high priority. Finally, assessing the relative severity of environmental problems should not dictate the strategic means of assistance (e.g., human

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resource development, institutional capacity building, policy reform, technology transfer, etc.). These considerations should be addressed in the subsequent two steps of the analysis.

Step 2: Evaluate the potential effectiveness and sustainability of strategies available to address the most severe problems.

The purpose of this step is to identify the major problems that may be addressed most effectively and sustainably, beginning with an evaluation of the environmental problems classified as most severe. This analysis will rely on the technical judgement of USAID's assessment team and their consultations with relevant in-country stakeholders. Consideration should be given to technical, institutional, policy, political, social, financial, and other constraints in the host country environment. The chapter on "Protecting the Environment" in Strategies for Sustainable Development and G/ENV's strategic plan both provide general guidance on the types of interventions appropriate for different environmental priorities (sustainable agriculture, urban and industrial pollution, energy, natural resources management). Subsequent guidance may clarify and update existing policies and guidance on programmatic approaches to these issues.

Cost-effectiveness may be considered as a criterion for comparing available strategies to address competing environmental priorities of similar severity. However, environmental planning should not be held hostage to present costs of environmental protection since, in many cases, the cost-effectiveness of environmental management will improve over time as the learning curve rises. Missions should pay particular attention to the sustainability of alternative strategies from financial, institutional, and political perspectives.

Step 3: Identify USAID's best opportunities for sustainable impact.

The final step in the assessment process focusses on USAID's comparative advantages in addressing competing environmental priorities. Mission staff, in consultation with USAID/W, will need to take primary responsibility for this step. Missions should evaluate USAID's technical capabilities to address the priorities that emerge from the first two levels of analysis (severe environmental problems that can be effectively and sustainably addressed). This evaluation should also include consideration of the existing and planned programs of other donors and their comparative advantages.

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Figure 1. Suggested format for assessing the severity of environmental problems.

Hazard Level	Potential Consequences: Human Health	Ecosystem Damage	Monetary Loss	Certainty/Frequency of Occurrence: High Repeatable	Moderate Several Times	Low Occasional	Remote but Possible
Catastrophic	Hi mortality (5% total life-years lost), prolonged epidemic, widespread injury	Complete, irreversible loss of critical habitat or critical ecosystem function	>5% GDP	HIGH			
Critical	Moderate mortality (2-5% total life-years lost), hi illness or injury (5% total)	Widespread conversion of critical habitat, loss of keystone species, substantially impaired ecosystem function	2-5% GDP		MEDIUM		
Marginal	Low mortality (1-2% total life-years lost), moderate illness or injury (2-5% total)	Moderate but reversible degradation of critical habitat or ecosystem function	1-2% GDP			LOW	
Negligible	Negligible mortality (<1% total life-years lost), low illness or injury (2-5% total)	Alteration of noncritical habitat, slight or quickly reversible damage to few species or ecosystem function	<1% GDP				TOLERATED

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II. ENVIRONMENTAL PROCEDURES

The Environmental Strategy Paper states that "USAID will strengthen its institutional capacity to ensure that all Agency-supported efforts, whether projects or program-related investments, are environmentally sound. Where necessary, it will require mitigating measures or project redesign. Ensuring the environmental soundness of every USAID program, project, and activity is a prerequisite for sustainable development. It is also a legal obligation under the agency's regulations.[1]

A. Goals and Approaches

These regulations will continue to provide the legal and policy framework to ensure that all activities undergo appropriate environmental analysis. Environmental officers and advisors will provide leadership and technical expertise, but responsibility for the success of the process will belong to every officer in the agency. Environmental work will continue to be done at the earliest practical point in the project identification and design process and be fully integrated. This allows for full integration of environmental and other project objectives and minimizes possible delays in project approval. While not formally required in USAID's regulations, the agency as a matter of policy will pay particular attention to ensuring the development, implementation and monitoring of appropriate plans to mitigate environmental impacts. Similarly, while not required under USAID's regulations, the agency will seek to undertake environmental analysis at the programmatic and sector level.

USAID will seek to assist host governments in creating the capacity to undertake high quality environmental impact assessments (EIA) of all development programs. USAID's country strategies will examine opportunities and where feasible support activities to strengthen local laws and regulations on EIA, train regulatory officials in EIA techniques, and strengthen public participation in the EIA and project design process. USAID will use its own environmental assessments (EAs) and environmental impact statements (EISs), where required, as models and training opportunities. USAID will also seek to assist other donors and lending institutions to strengthen their EIA procedures with a goal of helping them to match USAID's own standards. Weak environmental procedures within other donor agencies and lending institutions undercuts the efforts of USAID's and its partners.

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[1] 22 CFR § 216 codifies USAID's procedures "to ensure that environmental factors and values are integrated into the A.I.D. decision making process." These regulations are consistent with Executive Order 12114 ("Environmental Effects Abroad of Major Federal Actions") and with the purposes of the National Environmental Policy Act (NEPA).

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Absolute harmonization of EIA standards would be unworkable, and probably unwise. However, comparable standards are essential.

USAID will strengthen public participation in the EIA process, in keeping with the agency's strengthened commitment to participation and democracy. USAID will ensure that interested and affected peoples -- both women and men -- are consulted in the process of preparing EAs and EISs and that they have an opportunity to review and comment on the draft document prior to final approval by the Bureau Environmental Officer. USAID will also seek to consult with and provide draft environmental documentation to interested parties in the U.S.

President Clinton has asked the National Security Council in PRD-23 to chair an inter-agency review of the Administration's policy on the applicability of the National Environmental Policy Act (NEPA) to Federal actions abroad. NEPA provides the statutory framework for EIA by the Federal government. USAID's own environmental procedures resulted from the 1975 settlement of a lawsuit concerning the agency's compliance with NEPA. PPC is representing USAID in the inter-agency process under PRD 23 and will take the lead on any changes that may be needed in 22 CFR § 216 as a result of this review.

B. Institutional Responsibilities

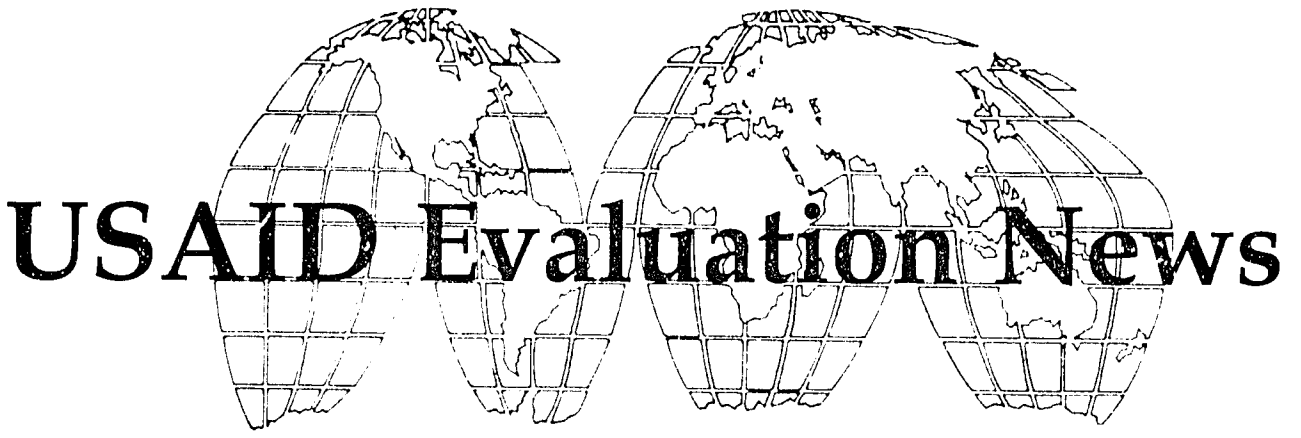
Responsibility for USAID's environmental procedures will be shared among missions, regional bureaus, G, BHR, PPC, GC and other operational units that manage programs, projects, or activities:

- Missions and other operational units will continue to be responsible for compliance with the environmental procedures in the activities that they manage. After approval of environmental documentation, Missions will be responsible for implementation of any resulting decisions or mitigation measures. Missions will also assess compliance with the environmental procedures in all interim and final project evaluations.

- Each regional bureau, G, and BHR will appoint a Bureau Environmental Officer to oversee, and provide technical support for, compliance with the procedures, and to approve environmental documentation pursuant to the procedures.

- PPC will oversee implementation of the procedures across bureaus and resolve disputes or other issues concerning the procedures.

- GC will appoint an attorney to be the agency's principal legal advisor on 22 CFR § 216.22.



A Newsletter on Recent Evaluation Findings and Methods

1994 - Vol. 6 - No. 1

Focus on Performance Measurement

Overview

In a recent readership survey of USAID Evaluation News more readers suggested performance measurement for a focus issue than any other topic (see page 28). Their response coincides with the recent selection of the Agency as a pilot project under the Government Performance and Results Act of 1993, making the theme of this issue particularly timely.

The issue begins with some governmentwide perspectives and reviews of performance measurement systems, then focuses on what USAID is currently doing, from the perspectives of the Agency's central and regional bureaus and the Missions.

The first article, *Performance Measurement: Public Pressures and Legislative Mandates*, discusses the growth of performance measurement and managing for results in the U.S. public sector. After explaining what performance measurement is and what is different about a managing-for-results approach, the author reviews recent initiatives of the Clinton Administration and legislative mandates behind the new push for performance measurement and accountability for results in Government.

The second article, *Performance Measurement: Lessons Learned from Other Agencies*, highlights findings from a review of more than 20 U.S. Government offices and other international donor agencies. The article summarizes key factors found to promote the effective use of performance measurement and draws lessons from this experience applicable to USAID.

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Performance Measurement in USAID: The PRISM System describes in detail USAID's Program Performance Information for Strategic Management System and how it is being implemented and used by the Missions and by USAID/Washington. The authors highlight a new Agency directive issued in May 1994 that establishes an Agencywide PRISM framework applicable to all operating units and relates it to the Agency's programming and budget processes.

In the article *Challenges and Opportunities for Performance Measurement in USAID*, the author examines several features of USAID and international development work that constrain the Agency from getting and using performance information. He then looks at several strengths operating to offset these constraints. The article ends with a discussion of some of the key challenges ahead in establishing an effective system of performance measurement in USAID. In *PRISM: Lessons Learned, A CDIE Perspective*, the authors provide another perspective of PRISM's strengths, weaknesses, and lessons learned.

Next are a series of special articles that offer reviews of performance measurement efforts from the perspectives of several of USAID's regional bureaus (Africa, Asia and Near East, Latin America and the Caribbean) and Missions (Ghana, Kenya, Guatemala, Egypt). These articles provide valuable insights from practitioners' points of view. The article *What USAID Missions Have Learned About Managing for Results* highlights key lessons drawn from Missions' experiences about what is important for effectively implementing and using performance measurement systems.

The law [GPRA]...requires that we chart a course for every endeavor...see how well we are progressing, tell the public how we are doing, stop the things that don't work, and never stop improving....

— President Bill Clinton
August 3, 1993

Performance Measurement: Public Pressures and Legislative Mandates

by Steven Gale
Center for Development Information and Evaluation

Managers in U.S. Government agencies are increasingly discussing—and applying—concepts such as *managing for results, results-oriented operations, customer satisfaction surveys,* and *performance measurement.* These concepts are not entirely new. In fact, many have been borrowed from the private sector, where profit has long been the bottom line and "customer satisfaction" the key to survival.

State and local governments also have used performance measurement successfully in several well-known experiments. At the Federal level, the General Accounting Office—for years a strong advocate of performance measurement—issued one of the first performance measurement guides for Congress and executive-level agencies more than 10 years ago.

What is new is that Federal agencies are emphasizing these ideas more now as pressures mount for

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better accountability and since passage of the 1993 Government Performance and Results Act made performance measurement law.

What is Performance Measurement?

Performance measurement, in short, is the process organizations follow to objectively measure how well they are meeting their stated objectives. It involves clarifying and agreeing on organizational goals, developing performance indicators to track progress, establishing baseline data and setting targets for future performance, and then periodically gathering actual data for comparison against those targets. Organizations actively manage for results when they use performance information to make budgeting and programming decisions (see Box 1).

How is Managing for Results Different?

Traditional ways of doing business focus on program *inputs* (for example, expenditures, number of full-time employees). By contrast, the new managing-for-results approach focuses on program *impacts*. An emphasis on process gives way to a focus on results. While old ways of operating made compliance with rules and regulations an end in itself, a managing-for-results approach makes performance the bottom line. In addition, while in the past activities (usually projects) were the primary focus, now higher order strategic objectives are what one tries to achieve.

The new approach also differs with respect to data acquisition. In the traditional approach data were often collected retrospectively; now the focus is more on built-in data collection and ongoing monitoring. Whereas the role of management in the old system was "command and control" oriented, under the new managing-for-results approach it becomes "improvement and empowerment." Finally, the focus has shifted from using data primarily for reporting on progress to using data for decision-making, which is what really counts (see Box 2).

The New Push for Results in Government

Initiatives from the Clinton Administration, legislative mandates, and public pressure have combined to put renewed emphasis on performance measurement and managing for results in government. Scarce tax revenues, an expanding Federal deficit, and growing headline claims of government waste, fraud, and abuse also move the government to change the way it does business. Performance measurement has now caught the attention of the general public. They want to know not only where their tax dollars went and how they were used, but also what was ultimately achieved.

Recent public interest in performance measurement is highlighted by the popularity of a 1993 book entitled *Reinventing Government: How the Entrepreneurial Spirit Is Transforming the Public Sector*. Written by government efficiency consultants David Osborne and Ted Gaebler, *Reinventing Government* looks at best practices of high-performing public agencies and presents 10 principles for creating effective government. One key principle is that effective agencies are results oriented. That is, they emphasize measuring and achieving results. In effective agencies, performance measurement is viewed as a management tool for allocating funds and improving operations.

> ***Public entrepeneurs know that when institutions are funded according to inputs, they have little reason to strive for better performance. But when they are funded according to outcomes, they become obsessive about performance.***
>
> **— Reinventing Government**

Vice President Al Gore's widely publicized National Performance Review (NPR) has also caught the attention of the public. A high-level government study team composed of experienced Federal workers, NPR has been charged with finding ways to improve government operations.

NPR has published its recommendations in *From Red Tape to Results: Creating a Government that Works Better & Costs Less* (1993). The NPR suggests the following broad steps to accelerate performance in government and improve government efficiency overall:

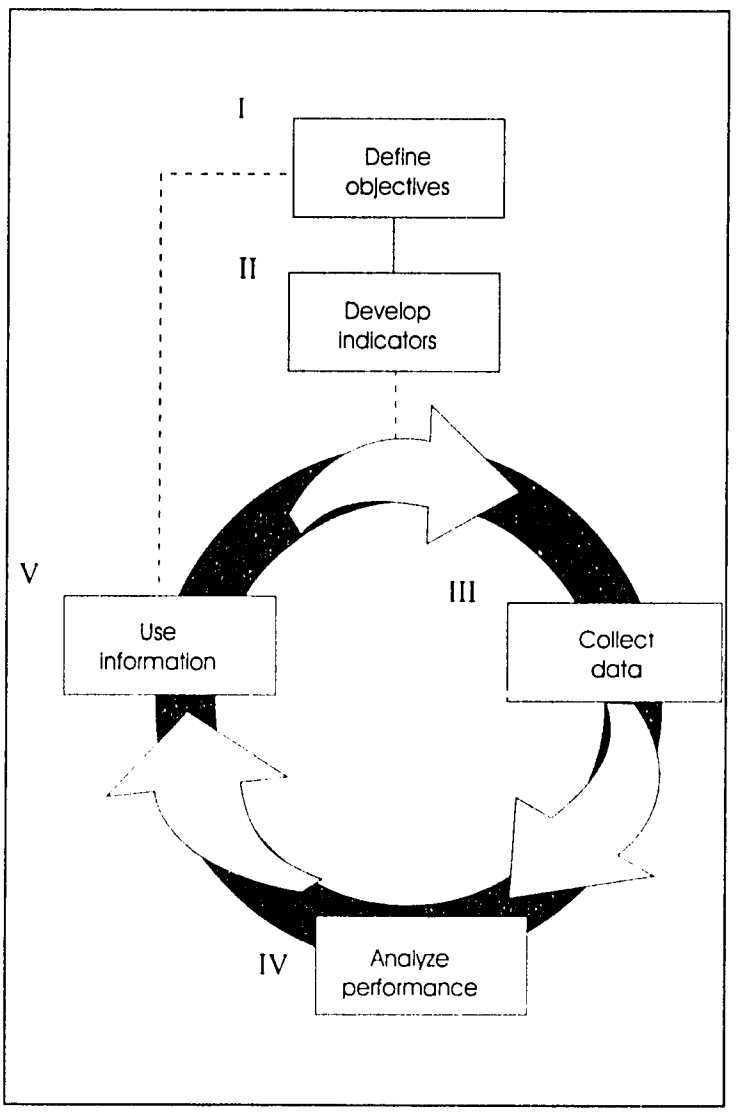
- Cut Federal red tape by streamlining the budget and procurement process.
- Deliver better customer services by giving clients a voice and creating market dynamics.
- Empower Federal employees to get results by decentralizing decision-making, holding managers accountable, and upgrading training.
- Return to basics by consolidating functions, charging fees for services, and increasing efficiency.

Box 1. Phases of Performance Measurement

The performance measurement process typically involves several phases:

I. *Defining objectives.* In this initial phase an organization must articulate its objectives and identify strategies to meet those objectives. The objectives should be meaningful and significant, and the organization should be willing to be held accountable for reaching them. Sometimes a hierarchy of objectives are articulated, with longer term objectives causally linked to shorter term, intermediate outcomes. The process of defining objectives should be as participatory as possible to generate consensus.

II. *Developing indicators and baselines, and setting targets.* Next, the agency identifies or develops indicators to use in measuring progress toward meeting the objectives. It collects baseline data to establish a starting point, then sets future targets or benchmarks it expects to reach. The targets are based on critical assumptions about existing trends, available agency resources, and external factors likely to influence the outcome.



III. *Collecting data.* The agency may collect actual performance data directly or through secondary sources if quality can be ensured. Depending on the rapidity of expected change, data collection on performance may be undertaken monthly, annually, or every few years, as appropriate. It is important that data be collected regularly and systematically.

IV. *Analyzing performance.* Performance data are analyzed against previously established targets or benchmarks. The performance measurement data often raise a "red flag" for program managers when something is amiss but rarely provides any specific details about why progress fell short. Performance measurement typically tracks rather than explains results. Thus, if an agency needs more information about "why" a target has not been met, or if recommendations about program improvement are wanted, it can decide at this point to conduct a more in-depth evaluation.

V. *Using performance data for decision-making.* Performance data are typically analyzed to report on program performance to agency managers, decision-makers, and external audiences interested in an agency's progress. However, the ultimate aim of performance measurement information is achieved only when its use influences management actions and thus feeds back to improve the agency's programs. This stage is known as "managing for results."

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Many of NPR's detailed recommendations for improving government stress results-oriented management approaches. Among them are employee accountability standards, agency performance agreements, customer satisfaction surveys, development of strategic plans with clear measures of intended results (targets), and monitoring and reporting on actual results against those targets. USAID Administrator J. Brian Atwood volunteered the Agency as an NPR "reinvention laboratory" last summer. Since then we have been actively reengineering how the Agency will do business in the future.

The Clinton Administration is also moving ahead by establishing service delivery standards. Having such standards and getting feedback from clients on the quality of services provided is considered to be an essential phase in the performance measurement process. Consistent with the recommendation of NPR, President Clinton has signed an executive order requiring all Federal agencies to post service standards, measure results against them, and benchmark customer service performance against the "best in the business." USAID is in the early stages of planning such a survey.

Congress too is taking performance measurement seriously. Several recent legislative initiatives have advanced performance measurement governmentwide. For example, under the 1990 Chief Financial Officers (CFO) Act, Federal agencies must start submitting *audited* financial statements that describe how they spent their appropriations or any other funds received. The CFO Act requires agencies to clearly define their mission, measure efficiency and effectiveness, and improve performance where deficient.

In short, an agency's traditional balance sheet alone will no longer be acceptable under the CFO Act. It must include how well funds were spent to achieve stated goals and what was accomplished by the agency with those expenditures.

The most significant legislation to influence performance measurement is the recently enacted Government Performance and Results Act (GPRA). In brief, GPRA requires agencies to develop strategic plans in consultation with their "customers," establish performance targets that are outcome oriented, produce performance measurement plans that track actual results against those targets, and report on performance.

Under GPRA, agencies can no longer measure just inputs and outputs. No longer is it sufficient to measure just what is needed for implementing a specific project—personnel, funds, equipment, and facilities (inputs). Nor is it sufficient to record only what the project directly produced, such as the number of people trained (outputs). What is now required is a measure of the project's outcome or impact. For example, did the training project achieve a change in the trainees' skills, practices, or behaviors as intended? Under GPRA, all Federal agencies must prepare and submit to the Office of Management and Budget (OMB)

- *Five-year strategic plans* that define their mission and long-term goals
- *Annual performance plans* that link the long-term goals to shorter term objectives, which can be measured and tracked annually and which identify the resources necessary to achieve them
- *Annual program performance reports* that provide feedback to managers, policymakers, and the public concerning what was actually accomplished for the resources expended and how well the original objectives were met

Under GPRA, OMB will be allowed to grant waivers of nonstatutory administrative requirements to agencies seeking greater managerial flexibility on personnel levels, salaries, and budget constraints. In exchange, agencies will be expected to provide greater accountability for improved program results.

The timetable for governmentwide implementation of GPRA calls for agencies' 5-year strategic plans to be submitted to OMB by September 1997. In FY 99, the first annual performance plans are to be prepared by agencies and their first annual performance reports submitted by March 2000. A pilot phase (FYs 94–96) is under way to provide an opportunity to learn lessons and resolve problems, with pilot agencies working under an accelerated timetable. USAID's proposal to be considered a pilot agency was recently approved by OMB.

Box 2. What's Different About Managing for Results?

In the old way of doing business, the focus was on	In managing for results, the focus is on
Inputs	Outcomes
Process	Results
Activities	Strategic objectives
Retrospective data analysis	Ongoing monitoring
Compliance	Performance
Management control	Management improvement
Reporting data	Using data

In addition to these governmentwide legislative mandates, the latest version of the Administration's proposed foreign assistance legislation, the Peace, Prosperity, and Democracy Act (PPDA), makes a strong case for performance measurement. For example, it states that the United States will establish open and transparent systems to monitor results of its assistance, and will be prepared to shift scarce resources from unproductive programs.

USAID has not been caught off guard by these performance-oriented trends. To the contrary, USAID has been out front, more than most other Federal agencies, in developing and installing performance measurement into its way of doing business in Washington and in field Missions. With USAID's leadership committed to managing for results, that trend is likely to continue.

Performance Measurement: Lessons Learned From Other Agencies

by Thomas J. Cook, Jerry VanSant, Leslie Stewart, and Jamie Adrian
Research Triangle Institute

In 1993 the Center for Development Information and Evaluation contracted with Resources Triangle Institute (RTI) to explore how other U.S. public and international organizations have managed the use of performance information to manage for results. The intent was to learn from the "best practices" of other agencies to improve USAID's own strategic management approach.

In conducting the study, RTI interviewed representatives of more than 20 international development agencies and U.S. Government offices. It also reviewed evaluation research literature and agency reports and articles. RTI ultimately examined performance measurement systems established by these agencies and analyzed how the systems are being used to manage and evaluate programs. This article summarizes key factors found to promote the effective use of performance measurement in the agencies reviewed. It then draws lessons from this experience applicable to USAID.

Promoting the Effective Use of Performance Measurement

Performance measurement systems are used to formulate budgets, allocate resources, motivate employees, improve services, and facilitate the exchange of information between the government and the public. Performance measurement can also help improve credibility and secure resources necessary to maintain and enhance programs. Performance measurement should be used for self-assessment and improvement, not just for auditing and monitoring. It should focus on how to make programs better, not dwell on individual job performance.

Here are some of RTI's suggestions on how to promote the use of performance data in development management:

- *Managers must view performance measurement as an integral part of the agency's mission and strategic plan.* Unfortunately, performance measurement is often viewed as an adjunct to the plan, in the same way that evaluation is often viewed as a requirement to be satisfied after the program is completed. This requirement presumes that the plan's strategic objectives (1) are meaningful relative to what the agency is actually trying to accomplish and (2) are expressed with sufficient precision to allow assessment of their achievement.
- *Performance measurement also requires senior management support at the program design stage and onward.* Performance measurement should be built into the program and project design so that questions about performance measures are linked to questions about program content. Senior program managers must be actively involved in designing the performance measurement system to show support. They should not delegate this task to others.
- *Senior managers must make sure there is a clear understanding throughout the agency of the purpose of performance measurement.* The reasons it is critical to the agency's mission and strategic objectives, and the planned uses of data for management decision-making at all levels must also be clarified.
- *A direct connection must exist between data and decisions.* The emphasis on agencywide use of data can be strengthened by creating a demand for performance data, rather than by assuming that if the data are available, they will be used. Managers throughout the agency must believe in the value of routinely using performance data to manage their programs and projects; moreover, managers must accept that their performance as managers will be evaluated in large part on this basis.
- *Another way to promote performance measurement is to have an "information broker" in the agency.* The broker could act as a repository of agency information on performance data, ensuring that the data are readily available to managers when needed. The broker can also promote feedback of performance

results to program staff, especially those who may have been involved in generating the data. The information broker could document the use of performance data and communicate back to the data producers to strengthen their commitment to providing good data.

• *Successful installation of a performance measurement system is, at minimum, a 3- to 5-year process entailing considerable group facilitation, negotiation, and training.* One of the weakest assumptions of performance measurement is that development managers know how to use performance data to manage their programs. Insufficient experience, training, and resources (time and budget, for example) of managers often constrain their effective use of performance data. Many managers need training and other technical assistance (such as software) to make good use of the data. Others do not have the time or staff to analyze the information.

• *Performance measurement should be keyed to different levels of the agency to give managers access to information directly relevant to their immediate responsibilities.* Managers may have more incentive to deal with matters in which they have direct control. The manager of a water purification project, for example, is likely to be more interested in the gallons of water treated per day than in how the project is part of an "infrastructure development" program that, in theory, contributes to countrywide economic development.

• *Positive incentives are important and should focus on reinforcing good management practices.* Managers should be evaluated on whether and how they use performance data to manage their programs, not necessarily on the actual results of the programs. Managers may have little direct control over results. They can develop and use performance data to document how well a program is progressing toward its objectives.

• *The total agency – all affected managers – need to be involved in generating performance data.* Senior managers should not just bureaucratically delegate the responsibility to some lower level. Private sector respondents strongly recommend that the Federal Government not create a "measurement bureaucracy." Moreover, if senior managers have no contact with those producing the data, communication problems can result reducing the effective use of performance data. This can especially be a problem if senior management has no direct contact with the staff who are both defining performance indicators and generating data for management. The data users may not fully understand what is behind the numbers they are given, and data producers may have little appreciation for the issues facing senior managers who need the performance data.

• *Given tight budgets, managers must view the production of performance data as a cost-effective process.* They must perceive that the direct benefits they receive from using performance data equal or surpass the cost of collecting the data. Benefits can be realized through better program management. Costs can be limited by using existing data whenever appropriate and by employing creative sampling strategies.

• *Every performance measurement system should have built-in quality-control checks for data and routine audits to safeguard the reliability and accuracy of the data.* Confidence in the quality of information is critical. It will promote use of the performance measurement system.

• *Focus on measuring results, not just processes.* This suggestion reflects the *Reinventing Government* argument that performance measurement should focus on what programs are accomplishing, especially the "people impacts." In other words, we know what programs are doing; we simply do not know if they are doing any *good*.

• *Limit the performance analysis to a few areas directly relevant to the agency's mission and strategic objectives.* USAID's admonition to "focus and concentrate" captures the point made by several sources. Otherwise, the agency risks overloading managers with numbers that they may not have the resources or the background to use effectively.

• *Use a nonthreatening approach.* Managers are bound to feel threatened if they are told to report data on their programs without being involved in the performance measurement process or without explaining how and by whom data are and are not going to be used. A strict compliance mode of measurement will not only lessen the possibility of manager "ownership" but will also likely produce bureaucratic resistance and, worse, lead to data corruption.

A direct connection must exist between data and decisions... Managers throughout the agency must believe in the value of routinely using performance data to manage their programs and projects.

Key Lessons Learned for USAID

From the suggestions mentioned above, lessons can be drawn for effective promotion and use of performance measurement systems in USAID. These lessons are as follows:

- Leadership support is essential. Key USAID officials must give backing to performance measurement and provide a mandate and resources for its implementation.
- Ownership should be elicited at all management levels; performance measurement "champions" are needed in Washington as well as the field Missions.
- Don't overload expectations. The purpose is not to measure linkages or to draw cause-and-effect conclusions. The performance measurement system is a complement to, not a substitute for, program evaluations.
- Involve program managers in developing plans for analysis and actions based on monitoring information.
- Train Agency staff and managers to use performance measures.
- Focus on a few key areas for results at each point of management responsibility.
- Report frequently on aspects of performance that can easily be manipulated in the short run; report less often on those less sensitive to program changes.
- It will take several years to implement a performance measurement system. Give it time.
- Use a small number of indicators and keep the system as simple as possible. Not all potentially relevant information improves decisions or is eventually worth knowing.
- Resist creating a measurement bureaucracy.

For more information see "Performance Measurement: Lessons Learned," by Thomas J. Cook, Jerry VanSant, Leslie Stewart, and Jamie Adrian, USAID Managing for Results Working Paper No. 2, May 1994 (PN-AAX-285). This study was funded under the CDIE/PRISM contract with Management Systems International, with support from Labat-Anderson and Research Triangle Institute.

PRISM
Program Performance Information for Strategic Management

Performance Measurement in USAID: The PRISM System

by Annette Binnendijk and Steven Gale
Center for Development Information and Evaluation

USAID leaders have placed renewed emphasis during 1993-1994 on strengthening the Agency's commitment and capacity to manage for results. In 1993, USAID Administrator J. Brian Atwood volunteered the Agency as a "reinvention laboratory" for Vice President Al Gore's National Performance Review (NPR) initiative. And more recently, in July 1994, USAID was accepted as a pilot agency to help implement the Government Performance and Results Act (GPRA).

Fundamental to a strategic management approach is the establishment and implementation of strategic planning and program performance measurement systems and complementary program evaluations to produce information needed for decision-making on resource allocations, programs, and policies. The Center for Development Information and Evaluation (CDIE), within the Bureau for Policy and Program Coordination (PPC), has a lead role in supporting and strengthening program performance monitoring and evaluation throughout the Agency.

USAID signaled the adoption of a more strategic and results-oriented management approach when it tasked CDIE with creating the Agency's overall Program Performance Information for Strategic Management System—PRISM. Initiated in April 1991, and building on experience under the Development Fund for Africa in the Africa Bureau, PRISM provides a comprehensive approach to strategic planning, program performance monitoring, and

reporting. Although it preceded NPR and GPRA, PRISM is surprisingly consistent with the requirements set forth in these initiatives. The system serves the information needs of both senior managers in Washington and program managers in field Missions around the world. Its key characteristics are as follows:

- PRISM focuses on achievement of higher level strategic objectives and program outcomes rather than on the inputs and outputs of individual project activities.
- PRISM is built on the strategic plans and performance measurement systems of its operating units—the country Missions and central offices—and is thus a "system of systems."
- PRISM is not imposed from the "top down" but is built from the "bottom up," reflecting the real differences among country circumstances and Mission programs.

PRISM's first-line application is in the field Missions, which have primary responsibility for implementing U.S. assistance programs in developing countries. PRISM helps Missions clarify their development objectives, focus activities and resources on those objectives, decide on appropriate performance indicators, measure actual performance against expected performance targets, and use this information for making management decisions at the Mission level and for reporting to USAID/Washington. Similar approaches are now being extended to central offices responsible for providing field support to Missions, conducting research, and implementing special centrally managed programs.

PRISM's second-line application is as a central, Agencywide program performance monitoring system and database. As such, it is built on the performance measurement systems of the operating units—with data from each Mission and office entered into the Agencywide database and used for reporting annually to senior managers on the Agency's overall program performance. CDIE has responsibility for maintaining the PRISM database and for annually analyzing and reporting on the Agency's program performance.

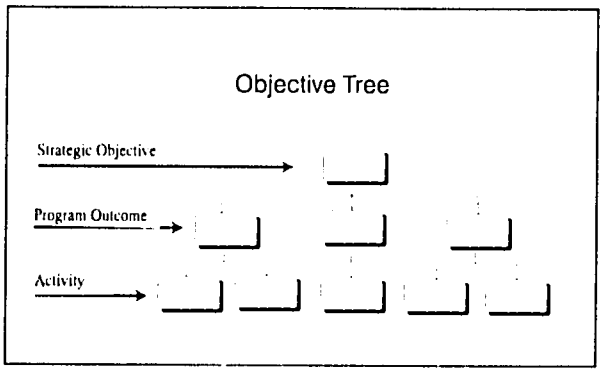
The success of foreign assistance is determined by its impact upon developing nations. Inputs are meaningless without reference to effects. With this in mind, USAID will measure its results by asking how projects and programs achieve discrete, agreed objectives.

—Strategies for Sustainable Development
USAID, March 1994

PRISM in the Missions

Missions typically go through several phases, described below, to fully implement PRISM. The process should be highly participatory and include Mission staff, project implementation staff, and host country counterparts.

Strategic planning. In this phase, Missions identify and clarify their strategic objectives and program outcomes, arranged in an "objective tree" hierarchy. Strategic objectives are defined as long-term objec-



tives that are developmentally significant for which the Mission is willing to be held accountable for achieving within 5 to 8 years. Program outcomes, the next lowest objectives, are interim results achievable in 2 to 5 years. The third level of objectives are the outputs of the assistance activities contributing to the program strategy.

Performance measurement. The next PRISM phase is to define strategic objectives and program outcomes in measurable terms (indicators), determine adequate data sources and establish baseline data for each indicator, set targets (expected results), undertake data collection routinely on actual results, and analyze progress. When actual results fall seriously short of expected results, Missions will often undertake evaluations to investigate explanations and recommend solutions to problems.

Missions are currently at different levels of installing performance measurement systems. To assess progress, CDIE, in collaboration with other bureaus, has defined several progressive levels of

development for tracking implementation. CDIE uses this information to develop a joint understanding with bureaus and Missions on where they are in implementing PRISM and for planning next steps. The levels are "progressive" in the sense that a Mission cannot advance to a higher level without first having attained the lower levels. For example, a Mission cannot advance to level 3 without having attained levels 1 and 2. Definitions of the levels are as follows:

- *Level 1.* Mission has identified strategic objectives and program outcomes, most or all of which meet PRISM standards.
- *Level 2.* Mission has defined indicators that meet PRISM standards for most or all of its strategic objectives and program outcomes.
- *Level 3.* Mission has set targets for expected results, has gathered relevant baseline data, and has identified likely sources for future performance data for most or all of its strategic objectives and program outcomes.
- *Level 4.* Mission's annual program performance reports provide data on actual results for most or all of its strategic objectives and program outcomes.

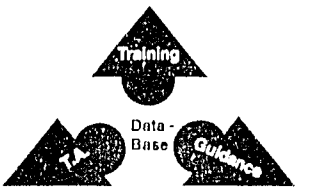
Of USAID's 43 "sustainable development" countries, three have not yet achieved level 1; they have identified strategic objectives but not program outcomes. The remaining 40 Missions have all achieved level 2 or above. Of these 40, 16 Missions are at level 2, 15 are at level 3, and 9 are at level 4.

Missions can begin using program performance information systematically for management decisions even while in the early PRISM levels. That is, managing for results is not necessarily a final stage of PRISM implementation but may begin even as Missions collect baseline data.

USAID/Washington is now intensively reviewing Missions' progress in implementing PRISM and is committed to helping "sustainable development" country Missions reach level 3 by October 1994 and level 4 (collecting actual results data) by October 1995. A variety of support services are being offered by CDIE to assist Missions and offices (see Box 1). Some USAID country programs, for reasons of their size; their political, emergency, or transitional nature; or other factors, are not immediate targets for PRISM coverage.

Evaluation. Historically, Missions rarely carried out evaluations that focused on multiple project activities. Most focused only on individual project implementation. New evaluation guidance, currently being drafted, will attempt to change this. The guidance will encourage Missions to focus more of their evaluations on groups of related activities that together aim to achieve a given program outcome or strategic objective. To complement the program performance measurement system (PRISM), which tracks performance of program outcomes and strategic objectives, the new "program evaluations" (sometimes called "strategic evaluations" or "linkage studies") will examine cause and effect between USAID activities, program outcomes, and strategic objectives; explain why performance was successful or not; and recommend management actions to improve program performance (see Box 2). Evaluations that focus above the individual project level should be more useful for advising Missions of "strategic" or program-level management decisions.

Managing for results. A fully operational PRISM system is reached when Mission management routinely uses information from the performance meas-



Box 1. CDIE'S PRISM Support Services

Effective implementation of PRISM by the Agency's operating units has been supported by a variety of CDIE services, including technical assistance, training and workshops, guidance papers, and a PRISM hotline. For example, during FY 94, CDIE has so far participated in 20 technical assistance teams to help Missions in developing strategic plans and performance measurement systems. Missions and offices can tap into a central PRISM contract for a variety of relevant services and skills. CDIE also holds customized, Mission-based workshops covering all aspects of strategic planning, performance measurement and evaluation, and strategic management. Numerous CDIE working papers are available on performance measurement and evaluation topics, and recently CDIE has established an E-mail hotline to answer PRISM queries. The hotline services can be accessed through E-mail to PRISM HOTLINE@CDIE.SDS@AIDW. Alternatively, queries can be mailed or pouched to PRISM HotLine, PPC/CDIE, Room 311, SA-18. Washington, D.C. 20523.

urement system and complementary evaluations to make effective decisions that support successful program strategies and projects, while revising or phasing out those that are not performing well.

Missions in the forefront of installing PRISM report many benefits. Among them:

- Using strategic planning to focus their assistance programs on a smaller number of more meaningful and ambitious objectives.
- Using strategic plans as a reference point for assessing their project portfolios and revising or phasing out activities that do not contribute to objectives.
- Using strategic plans as vehicles for dialog and collaboration with host-country counterparts and with other donors to explain USAID's objectives.
- Using strategic plans and program performance information for reporting to USAID/Washington. Missions are now required to submit their strategic plans, annual action plans (relating resource needs to intended results), and annual program performance reports (providing actual results).
- Organizing Missions in new ways to better achieve strategic objectives. These new ways include the creation of "strategic objective teams" that cross traditional office lines.
- Using program performance information to serve as warnings that programs are facing problems and that further evaluation is needed to find out why and to recommend solutions.
- Comparing data on actual results with expected results and using these findings, often supplemented with evaluations, to make management decisions that will improve performance.

PRISM in USAID/Washington

In addition to its uses in field Missions and offices, PRISM is expected to serve information needs of senior managers in USAID/Washington. To help meet these needs, CDIE maintains a central, automated PRISM database. It contains strategic planning and performance data of individual operating units, gleaned from various reports (for example, strategic plans, action plans, various performance reports). Key uses of PRISM information by USAID/Washington include:

- Reporting convincingly to Congress and various oversight agencies on overall performance and results of USAID programs
- Fulfilling legislative requirements for performance measurement and reporting under the GPRA

Box 2. Complementary Roles of Program Performance Measurement and Evaluation

Program Performance Measurement	Program Evaluation
✔ Clarifies program objectives.	✔ Analyzes why and how intended results were or were not achieved.
✔ Links project activities and their resources to objectives.	✔ Assesses specific contributions of activities to the results (for example, addresses cause-effect, linkage, or attribution issues).
✔ Translates objectives into measurable, usually quantitative, performance indicators and sets targets (intended results).	✔ Examines other desired results not easily measured or quantified.
✔ Routinely collects data on these indicators, compares actual results with targets.	✔ Explores unintended results.
✔ Reports on progress to managers and alerts them to problems requiring attention and action.	✔ Provides lessons and recommendations for adjustments in programs or policies to improve results.

- Reviewing Mission and office objectives for consistency with new Agencywide strategic goals and guidelines
- Reviewing Mission and office progress toward expected results to keep a central watch on problematic programs requiring special attention, diagnosis, and corrective actions
- Using programming performance information to identify or flag particularly problematic or successful program strategies for greater in-depth evaluations by CDIE
- Improving program strategies and guidance
- Improving easy access to strategic planning and performance data by USAID/Washington managers

Until recently, these Agencywide PRISM efforts and uses were complicated by the somewhat different approaches and reporting formats and cycles of the different regional bureaus in USAID. However, the new "Agency Directive on Setting and Monitoring Program Strategies" (May 1994) now establishes

Box 3. Agency Directive on Setting and Monitoring Program Strategies

In May 1994, USAID's Bureau for Policy and Program Coordination issued a new directive establishing an Agencywide PRISM framework for the strategic plans and performance measurement systems of USAID Missions and offices. This directive, for the first time, clearly relates the Agency's overall programming and budget process to the systematic review of operating units' strategic plans, annual action plans, and annual performance reports. The intent is to develop a process that does a better job of putting the Agency's resources behind those programs that promise meaningful development results and that demonstrate progress in achieving those results.

Agencywide resource allocation decisions will be based on such factors as the contribution a USAID country program can make toward meeting strategic objectives, the incremental progress the program is making toward those objectives, and the suitability of the country environment to making a positive development impact. Thus, a flexible type of performance-based budgeting system will be put in place beginning with the FY 96 budget cycle that initially relates a Mission's resources to intended results (action plan), whereas ultimately resource allocation decisions will be influenced by how well actual results are achieved (performance report).

USAID/Washington review of the strategic plans of the operating units will ensure that their strategic objectives are consistent with Agencywide (as well as region-specific) strategic directions and priorities and that their plans to measure performance are adequate and meet Agency PRISM standards.

USAID/Washington reviews of program performance reports will provide a forum for the Agency's senior managers to review jointly with operational units progress being made to achieve strategic objectives and to identify any emerging issues that may warrant senior management attention. In addition, program performance reviews will provide senior managers with a broad understanding of the impact to date of the Agency's operational programs and thus contribute to (1) informing Agency decisions about overall program planning and resource allocation and (2) meeting accountability requirements to report on the effectiveness of Agency programs.

USAID/Washington annual reviews of strategic plans, action plans, and performance reports of the operating units will form the basis for the Agency's annual budget submissions and for annual program performance reporting to Congress and to the Office of Management and Budget. This new strategic planning, monitoring, and reporting framework is consistent with, and thus should fulfill Agency requirements under, the 1993 GPRA legislation.

a consistent Agencywide PRISM framework and requirements for the strategic plans and performance measurement systems of operating units (Missions and offices). The Directive also outlines procedures whereby the operating units will report to USAID/Washington and undergo periodic reviews (see Box 3).

Greater Agencywide access and use of program performance information by Agency managers is being facilitated by plans to include the PRISM database, objective trees, and related performance reports on USAID's on-line File Access System. Sharing USAID performance information with selected outside audiences (such as other donors) via the Internet or other automated mechanisms is a possibility, but one that has not yet been fully explored.

CDIE has responsibility for reporting annually on program performance Agencywide. Two such annual reports have been completed, covering 1992 and 1993. These reports describe the objectives and program strategies of the Missions. They use an analytical "clustering" technique to group similar objectives and program strategies into common or Agencywide "analytical frameworks." What Missions are actually doing is then compared for consistency with Agency directives on strategic goals, policies, and priorities. Actual data on the progress that programs are making toward their objectives are provided where available. The reports usually draw not only on PRISM data but also on Agencywide program evaluation findings, especially those conducted by CDIE. Summaries of PRISM implementation progress and next steps are also typically included in the annual reports (see page 28).

As PRISM begins to provide more actual performance data, it should become possible through cross-country analysis to identify program strategies that are particularly successful or problematic in varying country conditions. This, in turn, should flag specific Agency program strategies in need of greater in-depth evaluation by CDIE—to better understand cause-and-effect relationships underlying performance, to explain common factors, or "lessons," behind their success or failure, and to recommend management actions. Thus, program performance monitoring and program evaluations are distinct yet complementary functions. Both are important management tools. The results of these cross-country PRISM analyses and CDIE evaluations of program strategies Agencywide should be used to influence and improve the Agency's program strategy guidance.

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Challenges and Opportunities For Performance Measurement In USAID

by Lawrence S. Cooley
Management Systems International

With the passage of the Government Performance and Results Act of 1993, the Government committed itself to monitoring its strategic objectives as an integral part of the way it does business.

USAID's efforts to introduce a monitoring system of this type preceded the legislation by 2 years. Those efforts, now in midstream, make USAID one of the most advanced agencies of the Federal Government to implement a comprehensive system for measuring program performance. The Agency's Program Performance Information System for Strategic Management—PRISM—also represents one of the first efforts to install a strategic management and results-based performance monitoring system in a major international development agency. A review of USAID's experience to date thus has relevance both to the continued implementation of performance measurement in USAID and to the broader effort to implement such systems in other public agencies. This article reviews the constraints to further use of performance measurement and then assesses USAID's existing strengths and the challenges to be faced down the road.

Constraints

At least seven features of USAID complicate the Agency's ability to get and use performance information to manage for results. Some of these features are unique to USAID; others are inherent in the nature of international development.

1. USAID's operation has long been and continues to be a decentralized, project-centered and Mission-centered enterprise. That makes it difficult for the Agency to achieve consistency in program activities and, consequently, aggregation of results across those activities.

2. As USAID is operating in different country contexts, there is no single standard or set of indicators, or single national source of data, for any given substantive area.

3. Performance monitoring has most commonly been used to assess the quantity and quality of service delivery to beneficiaries. Direct service delivery of this type has become increasingly uncommon in USAID projects. There is little domestic or international experience with monitoring performance in what USAID is increasingly involved in—namely, activities that are structural in nature, such as institutional development or policy reform.

4. USAID is being called upon to monitor the performance of programs in which it plays only a supporting role. In such programs the information systems and ultimate responsibility for results typically do not reside with USAID.

5. The substantive range of activities in which the Agency is involved is broad. Consequently, the resources needed for effective performance monitoring are more extensive than would normally be needed by an organization of USAID's size.

6. Development results are generally long-term propositions. Therefore, it is generally not feasible to monitor the results of current program activities for quite some time, at least with respect to significant development outcomes. Conversely, current-year performance is likely the result of program decisions and activities put in place years ago.

7. Because of the unavailability of performance information for so long in USAID, an antiempirical bias has developed among Agency personnel. They are not accustomed to using data in decision-making.

Strengths

Several features of the USAID system offset these challenges to some extent. They operate in favor of collecting and using performance information:

1. The Agency has highly qualified and motivated professional staff able to work through the difficulties of developing and implementing an effective system (USAID has the highest proportion of people with advanced degrees in social sciences of any agency in the U.S. Government.)

2. It is easier to monitor results and attribute impact under a convergent planning model like USAID's (in which multiple interventions are aimed at producing particular results) than with a divergent planning model (in which a particular program or set of activities is seen as possibly having several broad-gauge effects.)

3. USAID already has a good start in performance monitoring.

4. Helping to develop monitoring and evaluation systems in USAID-assisted countries is an important development objective in its own right.

The Challenges Ahead

In establishing an effective system of performance monitoring in USAID, the following issues have required special attention. They continue to pose challenges to the full implementation and utilization of the system:

The question of attribution of specific development impacts to specific USAID assistance. Performance monitoring can tell us whether we have reason to believe that our activities are contributing to important development objectives, but it cannot answer the cause-effect questions of attribution. About the best one can do is apply the concept of "plausible association," under which we ask whether a reasonable person might conclude from what USAID did at the assistance level and what happened at the impact level that the assistance probably did or did not contribute to the impact. If that impact has not occurred, such data would lead one to question the value of continuing the existing strategy.

It is possible to increase confidence in the assistance-impact relationship by doing one or more of the following: (1) picking objectives that are not far removed from USAID's level of responsibility; (2) focusing attention on the logic of the strategy, particularly on identifying, achieving, and monitoring intermediate objectives as critical linkages between assistance and impact; (3) monitoring critical assumptions that govern the assistance-impact relationship; (4) supplementing quantitative monitoring data with other evidence, such as case studies and narrative information; (5) using peer-review mechanisms to assess the plausibility of the assistance-impact relationship.

The difficulty of defining results. USAID's options for defining results seem to lie on a continuum between two extremes. There is the "PVO (private volunteer organization) model," in which accomplishments are counted one by one, and only the numerator matters (the number of jobs created, for example). And there is the "World Bank model," in which accomplishments are judged in terms of progress toward the solution of national problems, and both numerator and denominator matter (for example, a decrease in the national unemployment rate). For USAID, the trick is to find objectives that are high enough to be consequential in the eyes of Congress and the American people, yet low enough that USAID can feel—and demonstrate—a strong association between its efforts and those objectives.

USAID's efforts to define objectives that are both significant and credible are enhanced by "focusing and concentrating"—that is, by doing fewer things but doing them well so that the Agency can achieve significant impact. But even if a given USAID Mission were to do only one thing in a country (particularly with a small budget in a large country), it would still face the question of how high it should legitimately set its sights. It would have to balance what is doable with what is meaningful to those outside the Agency.

Experience suggests that the nature of the intended results specified in the strategic objectives of many Missions frequently exceeds what would appear reasonable given their available resources. The most prevalent cause of this "aspiration inflation" is the resort to broad, high-level objectives to encompass within a given program strategy many relatively unfocused, wide-ranging activities already under way.

For USAID, the trick is to find objectives that are high enough to be consequential in the eyes of Congress and the American people, yet low enough that USAID can feel—and demonstrate—a strong association between its efforts and those objectives.

The difficulty of measuring program performance in the areas of democracy, environment, and economic growth. Measuring significant results from assistance given to support democratic initiatives is difficult, principally because of the difficulty of identifying exactly what such programs are expected to produce as ultimate, observable consequences. This may not be as great a problem as it would be in other parts of USAID's portfolio, however, since the expected results of many of the lower level interventions (such as the participation of nongovernmental organizations in the political process, or free elections) are considered valuable in their own right. Perhaps measurement of results need not go beyond that level.

There is also a summation problem in the environmental area—namely, what do we mean by an improved environment? A further complication is that changes in the environment take time. If strategic objectives are intended to be medium term (i.e., 5 to 8 years), then one ends up using intermediate

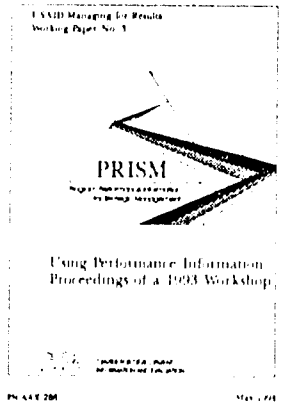
results (e.g., the rate of adoption of new conservation practices) as strategic objectives and performance indicators. To the extent that these intermediate objectives are considered meaningful by those outside the Agency—and they appear to be—then perhaps measurement of results at the intermediate levels is also sufficient here.

In economic development, it is likely that nothing short of improvement in people's incomes, their physical welfare, or some other high-level economic result is meaningful to those who want to be assured that USAID's programming efforts are achieving desirable results. Yet the interventions USAID is implementing are, at best, partial, additive solutions to the problem of low incomes or low gross domestic product. Framing appropriate objectives and measuring performance for USAID's activities in economic growth thus continues to be a significant challenge.

Taken together, the special features of performance measurement in USAID make the Agency's experience of special interest within both the international development community and the context of the overall U.S. Government effort to introduce performance measurement and management for results.

This paper was originally prepared for, and presented at, a Workshop on Performance Information Use conducted by USAID's Center for Development Information and Evaluation in July 1993. PRISM is being supported through a CDIE contract with Management Systems International, with support from Labat-Anderson and Research Triangle Institute.

Using Performance Information: Proceedings of a 1993 Workshop, can be ordered from the Development Information Services Clearinghouse, ATTN: Document Distribution Unit, 1500 Wilson Blvd., Suite 1010, Arlington, VA 22209 Phone (703) 351-4006; fax (703) 351-4039.



PRISM: Lessons Learned, A CDIE Perspective

by Steven Gale, Center for Development Information and Evaluation, and Robert Baker, Labat-Anderson Inc.

USAID's Program Performance Information for Strategic Management (PRISM) system, initiated in April 1991, was built on the pioneering experience of the Development Fund for Africa. While PRISM came in advance of the recent movement to "reinvent" the Federal Government and make it more results oriented, it is nevertheless highly consistent with these recent trends. Over the past 3 years, CDIE has achieved a number of its PRISM goals, such as providing technical assistance on strategic planning and performance measurement to field Missions and other operating units, developing Agencywide guidance on performance measurement, and building the database component. At the same time, we have experienced several constraints, especially in starting up the system. The following provides selected views on some areas of progress and continuing challenges and concludes with lessons from CDIE's recent experience.

Progress

- *Appropriate information.* PRISM reports on the performance and results of development assistance efforts—not on procedures, compliance, or administrative actions. This focuses attention on, and tends to clarify, the key objectives USAID seeks to accomplish with its assistance and forms a basis for taking regular readings on progress made toward those objectives.
- *Ownership.* PRISM was built from the "bottom up" by experienced field officers and seasoned practitioners of development assistance. Each Mission (and office) develops its own strategic plan, identifying the development objectives, program outcomes, indicators, and targets most appropriate to their specific country context. This Mission-oriented nature of PRISM results in a high degree of ownership of performance measurement systems by the Missions and enhances their use by Mission management.
- *Agencywide usage.* USAID envisioned that PRISM's information would be useful at all organizational levels, from front-line managers in Missions to senior decision-makers in Washington. Having an Agencywide system has several advantages. It allows a management tool designed and appropriate

for use at the country level to also be used to aggregate information about USAID's accomplishments at regional or worldwide levels. It allows Agency operational units to learn from one another's experiences, in terms of selection of indicators and data collection techniques and of strategic management "best practices." Finally, an Agencywide performance measurement system permits a common language and expertise to develop, as officers move from one country to another or between the field and Washington.

• *Clear policy.* In January 1994, Administrator Brian Atwood sent a worldwide cable endorsing a strategic management framework for USAID that builds on PRISM. In May, an Agency core directive was issued detailing the responsibilities of the operating units for strategic planning, performance measurement, and reporting under this new framework and relating it to the Agency's programming and budget process. These initiatives by the Agency's senior management team support PRISM implementation and use for decision-making and commit the Agency to a managing-for-results framework.

Continuing Challenges

Burden level. Especially in the early startup phases, PRISM has placed considerable burdens on field staff. Time and staff available for PRISM activities in the field have been limited, reflecting overall increasing and competing demands on USAID developmental specialists and managers.

• *System linkage.* PRISM and other Agency systems are not yet linked in real terms. Conceptually, there is widespread agreement that PRISM should be linked to budget and other USAID systems; however, there is still a gap between concept and practice—but the gap is closing.

• *Automation and access.* Automating PRISM has been slower than planned, especially at the Mission system level. For example, information on Mission strategic objectives, indicators, targets, and such is still abstracted and coded by hand from various published documents, delaying data entry, analysis, and reporting on program performance Agencywide. Also, access to the PRISM database is at present still quite limited to those in CDIE, although wider access within USAID should soon become a reality as PRISM data are entered into the Agency's File Access System.

• *Selecting indicators and setting targets.* Identifying and agreeing on key PRISM indicators is proving difficult and taking considerable time and effort—especially in some new priority areas, such as environment and natural resource management and democracy. Moreover, because PRISM is a "bottom up" system lacking uniform indicators, its ability to aggregate performance information across USAID countries may be less precise than some would prefer. Similarly, developing appropriate and stable performance targets—ones that are ambitious but still within the operating units' manageable interest—remains a very imprecise science.

• *Limited flexibility for using performance information for programming decisions.* While the Government Performance and Results Act may eventually release agencies from some administrative restrictions and budget controls in exchange for adopting performance measurement systems and managing for results, this is not yet a reality for USAID. Furthermore, as long as earmarks and other restrictions seriously limit USAID management's flexibility to allocate resources on the basis of performance, some managers will continue to doubt whether time invested in PRISM is well spent and worthwhile.

Lessons Learned

Looking back on CDIE's experiences, several valuable lessons emerge identifying key factors needed to effectively manage for results using a performance measurement system such as PRISM.

• *Sustained leadership is needed.* Strong, consistent, and unified support by Agency leadership is necessary to keep PRISM moving ahead. Bottom-up support is not enough. Leadership and sustained commitment for performance measurement systems and their use from senior-level USAID officials is even more important than technology advances in software, hardware, and systems integration.

• *Empowerment and accountability must be stressed.* Early Mission successes with PRISM show that once managers (or teams) are empowered to plan and manage strategically and are held accountable for results, they respond positively. Implementing PRISM successfully depends, in part, on how responsibility is defined at all levels for results-oriented management. Adopting the PRISM system must go hand in hand with dropping older accountability "systems." Staff empowerment must accompany increased accountability.

• *Agencywide support and teamwork are crucial.* To operate as an Agencywide tool, PRISM must receive support from all functional/technical areas within USAID. To be effective, the system must be sold (and bought into) at the very "top" and "bottom" so that decision-makers at all levels can use and depend on the information. Support from USAID decisionmakers and technical experts is necessary. Teamwork is essential for sustained PRISM progress.

Field Perspectives

Performance Measurement Experience of Three Regional Bureaus

Africa

by Kathie Keel
Bureau for Africa

Five years ago, the Africa Bureau put into place program management systems that emphasized using strategic planning and performance measurement to manage for results. The investment in time and resources to establish both a philosophy and practice within the Bureau has yielded rich returns—the most important of which is the ability to demonstrate significant and measurable impact associated with USAID's action on the lives of ordinary Africans.

The *Development Fund for Africa (DFA)* was the catalyst that led the Bureau to revamp its programming process to ensure that results were not only achieved but also accurately measured and reported. Passed in 1987, the DFA legislation served as a compact between Congress and USAID. The DFA provided USAID with a mandate to look anew at African problems and solutions and to decide how and where resources could best be used to improve the lives of Africans. In exchange for enhanced flexibility, USAID committed itself to managing for results and accepting greater accountability in reporting to Congress on the impact of those resources. Consequently, in addition to the annual reports and periodic consultations, a 5-year retrospective report on the performance of the DFA was recently presented to Congress. The report is entitled *Africa: Growth Renewed, Hope Rekindled.*

The DFA legislation has ensured funding for Africa, provided the flexibility to respond to the winds of change that have swept the continent since the late 1980s, and both enabled and forced the Bureau to do business differently. To enhance the impact of its assistance programs, the Bureau has emphasized four themes:

- *Focus* resources on strategic priorities—do fewer things and do them better.
- *Concentrate* resources in fewer countries.
- *Facilitate* participation of the host country, nongovernmental organizations, and private voluntary organizations.
- *Improve* donor coordination.

Underlying the Bureau's efforts is a strong conviction that African leadership and ownership in development planning and implementation are central to sustainable development.

The DFA's emphasis on having a measurable impact on economic and social development in Africa also led the Bureau to develop innovative programming, budgeting, and monitoring and evaluation systems. The DFA Action Plan laid out a development strategy aimed at broad-based, sustainable economic growth directly linked to bringing about positive changes in people's lives. The DFA Action Plan provides the framework for country-level programming.

The *Performance-based Budget Allocation System* enables USAID to concentrate staff and financial resources in countries where the prospects for sustainable economic growth and positive people-level impact are greatest. The budget allocation system incorporates a number of criteria, such as host country democracy/governance and economic performance, social and environmental policies, and need and population size. Country assessments resulting in country categorization and respective budget levels are conducted annually. Adjustments are made throughout the year as standards and principles are applied to changing situations.

Each Mission prepares the *Country Program Strategic Plan (CPSP)*, which lays out a Mission's 5- to 7-year plan for achieving results in a few focused strategic areas. This plan reflects a concentration of resources on a chosen, limited, and achievable set of objectives. It outlines programming specifics and defines the level and scope of projected impact. The document constitutes the Mission's "contract" with USAID/Washington to obtain specific measurable results within a set time period in return for human and financial resources. Missions are tasked with articulating strategic objectives that make sense in light of critical development problems within the particular country context and that are achievable, given USAID comparative advantage, level of resources, host country priorities, and other donor activities. Missions are responsible for demonstrating significant people-level results for which there is a

plausible association with USAID program activities.

The *Assessment of Program Impact (API)* is the Mission's annual report on progress in achieving impact in the strategic areas laid out in the CPSP. The API focuses on *program-level results* rather than on project outputs. Progress is measured against key performance indicators (selected by the Mission), which are linked to the Mission's investment and reflect people-level impact. The API is prepared annually by all major country programs and provides a rich source of data for the Bureau to use in internal and external reporting on the impact of USAID programs in Africa.

Intensive Bureau reviews of the APIs yield both sectoral and cross-sectoral analysis from country, subregional, and continentwide perspectives. Steady improvement in the quality of APIs over 4 years is seen as evidence of progress by Missions in establishing monitoring and evaluation systems that permeate Mission thinking and are seen within Missions as providing useful information for program managers to better manage USAID resources. For both Missions and the Bureau, the API provides an opportunity once a year to step back, see the "big picture," and ask whether we are on the right track.

The work of the Analysis, Research, and Technical Support Office of the Bureau complements the overall systems. It helps us better understand development problems by suggesting the most effective approaches and identifying the most appropriate performance indicators in various sectors and the rate of change that can be expected under different conditions.

The Bureau continues to grapple with performance measurement issues. Still, the systems developed to achieve results under the DFA have served us well over the past 5 years in enabling us to better understand the impact of USAID efforts.

For more information, please contact Kathie Keel in AFR/DP/POSE, Room 2495 NS.

USAID/Kenya: Using Program Performance Information for Strategic Management

Since the mid-1980s, USAID/Kenya has given increased emphasis to managing for results. Program performance monitoring and evaluation are central to the way the Mission does business with other donors, the Government of Kenya, and nongovernmental organizations (NGOs). Evaluation findings and other data on program performance have influenced Mission investment decisions, other donor support, government policy and priorities, and NGO management and practice in all development sectors.

In population and health, a 1979 USAID-financed survey, which documented one of the highest fertility rates ever recorded, contributed to the decision by the Government of Kenya to intervene actively in the population sector and to increase emphasis on service quality and coverage. Subsequent surveys and program performance data documented the dramatic decline in fertility . USAID-sponsored studies on consumer willingness to pay for health services led to the initial government decision to institute user fees at public facilities and to the subsequent decision to maintain these fees in the face of initial opposition. This policy is credited with increasing the availability of essential drugs for clients at government health facilities and increasing financial resources in support of primary/preventive health care services.

In agriculture, special studies, performance data, and evaluation findings have documented the positive impact of agricultural research on agricultural productivity and farm income. These findings have also influenced government policy decisions on fertilizer marketing, private sector roles, and controls on maize movements and prices. USAID support of an evaluation unit at the Kenya Agricultural Research Institute (KARI) has contributed to Kenyan ability to use data on results to influence policy and program priorities. For example, a recent KARI study of the people-level impact of adoption of high yield varieties of maize showed that female-headed households benefited less than male-headed households. This finding led to a decision to give more attention to socioeconomic barriers of increased agricultural production.

Similarly in private enterprise, program performance data have influenced USAID and other donor support and government policy. For example, findings from the Mission's evaluation of the Kenya Trust for Private Enterprise Development led to the decision to discontinue USAID support for equity capital in subsequent programs. On the other hand, USAID-supported monitoring data that documented results from the Rural Private Enterprise project generated additional support from European donors for these activities. Similarly, USAID-supported studies on the impact of government regulations on exports led to additional tax incentives for exporters, abolition of import licenses, and foreign exchange liberalization.

Stephan Ndele, program specialist (evaluation economist), Program Office, USAID/Kenya

The Near East

by Lynn Carter
Bureau for Asia and the Near East

In the winter of 1992, the Near East component of the Asia and Near East Bureau (ANE/NE) began actively supporting Missions in the development of monitoring plans to measure the performance of Mission strategies. The main purpose of performance measurement is to give Missions timely information on progress so they can adjust their strategy or implementation methods to reach their performance targets. Performance measurement also helps Missions learn from one another's experiences.

The indicators developed as part of the performance measurement plan cannot tell Missions why or how a strategy is succeeding or failing, but they can give some evidence of progress. They can also help Missions formulate the right questions. However, performance measurement does not mitigate the need for evaluation.

How does performance measurement work in the ANE/NE Bureau? The Bureau approves Mission strategy and monitoring plans. It carefully reviews existing plans and provides feedback to Missions on the extent to which the indicators selected and the timing of data collection meet criteria established by the Bureau. The Bureau requests documentation concerning why particular indicators have been chosen (their relevance to the objective), how the actual measurement is being done, and how the data will be collected. This information allows the Bureau to understand the relationship between the objectives and the indicators and also to give more informed comment. Targets or benchmarks are also reviewed. Bureau performance measurement criteria and requirements are laid out in the *Near East Bureau Manual for Program Planning and Performance Measurement and Reporting* (April 1993).

Missions have gone through a long process of improving and refining their performance measurement plans—clarifying objectives, becoming more accustomed to working with indicators, and learning more about how host country data are configured. Acquiring baseline data for many indicators has taken considerable time. Most performance monitoring plans rely at least in part on data that the Mission must generate itself. The Bureau has been both tolerant and encouraging of this process, recognizing that good indicators and good data are more likely to be useful to the Mission and are also more likely to contribute to the institutionalization of performance measurement.

The Bureau has provided direct assistance for performance measurement through two mechanisms: (1) a buy-in to the Center for Development Information and Evaluation PRISM contract, which gives Missions and bureaus technical assistance in a range of performance measurement methodologies, such as "objective tree" analysis and indicator specification; and (2) an intergovernmental agreement with the Bureau of the Census to support reviews of data sources, acquisition of baseline data, setting of performance targets, and development of techniques for data collection and analysis.

Missions must report annually on progress toward meeting their objectives. The requirements for the annual report or the Country Program Review are laid out in the manual mentioned earlier. The format is standardized. Missions are asked to analyze progress, report on critical assumptions by exception, and explain any other external elements that have changed and are expected to have an impact on the strategy. The Bureau does not expect reporting on strategic objectives annually, particularly in the early years of the strategy when progress against strategic objective indicators may be slight. Also, the Bureau requests annual reporting on program outcome indicators—measures at a level just under strategic objective indicators.

When annual reporting is not possible for particular indicators, the Bureau asks Missions to accompany these particular indicators with proxy indicators that will at least show a partial picture of progress. If the strategic objective is a new area for the Mission, with projects just being designed, then the Bureau finds it unrealistic to expect any reporting on *outcomes* at the close of the first year, and possibly even the second. Missions are instead asked to report on inputs and outputs and on the process of getting a series of interventions under way.

The Bureau is just receiving the first annual performance reports and holding reviews, so the uses to which performance data will be put are not yet clear. The Bureau is looking carefully at how Missions interpret the data and whether Missions are recommending changes based on progress. In one instance in which Mission funds had been cut, the Bureau and the Mission used the Country Program Review to jointly explore the future of the Mission and its strategy. As a result, elements of the Mission strategy are likely to change.

Finally, ANE/NE requirements for strategic planning and performance measurement and reporting may need to change, to better reflect recently issued

Agencywide guidance on performance measurement and new monitoring and evaluation directives. The Near East component must also work with its Asia counterparts to determine new joint review procedures.

For further information, please contact Lynn Carter in ANE/SEA/IRM, SA-2, Room 103. Copies of the handbook are available.

Latin America and The Caribbean

by Jean Meadowcroft
Bureau for Latin America and the Caribbean

The Latin America and Caribbean (LAC) Bureau began to develop a system for assessing program performance in 1991. LAC Bureau objectives formed the basis for establishing Mission strategic objectives and performance indicators. Initially these were organized into three themes: achievement of broadly based sustainable economic growth, evolution of stable participatory democratic societies, and response to specific challenges in the hemisphere, such as epidemics and narcotics trafficking. The LAC Bureau provided most Missions with technical assistance to help them develop Action Plans.

With USAID's Center for Development Information and Evaluation, as well as other bureau offices, LAC developed a rough scale for classifying Missions at stages of strategic planning and performance measurement. Comparison of 1992 reviews of 19 LAC Action Plans with 1993 reviews of 23 Action Plans showed considerable progress. By 1993, more Missions were preparing improved Action Plans with more focused strategies and programs to support them—now with limited technical assistance from the Bureau. Of 23 LAC country plans, 10 had met the Bureau's basic performance measurement standards, with indicators specified for most strategic objectives and program outcomes (level 2); 5 had achieved the next level with baseline data, expected results, and data sources (level 3); while 9 had provided data on actual results (level 4). Several of these Missions were using program performance information for strategic management.

A review of the Action Plans submitted for 1994 shows that most Missions are presenting well-focused plans with performance results and narratives providing a wider perspective on program performance and progress.

In 1993, enough information was available for an initial assessment of program impact in the region. Summary reviews were carried out of strategic objectives from all FY 94–95 Action Plans and results presented in 1993.

- *Twenty-two Missions pursued sustainable, equitable economic growth objectives.* Programs focused on economic policy reforms and activities, including liberalizing exchange rates, encouraging fiscal responsibility through tax reform and privatization, and promoting private investment, exports, and microenterprise.
- *Twelve Missions reported health, population, and education objectives.* Health programs worked to increase access to primary health care and improve health system management; population programs attempted to strengthen organizations and service delivery through nongovernmental and private voluntary organizations (NGOs and PVOs) and the public sector; and education programs were designed to improve primary education.
- *Another 12 LAC Missions reported environment objectives* and included programs in policy reform, institutional strengthening, and natural resources management. Environment programs were more recent initiatives, expected to show results in the longer term, with more immediate focus on policy and legal changes and strengthening NGO involvement in environmental programs.
- *Democracy programs were under way in 18 Missions,* supporting institutional strengthening for legislatures, judicial systems, public sector financial and audit activities, and electoral/voter registration systems. Other activities support nongovernmental and private voluntary organizations in encouraging greater citizen participation to address public sector accountability and human rights and mechanisms to increase participation of the citizenry in local government.

The LAC Bureau also assessed progress for Women in Development efforts. Comparison of performance reported in the 1992 and 1993 Action Plans showed progress had been made. For the 23 Action Plans reviewed in 1993, the proportion demonstrating some degree of attention to gender increased to 67 percent, above the 57 percent for Action Plans reviewed in 1992. Twenty-nine percent of the plans reviewed in 1993 showed reasonably consistent, comprehensive attention to gender, compared with 24 percent the year before. Interestingly enough, two of these Mission Action Plans did not adequately reflect the known attention to gender in the Mission programs, suggesting the importance of

ensuring that performance indicators and narratives incorporate the issue.

A review in 1993 of the performance data suggested several difficulties in interpretation of the Action Plan results:

- Most of the data were reported for 2-year spans (a few for 4 years) – too short a time period to establish significant trends.
- Data from centralized sources may be available for longer time periods but are not disaggregated sufficiently to be indicators for more focused Mission programs.
- External events often unduly influence performance, rendering program performance overly positive or negative. Indicators viewed in isolation from these external factors may be misleading.

Preliminary review of 1994 plans for the several sustainable development Missions indicate that they are responding well to new Agency priorities and to adjusted budgets for the region. One Mission made a major reduction in strategic objectives and others have restricted new activities. Many Missions have modified program outcomes to respond to new priorities, particularly increased equity and participation. Reporting of people-level impact needs more improvement but without creating a data collection burden. At the same time, Missions are trying to reduce the total number of indicators to lessen the data collection and reporting load and are providing a wider perspective on program performance through discussions in the narrative sections of reports. Finally, Missions are using the strategic objective framework for Annual Budget Submissions as well as for Semi-Annual Portfolio Reviews.

Overall, the 3 years of experience with Action Plans are bearing fruit, as Mission staff now have the capability to modify their strategic plans and identify and report performance using both data and descriptive narrative. Reporting on people-level impact and ensuring consistency in indicators still need more work, but the 3 years of performance data now are showing positive development trends.

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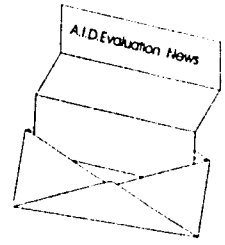

What USAID Missions Have Learned About Managing For Results

by Annette Binnendijk
Center for Development Information and Evaluation

A CDIE-sponsored 1993 Workshop entitled Using Performance Information yielded important lessons for implementing effective approaches to strategic planning, performance measurement, and managing for results. The lessons were drawn from the experience of Missions in Nepal, Ecuador, Guatemala, and Ghana. CDIE followed up by conducting three in-depth case studies of Mission experiences in Guatemala, Kenya, and Ecuador. Some of the key lessons follow:

- *Leadership support is critical.* Perhaps the most important factor for ensuring the success of a managing for results approach is having strong, determined, and consistent senior management support at Mission and Washington levels.
- *Strive for country program focus and continuity.* Strategic planning and performance measurement assume stable, long-term objectives and reliable access to resources. To achieve significant development impacts, Missions need to concentrate on a few critical objectives and then stick with them long enough to make a difference. Major shifts in policies, priorities, earmarks, and funding levels will inevitably set back Mission efforts. Once strategic objectives have been established by Missions and approved by USAID/Washington, every effort should be made to maintain the integrity of those objectives and the resources budgeted for their accomplishment.
- *Build ownership through participation.* Participation brings everyone on board, develops consensus around key objectives, and gives the big picture. Thus participatory approaches to strategic planning and measurement that include all levels of Mission staff, host-country counterparts, nongovernmental organizations, and even other donors

build ownership, fostering sustainability and long-term effectiveness.

- *Allow adequate time and staff resources.* It can take several years before a strategic planning and performance measurement system takes hold. The process requires patience. Also, staff need enough time (and possibly training) and relief from some of their other duties to adequately implement these new responsibilities. Some Missions have found it useful to devote a full-time position to coordinating performance measurement and evaluation functions.
- *Keep the performance measurement system simple.* The focus of performance measurement systems should be on a few key results at each level of the objective tree. Similarly, the number of indicators should be kept to a minimum for each strategic objective, program outcome, and activity output to keep it simple. Only information considered essential at each management level should be collected. Not everything collected at the Mission level needs to be reported to USAID/Washington.
- *Conduct complementary evaluations.* Performance measurement systems can track program performance over time but cannot necessarily explain that performance, draw cause-and-effect conclusions, or make recommendations for program improvements. Expectations for what performance measurement systems can provide should be realistic; they are not substitutes for evaluations. But if performance measurement systems are appropriately complemented by evaluations, together they can be powerful management tools for decision-making.
- *Experiment with new ways of doing business.* Managing for results requires new ways of operating and new organizational roles and responsibilities centered around strategic planning, performance measurement, and using performance information. Some key elements include empowering managers by delegating program decision-making authority along with accountability for results, building teamwork and participatory approaches, clarifying new institutional roles and responsibilities, and rewarding results-oriented behavior.
- *Clarify institutional roles, responsibilities, and processes.* Organizational structures, roles, and responsibilities must be clear for conducting strategic planning, for installing program performance measurement systems, and for institutionalizing procedures for feedback and use of performance information in decisions. Many Missions now integrate these responsibilities in personnel work plans and appraisals. Some Missions have successfully established and used interoffice strategic objective teams to fulfill these responsibilities, whereas other Missions have undertaken more formal reorganizations to align management units with new strategic objectives.
- *Ensure system use.* The use of program performance information by managers at all levels for decision-making and for reporting requirements is essential for success. This requires that managers clearly identify specific uses, the kinds of information needed, and time frames. A "learning culture" that encourages experimentation and avoids placing blame will foster a willingness to use performance information to modify programs accordingly.
- *Provide incentives for honest reporting and use.* Use of performance information can be reinforced through recognition and rewards to individuals and organizational units who base program decisions on performance information. Both a managing-for-results approach and better achievement of results can be fostered through such positive incentives. The incentives must favor honest and objective reporting and use of performance data and avoid blaming managers for problems beyond their control, or system distortions may result.
- *Get help.* Timely training and technical assistance from USAID/Washington can be very helpful in establishing effective strategic plans and performance measurement systems. PRISM teams bring technical expertise, conceptual tools, and training/guidance materials, as well as facilitation skills to ensure a participatory process. USAID's management training workshops can assist Missions with building teams and dealing with other organizational changes required to effectively manage for results.

For more information, ask for the following CDIE documents: "Using Performance Information: Proceedings of a 1993 Workshop," USAID Managing for Results Working Paper No. 3, May 1994 (PN-AAX-286); "Managing for Results: Experience From Two USAID Missions (Guatemala and Kenya)," USAID Managing for Results Working Paper No. 1, April 1994 (PN-AAX-284); and "Managing for Results: A Case Study of the Ecuador Experiment," CDIE Working Paper No. 160, 1994.

Performance Measurement: Three Mission Perspectives

USAID/Ghana

by Dawn M. Liberi
USAID/Ghana

The program at USAID/Ghana is young and highly focused. After a hiatus in the bilateral program during the mid-1980s, a renewed program was initiated in 1990. A year later, we conducted our first comprehensive review, called the Assessment of Program Impact (API), in the Africa Bureau, marking a move toward focusing on quantifiable program impact measurement. Managing the process was easier with a newly designed program. We were able to develop quantifiable performance indicators at the time of project design instead of trying to fit an old project into performance requirements.

Performance Measurement System Management

USAID/Ghana expended much staff time and many financial resources ensuring that our program performance system was user-friendly, cost-effective, and logical. Each Mission technical office, and all of the host-country ministries involved in Mission programs, designated a staff member for project-level monitoring and evaluation. In practice, however, these staff were often detailed elsewhere, and monitoring and evaluation activities were put on hold. Therefore, USAID/Ghana assigned a full-time manager to coordinate the monitoring and evaluation system—a critical step toward success.

Mission Strategies

USAID/Ghana has carefully selected three strategic objectives: (1) increasing nontraditional exports, (2) reducing fertility, and (3) improving the quality of primary education. These objectives are linked directly to larger subgoals and goals. Determining the appropriate level of indicators for the strategic objectives, program outcomes, and the individual projects was difficult. We struggled as well with determining how much and at what level data gathering was sufficient to ensure cost effectiveness.

In March 1993, the Mission invited a four-member team from the Center for Development Information and Evaluation (CDIE) to review and update our overall performance assessment system. The team worked closely with the Mission's technical offices to help refine specific indicators for each strategic objective. For example, a new subgoal—to increase nontraditional export sector income and employment—was added to capture the people-level impact of the Mission's program in this area and an additional target—increasing the use of more effective contraceptive methods, such as IUDs or injections—was added to the strategic objective of reducing fertility.

Measuring Program Impact: Multiple Sources

The CDIE review and the team's recommendations on future actions helped USAID/Ghana to devise coherent and realistic mechanisms for measuring program impact. One such mechanism, the Performance Information Management Plan, provides detailed information on each indicator the Mission tracks. It includes, for example, the indicator definition, names of contacts and sources for data, a brief assessment of data quality including reliability, and information on current and projected figures.

Primary and secondary sources of data also provide useful information. These include such sources as the Demographic and Health Survey (DHS) completed in 1993; a consumer baseline study completed in late 1993 on family planning and AIDS-related knowledge, attitudes, and practices; the Criterion Referenced Test (CRT), a Ghana-specific achievement test administered to 5 percent of 6th grade students (more than 12,000 students) in 1992 and again in 1993; a baseline study on employment levels and real per capita income of nontraditional export workers, completed in late 1993; and annual studies to measure the impact of feeder road rehabilitation—that is, whether rehabilitation is reducing transport costs and making access to markets easier.

USAID/Ghana incorporates information from these sources into the APIs and Semi-Annual Portfolio Reviews (SPRs). Missions are also responsible for writing Project Evaluation Summaries, which list actions planned in response to suggestions made in project evaluations. No formal mechanism had existed for tracking whether these actions were in fact taken, so USAID/Ghana integrated this information into the annual evaluation schedule. The schedules now outline actions recommended from the last

evaluation and show whether they have been carried out. The SPRs also provide an opportunity to follow up on these recommendations. The Mission can thus easily track follow-up by the technical offices.

These mechanisms provide USAID/Ghana with the information it needs to make management decisions, revise targets, and examine alternatives in project implementation. The Mission also draws much information from data that ministries collect. This in turn helps build the monitoring and evaluation and the program planning capacity of the Government of Ghana.

Performance Measurement for Decision-Making

One example of how the Mission uses performance measurement data to make decisions is illustrated with the results of the CRTs. Both Ghanaians and the Mission were shocked when the first test found that fewer than 2 percent of Ghanaian children were meeting the predetermined criterion for English and Math, a standard most Ghanaians considered reasonable. This served as an impetus within the Mission for discussing whether the project goal of 80 percent numeracy and literacy by 1995 was realistic. The low scores, together with local media commentary, sparked concern within the Ministry of Education about the general state of primary education—particularly about curriculum and teachers' performance. As a result, the Ministry of Education initiated an ambitious program of curriculum revision—streamlining the curriculum from nine to five subjects, increasing the length of the school day by 1 hour, and choosing more appropriate textbooks—areas previously not open to donor agency intervention.

Although establishing a system to better assess program performance may seem a daunting task, it is well worth the investment of time and finances...USAID/Ghana has a good record of getting the funding it requests mainly because it is able to show impact.

The baseline study on employment and income for nontraditional export workers provided information about the constraints to export activities. For example, a significant number of respondents considered that the time it took to clear export shipments was unacceptably long. Poor road conditions for moving export crops to market was found to be another constraint. Once these problems were identified, the Mission was able to find innovative ways of working with the Ghanaian Government to reduce these barriers and achieve the Mission objective more quickly. In the case of feeder roads, this was accomplished mainly by encouraging the Department of Feeder Roads to make timely reports to the Ministry of Finance and Economic Planning—a condition necessary for the release of nonproject assistance funds.

A measure of the success the Mission has experienced in increasing nontraditional exports is found in a recent annual report by a nongovernmental organization (NGO) working in private sector development. This NGO's work to improve processing and marketing capability of small-scale palm oil operations in rural communities resulted in several significant achievements, including the following: the reduction of postharvest losses, the enhancement of local manufacturing capacity, a national foreign exchange savings of $780,000 because more palm oil processing machinery is now assembled locally, and an increase in annual real income by 20 percent for farmers served by this project.

Using performance data also supports USAID/Ghana in making decisions about how to reduce fertility—the Mission's third strategic objective. Under the Family Planning and Health Project, for example, a recently launched advertising campaign for condoms, vaginal foaming tablets, and birth-control pills drew on results from an earlier consumer baseline study. Data on contraceptive use, awareness of modern methods, and types of methods chosen analyzed by region, age, and gender proved useful in tailoring the advertising messages to specific market segments. This campaign built on previous social marketing efforts aimed at reducing the total fertility rate. Results from the 1993 DHS show that since 1988 the total fertility rate has dropped from 6.4 to 5.5.

Next Steps

For the future the Mission plans to refine its program performance tracking, possibly by centralizing the computer database. Currently each technical office maintains its own database for the indicators it tracks. Centralizing this information could make tracking activities easier and retrieving information faster. The Mission is taking a closer look at cost-

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effectiveness in data collection as well. We need to consider how much more of our data collection activities could be contracted through the Ghanaian private sector instead of bringing in contractors from outside. Is it necessary to schedule studies on an annual basis? Are we really picking up significant changes with annual studies in some sectors? The Mission also plans to continue working toward ensuring that government counterparts and local institutional contractors play a more prominent role in monitoring and evaluation activities.

This last point is particularly important given the shifting priorities in development activities. The focus in both bilateral and multilateral aid programs is narrowing to fewer, more tightly managed and controlled sectoral programs. With shrinking flows of aid to the developing world, it is becoming imperative that governments learn to manage and allocate resources more efficiently.

Lessons Learned

Although establishing a system to better assess program performance may seem a daunting task, it is well worth the investment of time and finances. USAID/Ghana also found that several key ingredients constitute a successful program.

- *Support from top management is crucial.* Program and project implementation are generally a Mission's first priority. Monitoring and evaluation are easy to postpone and then to forget.
- *Document.* USAID/Ghana collects some data quarterly, some annually, and some only every 3 years. With rapid staff turnover and rare overlap of assignments, loss of institutional memory becomes a risk. Good documentation helps avoid duplication of effort.
- *Fight a tendency to measure inputs.* USAID/Ghana has a good record of getting the funding it requests mainly because it is able to show impact. The bottom line is not whether your program has distributed the number of textbooks planned but whether students in the host country meet an accepted basic standard of competency for reading and math. Inputs, although perhaps easier to measure, do not show results.
- *Focus and concentrate management units for impact.* We have three strategic objectives and five major projects. This structure evolved from thinking carefully about available financial and human resources. A highly focused Mission portfolio translates into a monitoring and evaluation system that does not require a large share of Mission resources in order to run effectively.

USAID/Guatemala

by Margaret Krombout
USAID/Guatemala

USAID/Guatemala has invested substantial resources in establishing and revising its system for measuring program performance; currently the system contains data on the impact of programs at the strategic objective and program outcome levels. The Mission's goal is to expand the system into an integrated performance measurement tool that includes data on project outputs as well as on objectives and outcomes. The aim is to develop a system that allows analysis and reporting of program impact by general and specific variables, such as population and gender.

Purpose: Description and Reporting

USAID/Guatemala designed its performance measurement system initially to aid decision-making and to improve reporting on the impact of Mission programs. But because the Mission's scope for making program and budget decisions has been becoming more limited, the performance measurement system has emerged as a way of viewing programs in snapshots and reporting on assistance more fully. Moreover, the system has become a tool for building consensus among Mission staff and host country counterparts on current and future program priorities and directions.

System Organization

USAID/Guatemala's program performance system organizes data at several levels of aggregation and significance. Building on information from individual project monitoring and evaluations, the system arrives at program performance level indicators. Cross-office strategic objective teams in the Mission, develop the strategic objective tree, set the policy agenda, implement performance measurement plans for the objective, and decide on indicators. Although the process may sound complicated, USAID/Guatemala has actually simplified and lessened the performance measurement burden by reducing the number of indicators it tracks. This was done to avoid wasting too many resources collecting data, to ensure greater clarity of analysis, and to draw management's attention to questions of increasing order of significance.

System Specifics and Access

The Mission compiles data in its Core Data Base in a simple FOXPRO format, which exports data to Harvard Graphics and Atlas GIS for graphic presentation. The Core Data Base is accessible through a read-only file to all staff on the Mission's local area network system and is managed by the Office of Program Development and Management. Each strategic objective team designates one person to be responsible for ensuring the flow of data to the Core Data Base manager.

System Use

This year for the first time the performance measurement system will be ready, with all higher level program indicators incorporated into the Core Data Base, for the Mission's Action Plan presentation. Although it has not yet been tested fully, the performance measurement system has shown its effectiveness in providing a strong logical framework for making strategic choices and allocating resources.

The system has also proved its practical worth in communicating strategic priorities to the host government, nongovernmental organizations, USAID/Washington, and other U.S. Government agencies and donors, as well as the general public. The performance measurement system has significantly reduced staff time spent on acquiring data and responding to requests for information. The savings thus achieved far outweigh the substantial initial investment in developing the strategic objective trees and corresponding indicators.

Future Challenge

USAID/Guatemala has gained much experience in strategic planning and performance measurement experience over the last 2 years. A strong and committed leadership at the Mission senior management level combined with a managing-for-results orientation has moved us forward. The outcome is a Mission that thinks and manages strategically, with a staff willing to be held accountable for specific outcomes, and where collaborative, results-oriented behavior is rewarded. Our challenge for the future is to ensure even greater participation from host-country counterparts and recipients of our developmental assistance to set the strategic framework, provide continuous feedback during implementation, and monitor and evaluate for results.

USAID/Egypt

by Randal Parks
USAID/Egypt

USAID/Cairo's experience in measuring program performance has involved more than just establishing a set of indicators; it has meant creating a Mission mindset. The Mission management and staff have dealt with several important challenges—the challenges of commitment, measurement, prediction, and formalization—from which they have learned that performance measurement involves a new way of thinking that is much more than just filling in the blanks for a set of indicators or targets.

USAID/Cairo comprises more than 350 Mission personnel, including direct hires, foreign service nationals, and contractors. Its portfolio includes 59 projects and programs with a $1.75 billion pipeline. The Mission's leadership has supported development and use of performance measurement, which it began to establish in the Mission a little more than 2 years ago with the help of three USAID/Washington technical assistance teams. In large part because of the size of the portfolio, the Mission needed more than a year to develop a final set of strategic objectives and program outcomes and their corresponding performance indicators.

Commitment

The Mission's greatest challenge in establishing a performance measurement system was obtaining the staff's full commitment. This remains a challenge still. Many USAID officers seem inclined to view strategic planning and performance measurement as separate "program office" exercises not involving them directly. Such detachment is understandable; the individuals most closely involved in project implementation are often overwhelmed by the day-to-day workload of ensuring that projects are being successfully implemented, by the administrative paperwork, and by dealing with auditors. They are also busy explaining USAID programming requirements to counterparts, which at the beginning makes project implementation time consuming. Faced with these immediate tasks, individuals simply do not view long-term measurement concerns as a priority.

Some personnel are also inherently wary of measurement. They worry, for example, about establishing performance targets and then not being able to meet them. The fact that Mission personnel

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change also affects commitment. New personnel rotating in have little understanding of or sense of ownership in the performance measurement system.

How does a Mission deal with such detachment? The most effective way has been for Mission senior management to consistently reinforce the importance of strategic planning and performance measurement for decision-making. Such reinforcement requires persistence and patience as everyone in the Mission learns to adopt managing for results.

Measurement

The Mission used data from the program performance measurement system as the basis for the Portfolio Reviews for the first time in the fall of 1993. During the review, it came upon an unexpected discovery: a number of the indicators the Mission had initially selected either did not accurately reflect the objectives and actions they were supposed to measure or could not actually be measured. In other words, indicators must be both meaningful and measurable.

Prediction

Another unexpected challenge surfaced during the fall 1993 Portfolio Review of USAID/Cairo. Under the best circumstances, prediction of future results—setting targets and benchmarks—is difficult in any field, and results do not always match the best projections. Everyone is acquainted with the scramble to reconcile poor results with rosy predictions. Occasionally, however, a project or a program will perform better than expected. Targets must then be adjusted to remain valid. For example, reforms made in certain segments of the Egyptian agricultural sector as a result of the Mission's Agricultural Production and Credit Project have outpaced original expectations. As the Mission's assumptions changed, staff took it upon themselves to adjust their targets accordingly.

Formalization

Every Mission must face the challenges of commitment and prediction before formalizing its performance measurement system. Formalization occurs when a strategic plan is in place and the performance measurement indicators are established and in use. But a formal system is only as good as the quality of the people who implement it, the data collected, and the analyses conducted. Performance measurement systems cannot substitute for competent staff. Circumstances change, information has to be synthesized, and management approaches are altered. An effective system incorporates new information and adapts to new situations.

The Mission has adopted such an approach modeled after the PRISM system. The Mission treats its strategic and performance indicators as tools, which it continues to refine and make more specific as experience is gained. Some strategies are being seriously questioned because little progress has been made in reaching certain targets. USAID/Cairo uses PRISM for managing for results and communicating these results to different stakeholders.

Strategic Management: System Versus Mindset?

Strategic management involves using data from multiple sources to successfully manage for results. Managers often cannot wait for information to be captured in "hard" quantitative indicators and must rely on "softer," more qualitative information sources. Specific indicators, however, can reinforce other impressions and serve as reality checks to Mission management. As USAID/Cairo's experience confirms, establishing a performance measurement system with a new set of indicators is an important element and catalyst in the Mission's efforts to manage efficiently and successfully. Such management also depends on a more important factor: a mindset that is concerned not only with inputs and outputs but also with impacts that make a difference.

Recent PRISM Publications

Managing for Results: Experience in Two USAID Missions, Working Paper No. 1, May 1994, PN-AAX-284.

Program Performance Measurement: Lessons Learned, Working Paper No. 2, May 1994, PN-AAX-285.

Using Performance Information: Proceedings of a 1993 Workshop, Working Paper No. 3, May 1994, PN-AAX-286.

An Assessment of the Quality of Strategic Objectives: 1993, Working Paper No. 4, June 1994, PN-ABG-292.

These documents can be ordered from the Development Information Services Clearinghouse, ATTN: Document Distribution Unit, 1500 Wilson Blvd., Suite 1010, Arlington, VA 22209 Phone (703) 351-4006; Fax (703) 351-4039.

Evaluation News

Our Readers Respond

We recently completed a readership survey of *USAID Evaluation News* to determine what our subscribers think of the newsletter. The results were highly encouraging. We mailed 2,633 survey letters of which 982 were sent to USAID staff. The number of responses far exceeded our expectations. Fully 32 percent of our readers responded, and 95 percent of those responding wanted to continue receiving *USAID Evaluation News*.

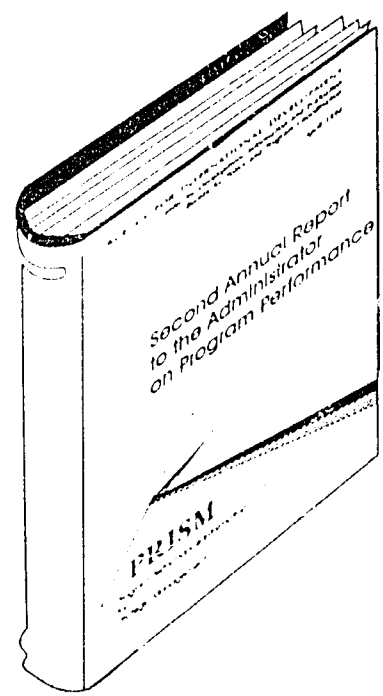
The survey information was also revealing. Ninety-three percent of our readers rated the overall quality of the newsletter as good or excellent, and nearly 70 percent found information from the articles very useful in their work. We asked our readers to rate each section of the newsletter. While each section had a following, the Development Experience Reviews was the most popular. Given that this section reports on findings from recently completed CDIE evaluations, the positive response is particularly noteworthy. It tells us that the newsletter is achieving one of its key goals: helping to disseminate findings and lessons from USAID experience inside the Agency and to the broader development community.

Finally, we received more than 50 suggestions for Focus Issues. Of these Performance Measurement had the greatest number of requests. Other popular topics were (1) agriculture and the environment; (2) public health, food, and nutrition; (3) economic growth; (4) democracy and governance; and (5) natural resource management.

We are grateful to our readers for taking the time to return their survey letters and will work hard to respond to their many useful suggestions. This issue, Focus on Performance Measurement, is a start. Also during the last 2 years, we have had to reduce the number of issues we produce from four per year to one because of shortage of resources. We hope that with your encouraging responses, we will be able to increase the number of issues without jeopardizing the quality of each issue. As always, we welcome articles and news reports on evaluation findings, lessons, and methodology from our readers.

Second Annual Report on Program Performance

In April 1994, CDIE published its Second Annual Report to the Administrator on Program Performance. The report describes the status of the Agency's programs as recorded by the Missions in their strategic plans and annual performance reports and entered into the PRISM database as of June 30, 1993. A summary presents the report's major findings and conclusions. Chapter 1 provides background on PRISM and Managing for Results in USAID. Chapter 2 describes the Agency's four development themes and presents "analytical frameworks" developed and used to link Mission objectives and activities to the themes through a hierarchy of causal relationships. Chapters 3 to 6 provide more detail on the objectives and program strategies of USAID Missions in each of the development themes: economic growth, human development, democracy, and environment. Selected results from countries where performance has been measured for several years are discussed. The final chapter discusses the additional steps the Agency will take in 1994 to advance performance measurement and managing for results. Copies of the report can be obtained from the DISC, 1500 Wilson Boulevard, Suite 1010, Arlington, VA 22209-2404, Tel: (703) 351-4006, Fax (703) 351-4039.



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A.I.D. Evaluation News

A Newsletter on Recent Evaluation Findings and Methods

1992 - Vol. 4 - No. 2

Evaluation System News

Tracking A.I.D.'s Environmental Programs

by Steven Gale, Center for Development Information and Evaluation, and Patricia Vondal, Management Systems International

In A.I.D. Evaluation News Vol. 3, No. 4, 1991, Gerald Britan of the Center for Development Information and Evaluation (CDIE) reported on the background and progress of the Agency's Program Performance Information System for Strategic Management (PRISM). In this issue the authors discuss the applications of PRISM to the Agency's environmental and natural resource programs.

A.I.D. will soon have a powerful new information tool—PRISM—to monitor and measure the performance of its environmental and natural resource management (E/NRM) activities. PRISM was mandated as part of the Administrator's *Evaluation Initiative* to develop and use performance data for strategic management. As a program performance information system, PRISM will help the Agency to "manage for results" in a time when government program accountability is seen as the highest virtue. Data from this system, when fully developed, will be used to inform program, budgetary, and policy decision-making throughout the Agency and at all organizational levels. Already, PRISM is providing a comprehensive overview of the Agency's E/NRM programs in terms of the specific objectives and strategies pursued by field Missions, regional bureaus, and functional offices.

The Center for Development Information and Evaluation (CDIE) is developing PRISM collaboratively with technical staff from A.I.D. field Missions and regional bureaus. These staff are members of the PRISM Environmental Working Group and from the very beginning have helped define the strategic planning framework to describe and measure the impacts of the Agency's E/NRM programs. The intent of CDIE is to build a system from the bottom up. That is, to anchor PRISM in the reality of what is feasible and practical under real field conditions and Mission operating constraints. Such a system must be flexible to capture diverse E/NRM activities in more traditional developmental contexts as well as to capture new environmental challenges presented by countries of Eastern Europe and the Newly Independent States receiving A.I.D. support

Four separate but coordinated PRISM activities are either under way or in the planning stages to achieve the goals of this new program performance information system. The activities include:

- Technical assistance to provide Missions, regional bureaus, and functional offices with hands-on strategic planning to enable them to clarify their E/NRM objectives, identify indicators and data sources, and to develop the resident capacity to operate a program performance information system.
- E/NRM guidance to provide a common Agency-wide set of definitions for strategic planning in general and E/NRM in particular which are consistent with bureau-level strategies and guidance.
- Training in the form of workshops for A.I.D. staff and their host-country counterparts on strategic planning, performance-oriented monitoring, and evaluation systems.
- Database development to code, store, and analyze E/NRM data on strategic objectives, program outcome, indicators, program targets, and actual results.

Environment and natural resource management represent one of the four thematic areas of PRISM—the other areas are private sector economic growth, democratic initiatives, and human resources. Collectively these four thematic areas describe the entire range of activities in which the Agency is currently engaged. Thus E/NRM is a central feature of PRISM. With support from others in A.I.D. working on environmental issues, PRISM can also be used to identify the essential linkages among environmental quality, natural resource management, economic growth, and human resource development.

How the PRISM E/NRM Database Is Organized

Based on documentation provided from Missions which describe their strategic objectives and program outcomes, the PRISM Environmental Working Group has categorized the Agency's E/NRM activities into two broad clusters. The first cluster describes Mission-based activities to improve natural resource management (INRM) and the second cluster describes Mission-based activities to improve environmental quality (IEQ). Almost all E/NRM strategic objectives reviewed by the working group fit into one of these clusters and several objectives span both clusters. Each cluster is described in more detail below.

- Improved Natural Resource Management (INRM)—This first cluster of E/NRM strategic objectives includes all those activities to *improve natural resource management* that are known to be critical for economic, ecological, and health reasons. Relevant activities are those that contribute to the establishment and implementation of those policy incentives, regulations, and practices which would foster the sustainable use of natural resources including soil, forests, flora, fauna, freshwater, watersheds, coastal, and energy resources.
- Improved Environmental Quality (IEQ)—This second cluster of E/NRM strategic objectives includes all those activities to *prevent, mitigate, or reverse damage* to the environment caused by indiscriminate practices. Relevant activities are those that contribute to the establishment and implementation of policy incentives, regulations and practices which would begin to reverse the deteriorated state of the environment, natural resources and urban/industrial environments that are critical for health, economic, and ecological reasons. These include an emphasis on improved quality of air, land, water, and other degraded natural resources through such mechanisms as pollution prevention, recycling, use of renewables, energy efficient technology, proper waste management, and other approaches.

A working group of Agency environmentalists has organized PRISM E/NRM performance indicators into five areas consistent with the Agency's new Environmental Strategy:

- Tropical forestry and other critical habitats for biological diversity
- Sustainable agriculture
- Environmentally sound energy production and use
- Urban and industrial pollution
- Water and coastal resources

Levels of E/NRM Project Impact

PRISM further ranks performance indicators as reported from the field at several levels of impact (see Box 1). PRISM draws from the Africa Bureau's indicator framework to measure the impact of Agency environmental activities. As discussed in the "Field Perspectives" article on the African Region's initiative, the framework comprises five interconnected levels of impact:

Level V: Sustainable increases in productivity, income, and human welfare (development goal)

Level IV: Biophysical changes that produce Level V outcomes (environmental goal)

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Box 1. An Example of an Indicator Framework at Work in USAID/Nepal

While USAID/Nepal is still making decisions about the final strategy and choice of indicators for monitoring performance over time, part of the basic framework is already in place. One of the Mission's strategic objectives is increased private sector contribution to income growth.

One of the major elements of that strategy is to turn over publicly owned forest land to private forest user groups. The user groups are primarily small farmers who have special uses for a variety of forest products found in Nepal (e.g., fertilizer and fuelwood). USAID/Nepal has made several well-founded assumptions concerning the link between small farmer access to forest resources and income growth. The Mission strategy fits under the "sustainable agriculture" focus of the E/NRM organizing framework.

Working from the bottom of the framework, Level I indicators (i.e., actions that establish Level II conditions) measure institutional policy changes. In this case, USAID/Nepal has worked with the planning unit of the Ministry of Forestry to develop legislation to turn over state-owned forests to private user groups. The Mission has met its goal at this level.

At Level II, conditions that lead to adoption of improved practices, indicators deal with the realization or implementation of changes in policies or institutions. In the case of Nepal, the Mission is working with the Ministry to promote implementation of the legislation turning over state-owned forests to private user groups. At Level III, adoption of practices that produce biophysical changes, the USAID Mission will measure several indicators of the total area encompassed by new practices and the number of people or groups engaged in the new practices. (It is important to measure both the area and the number of people involved.) Specifically, the Mission will measure the percentage of annual increase in the total number of hectares of forest land granted to user groups and the hectares of park area under participatory management as a percentage of total park area. They will also measure the number of forest user groups formed and registered.

At Level IV, indicators measure environmental conditions and biophysical changes that contribute to producing the development goal. USAID/Nepal assumes that quantity and quality of forest cover will be increased or maintained on a sustainable basis because of practices adopted by registered forest user groups. The Mission will probably have to undertake a special study sometime during the life of the project to test this assumption.

At Level V, indicators measure the achievement of the development goal—in this case, increased income. USAID/Nepal has baseline data for a sample of rural households, some of which will be affected by project efforts to promote private forest user groups. Income data will be collected again in several years to measure changes in income.

Level III: Adoption of practices that produce Level IV changes (project purpose)

Level II: Conditions that contribute to adoption of Level III practices (project output)

Level I: Actions that establish Level II conditions (project input)

As noted these impact levels correspond roughly to the four stages of A.I.D.'s Logical Framework for Projects: Level I corresponds with project inputs, Level II with project outputs, Level III with project purpose, and Levels IV and V with project goals.

The majority of the E/NRM indicators compiled from field Mission reports deal with the adoption of practices that produce improved environmental (biophysical) changes. Missions that sponsor E/NRM projects and programs largely focus their activities on promoting actions and conditions that in turn lead to the adoption of improved natural resource management practices. However, generally, A.I.D. field Missions state it is not within their management interests to claim responsibility for actual changes in the status of environmental conditions and biophysical states.

In addition, measuring biophysical changes may be too costly in terms of time and money. Frequently, measurable biophysical changes can take many more years than are allotted for the typical 5-7 year period of A.I.D programs. Three exceptions are solid waste emissions and air and water quality, all of which can be affected, and measured, more readily. Hence, indicators under these categories measure altered states in emissions from solid waste incinerations and in water and air quality.

Box 1 provides an example from A.I.D.'s Mission to Nepal, illustrating how the organizing framework works to report on impacts from A.I.D. E/NRM programs.

E/NRM Indicators and Their Measurement

Box 2 lists 31 core E/NRM indicators. A.I.D. field Missions can select indicators for the area of environmental activity most appropriate to their work. For example, Missions working on urban or industrial environmental problems may have programs addressing air pollutants and solid wastes. Accordingly, they should consider the indicators under those subcategories.

The ultimate goal of all E/NRM objectives is not to improve the environment for the sake of the environment alone, but to contribute to sustainable economic development, increased incomes, sustainable agricultural development, and improved health status of the population. A key step in achieving these higher level goals is promoting changes in the practices of people to manage their physical environments and resources more beneficially.

In most cases, there is a spectrum of improved E/NRM practices being diffused to communities. Individuals may adopt one or more of those practices, but not necessarily all. It is important for Missions to analyze which practices are being adopted and why, and then to reassess, and perhaps even modify, Mission recommendations and choice on the practices to monitor.

Any indicator must be preceded by analytical work linking the indicator with people-level impacts (as measured, for example, by changes in yields or income over time), biophysical impacts, and A.I.D.-supported changes in policy, institutional, or socioeconomic conditions that contribute to the diffusion of appropriate practices.

PRISM staff are working with field Missions and regional bureaus to develop an illustrative list of strategic indicators for each of the E/NRM clusters, providing guidance on the use of the indicators, and disseminating information on indicators developed for each of the five levels. Dissemination of indicators encourages greater consistency among Missions and bureaus reporting on impacts of A.I.D. programs. The list of indicators can also function as a guide or "menu" from which field Missions can select the indicators necessary for monitoring the progress of their programs. Where appropriate to the situation, indicators should be disaggregated by gender.

To obtain more information or arrange for PRISM support services, contact Steven Gale, Center for Development Information and Evaluation, Tel: (703) 875-5547 and Fax: (703) 875-5269

Box 2. Environmental and Natural Resource Management Core Indicators

Tropical Forestry, Biodiversity, and Critical Habitats

- Type of resources used (land, marine, forest) and number of users (e.g., farmers, by gender, logging companies, as appropriate to the situation) adopting management practices that increase the quantity and quality of vegetative cover (INRM and IEQ) (LM). (See note at the end of box.)
- Percentage and total number of hectares under management practices that increase the quantity or quality of vegetative cover (INRM and IEQ) (LM).
- Percentage of remaining natural forest brought under improved management practices (INRM) (NS or LM).
- Number and type of land users (e.g., farmers, by gender, logging companies, as appropriate to the situation) participating in active management practices in support of the conservation of biodiversity (INRM) (LM).
- Establishment of protected areas, for example, conservation parks, in zones known to contain important species.

Sustainable Agriculture

- Number and type of land users adopting new practices that will improve the physical environment for agriculture (e.g., indicators for such measurements as soil fertility, soil conservation, range resources, forest resources, water availability) and will contribute to sustainable economic development (INRM and IEQ) (LM).
- Total number of hectares covered by improved practices and percentage of total area targeted for coverage (INRM and IEQ) (LM).

Water and Coastal Resources

- Reduced levels of pollutants in water, as measured by the concentration of coliform bacteria, nitrates, phosphates, solid waste, fluid waste, and hazardous waste (whichever is appropriate for measuring, as determined by baseline measures) (IEQ) (NS or LM).
- Reduced levels of sedimentation, as measured by the concentration of sedimentary particles (IEQ) (NS or LM).
- Reduced levels of salinization in freshwater, as measured by concentration of salts (IEQ) (NS or LM).
- Number and type of people (e.g., fishermen, aquaculturalists, and developers), by gender, adopting management practices that conserve aquatic biological resources (INRM) (LM).
- Percentage and total number of hectares under management practices that conserve aquatic biological resources (or other measures, such as coastal miles and number of watersheds) (INRM) (LM).
- Number and type of water users, by gender, participating in water-user organizations, as a percentage of total people targeted (INRM) (LM).
- Percent reduction in the amount of water used, either for particular water user or by site, as appropriate (INRM) (LM).
- Percentage of water users adopting conservation practices (INRM) (LM).
- Percentage of population with access to potable water (INRM) (LM or NS).

Energy Resources

- Higher percentage of alternative energy sources used by public and private consumers (e.g., woodlots for fuel and other uses) (INRM) (LM).
- Increased investments in alternative energy generation and use (INRM) (LM).
- Increased marketing of alternative energy products and services (INRM) (LM).
- Reduced air pollution emissions from thermal electric generation (IEQ) (NS).
- Higher percentage of energy from environmentally sound sources (e.g., geothermal and solar sources) used by public and private consumers (INRM) (LM).
- Increased investments in environmentally sound energy generation (INRM) (LM).
- Increased share of products and services marketed from environmentally sound energy sources (INRM) (LM).

Urban/Industrial Environment

- Reduction of free-floating particulates, carbon dioxide, sulfur dioxide, and other toxic emissions to agreed upon health and environmental levels (IEQ) (NS or LM).
- Number of public and private vehicles not meeting emissions standards modified or removed from use (IEQ) (DE/NS).
- Number of industrial plants modified to reduce emissions to acceptable levels (IEQ) (DE/NS).
- Reduction of emissions from solid waste incineration to within acceptable levels (IEQ) (DE/LM).
- Percentage of solid wastes collected, handled, and recycled by private and public or parastatal firms (IEQ) (DE/LM).
- Percentage of industrial and residential solid wastes properly contained, promptly removed, and, where required, placed in solid waste landfills with proper drainage and coverage (IEQ) (DE/LM).
- Percentage of hazardous wastes destroyed in environmentally sound fashion, recycled into harmless wastes and economically reusable byproducts, or reconstituted into usable hazardous products under proper control and management (IEQ) (LM).
- Number of industries and agencies implementing hazardous waste plans (IEQ) (DE/LM)

Note: Evaluators must determine a potential data source for each of the proposed indicators. Possible sources for the preliminary PRISM E/NRM indicators list are national statistics available from host government or international organizations and Mission-collected data for local measurement.

INRM = improving natural resource management; IEQ = improving environmental quality; DE = date of event; NS = national statistics; LM = local measurement

Annual Report to the Administrator on Program Performance

Core Report

Center for Development Information and Evaluation
Bureau for Policy and Program Coordination
U.S. Agency for International Development

February 1995

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Executive Summary

THE PROGRESS of other nations matters to the United States. Growth of democracy facilitates more peaceful resolution of disputes and greater acceptance of values and principles we embrace. Economic growth benefits both poor people overseas and U.S. companies and workers who produce the goods they buy. Improved health and lower population growth reduce the spread of diseases and pressures for migration. Sound uses of local environments sustain the world's resource base and enhance the quality of life for all the Earth's inhabitants. And smooth transitions away from communism, conflict, or ethnic domination lead to greater regional and worldwide stability and prosperity.

USAID's programs address the four principal, inter-related threats to sustainable development: poverty and food insecurity, lack of democratic institutions and processes, rapid population growth and poor health, and environmental degradation. USAID also responds to disasters that create human suffering. In addition, the Agency supports the transition of the nations of Central and Eastern Europe and the former Soviet Union to more democratic, free-market societies.

Although it draws on experience and examples from all of USAID's programs, this report focuses on programs in 41 countries in Africa, Asia, the Near East, and Latin America and the Caribbean where USAID has decided to concentrate its sustainable development resources. It also describes accomplishments of humanitarian and post-crisis assistance programs worldwide and results to date from significant investments in the ENI region.

Encouraging Broad-Based Economic Growth

Economic growth is the foundation of sustainable development. It helps reduce poverty and provides essential resources for stabilizing population growth and protecting human health and the environment. USAID's economic growth strategy has three elements: strengthening markets, investing in people, and expanding access and opportunity. Forty sustainable development Missions have economic growth objectives.

Performance highlights include:

- In Central America, U.S. assistance for market strengthening helped reverse sharp economic declines in the 1980s. With reforms, the region is now achieving positive economic growth, and USAID has phased down its assistance.

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- In countries assisted by seven Missions, non-traditional exports increased by over 35 percent in the last 2 to 4 years, totaling $1.75 billion.
- A USAID evaluation of several of the world's most effective microenterprise finance institutions identified management strategies that allow them to be financially viable and to rapidly increase their outreach. The best institutions are able to expand the number of loans by at least 25 percent each year, providing thousands of poor clients with their first access to loans and safe places to hold savings. Conclusions from this report are being integrated into USAID's Microenterprise Initiative.

Building Democracy

USAID's democracy strategy has five broad objectives: strengthening the rule of law and respect for human rights, increasing citizen participation in elections and political processes, expanding an active civil society, developing more accountable governance, and increasing the flow and diversity of information to citizens. Twenty-nine sustainable development Missions have significant democracy programs.

Results from these programs include:

- USAID played an important role in six of eight countries that made significant democratic gains in 1994, according to the most recent Freedom House survey.
- As a result of rule-of-law programs in Latin America, access to legal advice and redress through legal aid and alternative dispute resolution has increased significantly for poor and marginal populations.
- USAID assistance to electoral tribunals in Bolivia, El Salvador, Mozambique, Panama, and South Africa helped ensure elections that were accepted as legitimate. In Malawi, Mozambique, South Africa and Ukraine, USAID assistance played an important role in voter registration, and turnout exceeded expectations for elections held during 1994.
- In Central America, USAID trained 50 percent of the region's journalists and media managers in journalistic ethics. In 1989, citizens of the region had little faith in the media; by 1994, a public opinion poll found the media ranked second only to the Catholic Church in credibility.

Stabilizing World Population and Protecting Health

USAID's strategy to stabilize population growth and protect human health has five priorities: preventing unwanted pregnancies and abortions, reducing deaths of children from preventable diseases, decreasing pregnancy-related deaths, preventing transmission of sexually related diseases such as HIV/AIDS, and increasing the basic education of girls and women. Ninety percent of USAID's sustainable development Missions are pursuing objectives in population or health.

Highlights include:

- In the 28 countries that have received the largest amount of USAID population assistance, average family size has decreased from 6.1 children in the 1960s to 4.2 in 1992.
- From 1985 through 1992, infant mortality declined by 10 percent in USAID-assisted countries. In some countries the decline was even greater, ranging from 17 percent in Bolivia to almost 50 percent in Honduras. During the same period, mortality rates for children under 5 in USAID-assisted countries dropped by 10 percent to 40 percent.
- In 1994, polio was eradicated in the Western Hemisphere by a multinational effort in which the United States was the lead donor.
- With USAID assistance, use of oral rehydration therapy during diarrheal episodes among children continued to increase, from 12 percent in 1984 to 46 percent in 1992. This treatment saves children's lives in the United States as well as in developing countries. It prevents an estimated one million childhood deaths worldwide each year.

Protecting the Environment

USAID programs address long-term threats to the global environment, particularly loss of biodiversity and global climate change. They also seek to protect the environment locally, regionally, and nationally by protecting biological resources, promoting environmentally sound urban and industrial development, fostering efficient use of renewable and non-renewable energy, improving the availability and quality of water, and encouraging better stewardship of natural resources. Twenty-five sustainable development Missions have one or more environmental objectives.

Among the results are:

- Through the Parks in Peril program, USAID has helped create 26 protected areas covering 5.6 million hectares in 12 countries.
- Strategies that increase local stewardship by empowering and encouraging participation of local people are more effective than those that rely on government agencies alone.
- In Quito, Ecuador, USAID assistance transformed the Water Authority, lowering operating costs by 25 percent, enabling 35,000 household connections, and upgrading services to 180,000 people in marginal neighborhoods.
- Support for integrated pest management (IPM) is reducing environmental damage and increasing yields. In Indonesia, a catalytic USAID investment in a multi-donor project helped to show how reducing pesticide use can boost farm incomes from rice cultivation. Pesticide use is down 65 percent nationwide. IPM reduced environmental damage and health risks to farmers and saved $120 million in insecticide subsidies.

Humanitarian and Postcrisis Assistance

USAID has four objectives for its humanitarian assistance: timely delivery of disaster relief and short-term rehabilitation, helping prevent disasters and reduce the vulnerability of populations at risk, preserving the basic institutions of civil governance during periods of crisis and transition, and protecting the food security and health of vulnerable groups during conflicts or periods of reform.

Some highlights:

- In 1994, humanitarian assistance was provided to more than 50 countries. Emergency food reached an estimated 58 million people in 18 countries.
- Timely delivery of food and other resources and U.S. leadership of the donor effort in response to the 1992 drought in southern Africa prevented mass migration and starvation of hundreds of thousands of people. It also fostered long-term sustainable development in the region.
- USAID's efforts to help prevent, prepare for, and mitigate disasters has paid big dividends. Early warning systems for famine and pestilence in Africa, and elsewhere for volcanoes, have saved lives, property and rehabilitation costs.

Central and Eastern Europe and the New Independent States

USAID's programs in this region have three principal priorities: economic restructuring, building democracy, and social sector restructuring.

Highlights include:

- Assistance in privatizing industry and in new business start-up has contributed substantially to private sector growth in many countries. Enterprise Funds have sustained 21,000 jobs, created 11,000 more, and generated more than $60 million in earnings. Twenty-three joint ventures with U.S. companies have been created, attracting $150 million in private foreign investment.
- Energy audits and demonstrations have improved efficiency by as much as 30 percent in urban heating systems in Armenia, Belarus, Kazakhstan, the Kyrgyz Republic, Russia, and Ukraine. Use of U.S.

equipment costing $1 million resulted in an estimated annual saving of $14 million in these systems.

- With USAID help, many parliaments in the region have enacted critical political reforms, including new election laws that help ensure fair and democratic elections.
- By helping to establish a legal basis for creating nongovernment organizations, USAID has enabled NGOs to flourish across the region.

Challenges for 1995

USAID has made significant progress in focusing on results, but more is required. Our agenda for 1995 includes:

- We will complete an Agencywide results framework, which will include performance indicators to assess the results of our work more uniformly and process indicators to track our internal progress in managing for results.
- We will complete development and begin installation of a corporate information system. When complete, it will reduce formal reporting requirements, increase USAID's ability to analyze and report on program performance, allow managers to make decisions better informed by the progress of their activities and lessons of experience, and permit broader, quicker dissemination of results.

Annual Report on USAID Program Performance

THE PROGRESS of other nations matters to the United States. Growth of democracy facilitates more peaceful resolution of disputes and greater acceptance of values and principles we embrace. Economic growth benefits both poor people overseas and U.S. companies and workers who produce the goods they buy. Improved health and lower population growth reduce the spread of diseases and pressures for migration. Sound uses of local environments sustain the world's resource base and enhance the quality of life for all the Earth's inhabitants. And smooth transitions away from communism, ethnic domination, or conflict lead to greater regional and worldwide stability and prosperity.

A focused, well-managed development assistance program is in the United States' interest, but only if it produces *results*. This report provides evidence from Mission reports, central evaluations, and other data collected during the past year that USAID is achieving measurable results through its programs.

To achieve results USAID must listen to and work closely with its partners and customers, learn from its experience, and improve its systems and incentives in response. In 1994, USAID published *Strategies for Sustainable Development* and developed guidelines for managers to follow in implementing them. Building on 3 years of experience, a directive was issued on strategic planning that underlines our commitment to performance measurement and requires all offices in the field and at headquarters to set clear program objectives, establish performance indicators and targets, and collect baseline information by April 1995. Operations and other support systems were re-engineered to focus them more clearly on results.

An Agency-level results framework will be developed in 1995 that will include common indicators of performance across all programs worldwide. The framework will also specify management performance indicators and targets to help track how well the Agency is managing for results.

The full benefit of this improved ability to identify, report, and use program performance results will be realized over the next 2 to 3 years. However, USAID is already able to identify many of the impacts its programs are having and profit from lessons it is learning.

USAID's mission is to promote sustainable development—economic and social growth that does not exhaust the resources of a country; that respects and safeguards the economic, cultural, and natural environment; that creates opportunities for enterprises and incomes to grow; and that builds effective institutions and empowers citizens. Its programs address the four principal, inter-related threats to sustainable development: poverty and food insecurity, lack of democratic institutions and processes, rapid population growth and poor health, and environmental degradation. But USAID alone does not—cannot—achieve sustainable development. It can help, facilitate, even accelerate development, but the major task must be carried out by the developing country itself. Sustainable development is built on a sense of ownership and participation. To be successful, this effort requires partnerships with government agencies and non-governmental organizations (NGOs), other donors, and ordinary people in the countries where we work.

USAID also responds, on behalf of the American people, to disasters that create human suffering and diminish the prospects for sustainable development. Where possible, we help countries recover from violent conflicts and move toward sustainable development. In addition, the Agency plays a leading role in supporting the historic transition of the nations of Central and Eastern Europe and the former Soviet Union—and others

such as South Africa, Ethiopia, Mozambique, and Haiti—to more democratic, free-market societies.

During the past 3 years (FYs 1992-94), USAID funded programs totaling $16 billion (excluding cash transfers to Israel and Turkey). Of this amount, $11.7 billion in Development Assistance and Economic Support Funds were provided to countries in Africa, Asia, the Near East, and Latin America and the Caribbean—$6.9 billion (59 percent) to encourage economic growth, $2.9 billion (25 percent) to help stabilize population growth and protect human health, $1.2 billion (10 percent) to protect the environment, and $0.6 billion (5 percent) to build democracy.[1] In addition, USAID provided $1.3 billion for humanitarian assistance and aid to post-crisis transitions, and $3 billion to support the political and economic transitions in Central and Eastern Europe and the New Independent States of the former Soviet Union (ENI).

Although it draws on experience and examples from all of USAID's programs, this report focuses on programs in 41 countries in Africa, Asia, the Near East, and Latin America and the Caribbean where the Agency has decided to concentrate its sustainable development resources.[2] It also describes accomplishments of humanitarian and post-crisis assistance efforts worldwide and results to date from significant investments in the ENI region.

Since 1991 (earlier in Africa), USAID Missions have designed strategic plans that identify medium-term (5 to 8 years) objectives and intermediate outcomes for their programs.[3] During the past year, these plans were revised to reflect USAID's new sustainable development strategies. To some extent, progress in making these adjustments came at the expense of our ability to report on performance, since some objectives and indicators previously established were modified.

As of October 1994, all 41 sustainable development Missions—100 percent—have approved strategic plans, up from 75 percent in 1992. Figure 1 summarizes these strategies and the principal objectives that have been defined in these countries. Seventy percent of these Missions (compared with 40 percent in 1992) have set performance targets for half or more of their progress indicators. Results have been reported for 50 percent of the Missions' strategic objectives and 70 percent of their intermediate outcomes.

Information in this report is drawn from Mission reports that compare actual performance against their objectives. It is supplemented with material from project and program evaluations and other data collected during the past year. The report is organized by our main sustainable development themes (economic growth, democracy, population and health, and environment), followed by humanitarian assistance and ENI programs. Each section describes the strategy the Agency pursues, objectives defined as of September 1994, results these programs have achieved, and lessons we have learned from our experience. A final section outlines challenges that face the Agency's efforts to manage for results in 1995. This information is described in more detail in the full 1994 *Annual Report on Program Performance*, available from PPC/CDIE.

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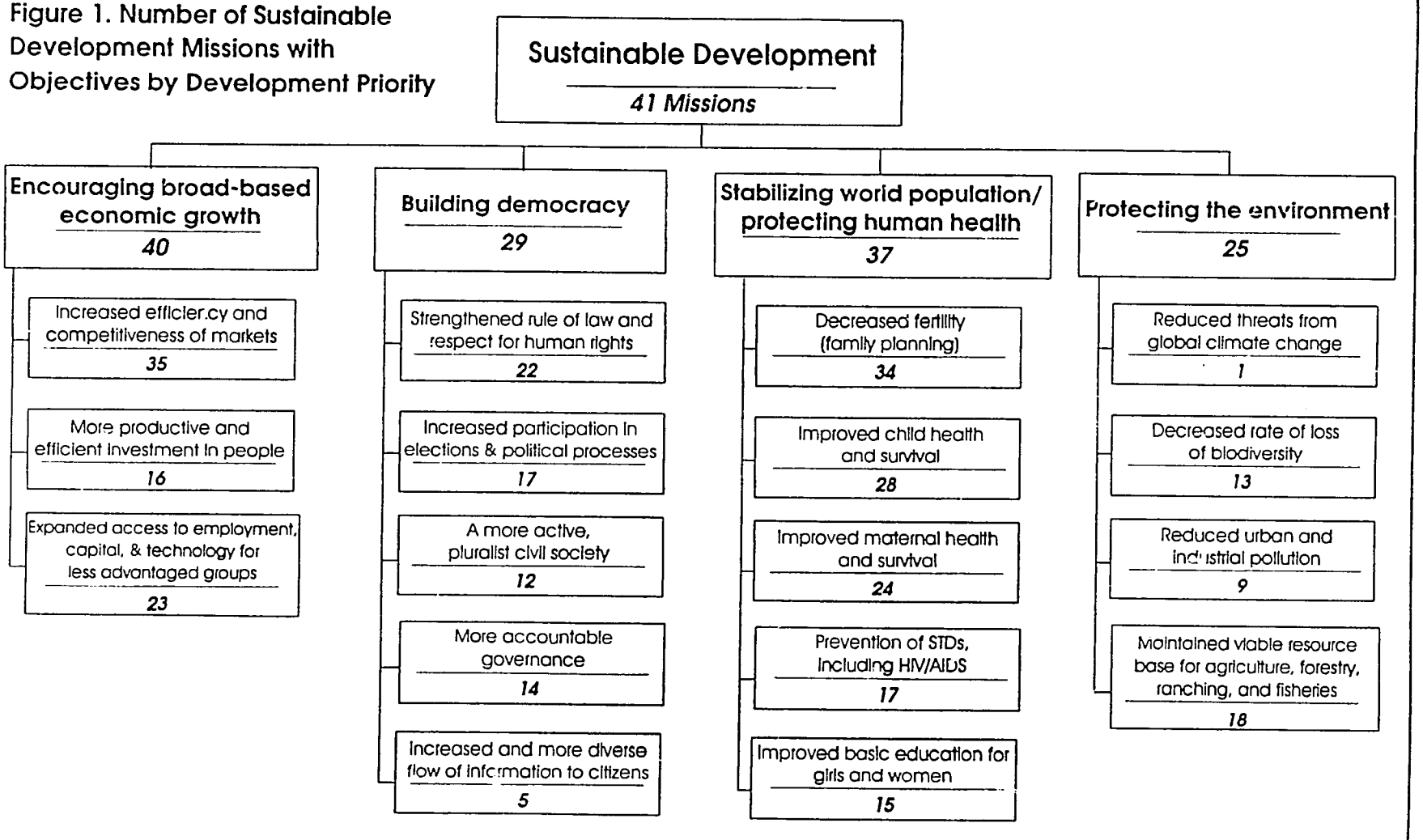
[1] The inclusion of ESF and PL-480 Title III biases these percentages toward economic growth objectives. If ESF and Title III are excluded, the proportion of DA/DFA funding among the four areas would be as follows: economic growth - 40 percent; population and health - 43 percent; environment - 12 percent; and democracy - 6 percent.

[2] Sustainable development countries are those which USAID has determined to have good potential for sustainable growth, respect internationally recognized human rights or are moving in a positive direction in this regard, need assistance and have shown they can and will use outside help effectively. Unless otherwise noted, performance in these 41 countries is the basis for analysis in this report relating to our sustainable development programs. USAID also supports programs in 51 other countries. These include the ENI nations, as well as countries that have a development problem of global significance, where our activities emphasize crisis response or humanitarian assistance, or where USAID bilateral assistance is being completed within the next 2 years.

[3] USAID's ENI programs have developed a separate but conceptually compatible system for monitoring and measuring results in response to their unique program and management setting.

Figure 1. Number of Sustainable Development Missions with Objectives by Development Priority



Encouraging Broad-Based Economic Growth

Strategy and Objectives

ECONOMIC GROWTH is the foundation of sustainable development. It helps reduce poverty and provides essential resources for stabilizing population growth and protecting human health and the environment. Significant economic growth has occurred in the developing world. According to data published by the World Bank, per capita incomes in developing countries as a whole grew faster than in the developed world from 1965 to 1990.

The region largely responsible for this record was Asia (which accounts for half of global poverty), where per capita incomes grew almost twice as fast as in the rich countries.[5] During 1980-92, the average annual growth rate of developing countries lagged behind that of industrial countries because of negative performance in other regions, especially sub-Saharan Africa. However, several individual countries outpaced the performance of rich countries, including Botswana, Chile, Indonesia, Malaysia. Thailand, and the populous poor countries of China, India, and Pakistan.

To reduce poverty and food insecurity and contribute to lasting improvements in peoples' lives, economic growth must be *rapid*. It must be *broad-based*, leading to widespread increases in employment and incomes among both men and women. It must also be *sustainable* and based on efficient, responsible use of human, material, and natural resources. Finally, economic growth must be *participatory*, with open access by all to political and economic systems. Evidence from experience confirms the relationship between rapid economic growth and poverty reduction. Data published by the World Bank from 13 developing countries show a high correlation between the rate of growth of national per capita household income (consumption) and the rate at which poverty declined.

USAID's economic growth strategy has three elements: strengthening markets, investing in people, and expanding access and opportunity. This strategy reflects a consensus that has emerged among donors and developing countries alike about key measures governments must take to promote broad-based economic growth.

These measures fall into two broad categories. First, governments must ensure a sound policy and institutional framework for efficient operation of private markets. This is fundamental but does not always guarantee that the poor and disadvantaged benefit enough. Thus, governments often need to intervene directly in areas where private markets, even with a sound enabling environment, fail to provide investments essential for sustainable development. These include human resource investments (particularly basic education and health services), physical infrastructure, and environmental protection. USAID supports institutional and technological change that benefits poor people and policies that protect them from discrimination in the marketplace.

Results

Forty sustainable development Missions have economic growth objectives. In most nations our programs have been relatively

[5] Growth in China accounts for some of Asia's performance, but even when China is excluded, Asian per capita incomes grew almost 50 percent faster than those of developed countries. Even without China, there are more poor people in Asia than in any other region.

modest compared with investments by developing countries themselves and by multilateral development banks, particularly the World Bank. Nonetheless, USAID can take significant credit for progress in countries where economic growth has been a major element of its strategy. One reason is our professional field staff, larger than that of any other donor and able to engage host country counterparts regularly and directly on critical policy issues. In countries where assistance concentrates on a particular sub-sector or issue, such as privatization or microenterprise finance, an even larger share of results can be attributed to U.S. assistance.

Strengthening Markets

USAID programs in 35 sustainable development countries seek to strengthen the contribution of markets to economic growth by improving their efficiency and performance, mainly by reforming the enabling environment of policies and institutions. Economic research has shown that the enabling environment is critical to economic growth and analyses of USAID programs have confirmed this linkage. In Central America, large-scale U.S. assistance for market strengthening helped reverse sharp economic declines in the mid-1980s. With reforms, that region is now achieving positive economic growth, and USAID has been able to phase down its assistance. In Africa, an evaluation of USAID market-strengthening programs in six countries concluded that the main reforms (decontrol of prices and markets, relaxation of trade controls, reduced subsidies and elimination of government monopolies) all resulted in increased efficiency.

> *"In Guatemala, small farmers benefited more from USAID support for improved policies and regulations affecting market performance than from assistance directly to them or to specific enterprises."*

The Agency is also helping privatize public enterprises and increase production in specific markets, especially non-traditional exports. In Honduras, USAID helped privatize 43 state-owned enterprises, earning $160 million for the Honduran Treasury and reducing external debt by $40 million. Where commitment to privatization by government authorities is lacking, however, as in Zambia, progress has been disappointing.

By 1993, non-traditional exports for countries assisted by seven Missions able to report results totaled $1.75 billion, an increase of over 35 percent in 2 to 4 years. Five Missions exceeded their 1993 targets. For example, with USAID support, El Salvador's non-traditional exports grew an average of 19 percent annually over the last 3 years, substantially more than the target.

Investing in People

USAID seeks to help countries establish self-sustaining basic education systems that will enable their people, particularly the poor, to lead socially and economically productive lives. By one common quantitative measure (the percentage of the population age group enrolled in primary education), there has been substantial progress in the developing world over the last two decades: from 79 percent in 1970 to 102 percent in 1991.[6]

Even more impressive is progress in female primary school enrollment, up from 63 percent to 94 percent. The latter is particularly significant, given the important positive

[6] Figures over 100 percent reflect the presence of under-age or over-age children enrolled in primary school.

effect that education of girls and women has on sustainable development. For example, even at modest levels, education empowers women to seek and use health and family planning services. In most countries, better educated women desire smaller families and a higher proportion of their children survive. Major regional disparities remain, however. In Africa, total and female primary enrollments in 1991 were 66 percent and 58 percent, respectively; in South Asia they were 89 percent and 76 percent.

A major deficiency of these enrollment ratios is that they tell us nothing about the *quality* of basic education. High drop-out rates and grade repetition by primary students in many countries reflect a judgment by parents about the poor quality of schooling relative to the need for children to work to supplement family income. Thus, 16 sustainable development Missions are pursuing improvements in the quality and efficiency of primary education. Most focus on girls' education and track female enrollment and grade completion rates.

> *'In Bangladesh....loans have helped build many women-owned microenterprises, and incomes of borrowers now exceed incomes from agricultural labor by up to 300 percent.'*

Of nine Missions reporting results to date, eight are achieving or exceeding their targets. In Egypt, where USAID helped build more than 2,000 rural schools, girls' enrollment in first grade increased by 29 percent between 1981 and 1994. In Guinea, USAID-supported administrative and budgetary reforms of the primary education system led to an increase in first grade enrollment from 23 percent to 47 percent from 1990 to 1993. Enrollment by girls and rural children grew the fastest. In Guatemala, emphasis on expanding access to basic education through bilingual programs for the Mayan population increased enrollment of Mayan students by 7 percent from 1992 to 1993.

Expanding Access and Opportunity

Efforts to strengthen markets and invest in people significantly improve access and opportunity for the poor. But markets never work perfectly, even when the policy and institutional framework is sound. Competition is rarely complete, and high information and transaction costs (costs of assessing a good credit risk, for example, or of understanding and adopting new techniques) can justify selective government subsidies or even temporary direct support to poor and disadvantaged groups in new markets until they overcome these obstacles.

USAID programs in 23 sustainable development countries seek to expand economic access and opportunity. They do so primarily through policy and institutional reforms and other measures that help women and other disadvantaged groups secure basic rights, gain access to resources and improved technologies, and influence public policy and administration. Most USAID programs in this area stress support for microenterprise finance and improved technology for small farmers. Of 10 Missions reporting results to date, eight are achieving or exceeding their targets.

In Egypt, where USAID has given significant support to microenterprise and small business development, the number of small businesses and microenterprises receiving credit increased from 600 in 1991 to almost 16,000 in 1993. Microenterprise programs increasingly target women, who tend to have higher repayment rates than men and are more likely to spend enterprise income to improve family welfare.

In Bangladesh, USAID has generated economic opportunities for rural women

through more than 27,000 loans. The loans have helped build many women-owned microenterprises, and incomes of borrowers now exceed incomes from agricultural labor by up to 300 percent. Such advances enable many women and their families to move beyond abject poverty.

USAID is also expanding access of small farmers and microentrepreneurs to improved technology, information, and related services in 10 countries. In Jamaica, for example, the number of small farmers adopting improved and environmentally sound practices grew from 9,200 to 14,200 from 1992 to 1993, an increase of more than 50 percent. New cocoa cultivation techniques tripled small farmer production from 1989 to 1992 in one area that now accounts for almost 60 percent of Jamaica's total harvest.

Learning from Experience

Our experience in supporting economic growth has yielded some basic lessons:

- The policy and institutional setting is a central determinant of economic growth. One example comes from a recent evaluation of USAID agribusiness programs. In Guatemala, small farmers benefited more from USAID support for improved policies and regulations affecting market performance than from assistance directly to them or to specific enterprises.
- Rapid, broad-based economic growth is critical for improving basic education, health, and nutrition because larger incomes allow families to invest more in these areas and because economic growth generates the revenue base for increased public services.
- A new evaluation study of several of the world's most effective microenterprise finance institutions concludes that carefully crafted management strategies allow such institutions to be financially viable and to rapidly increase their outreach. Financial viability requires charging interest rates that cover costs (including inflation and loan losses); this permits institutions to multiply donor contributions by tapping far greater funding from commercial sources. The best institutions are able to expand the number of loans by at least 25 percent each year, providing thousands of poor clients with their first access to loans and safe places to hold savings. Conclusions from this report are being integrated into USAID's Microenterprise Initiative.

Building Democracy

Strategy and Objectives

IN RECENT years, the belief that democracy provides the most accepted method of governing has spread through Latin America, Eastern Europe, Asia, Africa, and the former Soviet Union. According to the most recent Freedom House survey,[7] 114 countries can properly be categorized as democracies, the largest number ever. The same survey reports that 60 percent of the world's people live in free or partly free societies.

Countries categorized as "partly free" are among those targeted for U.S. assistance programs. These countries are still in need of some measure of external assistance and, above all, the chance to build on the tangible gains they have made. At the same time, progress toward self-sustaining democratic governance will not in all cases proceed in a linear direction. U.S. democracy assistance programs, therefore, must have the flexibility to respond to unforeseen political developments as well as adopt a long-term development perspective.

Notable democratic progress was made during 1994 in South Africa, El Salvador, Mozambique, and Malawi. Less in the news, but no less important, significant gains occurred in Ukraine, Panama, and Uganda. These transitions were the products of free and fair elections, a discernable expansion of political and civil liberties, and strengthened organizations that advocate on behalf of, and represent, the citizenry.

Major challenges to sustainable democratic governance, however, remain. Forty percent of the world's people continue to live in societies where basic rights are denied. In addition, countries such as Rwanda, Burundi, and much of the former Yugoslavia demonstrate that ethnic conflicts, if allowed to fester, can descend into the horror of genocide. In all regions of the world, insufficient economic growth, high levels of illiteracy, overreaching military bureaucracies, and corrupt civilian bureaucracies challenge new democratic governments.

USAID's democracy strategy has five broad objectives:

- strengthening the rule of law and respect for human rights;
- increasing citizen participation in elections and political processes;
- expanding an active civil society;
- developing more accountable governance; and
- increasing the flow and diversity of information to citizens.

Specific programs are tailored to country circumstances and available resources. Twenty-nine sustainable development Missions have significant democracy programs. Sixteen of these countries are classified as "partly free" and seven as "free" in the most recent Freedom House survey. USAID considers these 23 countries as having the greatest potential for promoting and consolidating democratic rule.

In the remaining six, classified as "not free" by Freedom House, USAID looks to take advantage of specific opportunities for promoting democracy and respect for human rights, relying principally on work with both U.S.-based and local non-governmental organizations (NGOs). While operating within a slightly different framework, USAID also has set significant democracy objectives in

[7] The Freedom House index is a seven-point scale grouping countries according to their degree of freedom. Using a checklist of nine indicators for political rights and a checklist for 13 indicators of civil rights, Freedom House determines two values for the respective group of rights. The average of these two values is used to group countries in three categories: "free," "partly free," and "not free."

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the ENI region and for other countries such as Cambodia, Haiti, and Gaza/West Bank.

Results

USAID played an important role in six of eight countries that made significant democratic gains, according to the most recent Freedom House survey.[8] But sustainable democratic change comes neither quickly nor easily. Investments must be made carefully and incrementally in educating citizens about democratic values, redefining government's role, and building key institutions inside and outside government to nurture the new political environment. Successful transitions often flower from seeds of reform planted much earlier.

Such was the case in South Africa and Mozambique. In South Africa, USAID began in the mid-1980s with support to NGOs and community groups. This led to more intensive work during recent elections on voter education, expanded political work by NGOs, training election observers, and strengthening the electoral commission. Post-election assistance is focused on building respect for the rule of law, supporting good governance, and strengthening civic organizations as a check against future abuses of power.

In Mozambique, USAID's help during civil war in the 1980s and early 1990s stressed humanitarian assistance for refugees. The October 1994 elections were a watershed. Before the elections, USAID activities shifted to voter education, electoral commission strengthening, and training local election monitors. These efforts played a key role in ensuring successful elections. After the elections, USAID is supporting new initiatives in decentralization, legal reform, and development of civil society.

In countries where the initial political transition phase has been completed, Missions concentrate on consolidating democratic development. In Bolivia, for example, USAID is working to improve the effectiveness and accountability of judicial systems and legislatures. In Namibia, one of Africa's newer democracies, USAID is encouraging more diverse representation in parliament and supporting civic education programs.

Not all efforts have led to unequivocal successes. The Dominican Republic's May 1994 elections were widely regarded as fraudulent, notwithstanding USAID support for the electoral commission and an international monitoring effort. In Zambia, corruption among top government officials led the United States and other donors to reduce assistance. (Since then, Zambia has enacted a new parliamentary and ministerial code and announced plans for a corrupt practices act.) In Indonesia, the government has proposed legislation that would limit the freedom and effectiveness of NGOs; if enacted and enforced, the entire USAID program would have to be reassessed.

Rule of Law and Human Rights

Citizens require a strong legal framework to ensure their fundamental rights, to establish procedures for redress, and to enforce contracts. More than 75 percent of USAID's sustainable development Missions with democracy programs support work in rule of law and human rights. Of the 11 countries reporting some results to date, nine are showing progress toward their objectives.

Rule of law programs began in Latin America in the 1960s and spread there and in other regions in the 1980s. As a result of these programs, access to legal advice and redress through legal aid and alternative dispute resolution has increased significantly for poor and marginal populations. In Bolivia, for example, the Inter-American Bar Foundation, with USAID support, has established three neighborhood reconciliation centers and plans to increase this number to 20 by 1997. USAID also helped eight Latin American countries adopt and implement revised criminal codes and move toward sys-

[8] Countries that changed from "not free" to "partly free" or "partly free" to "free". The six countries are Haiti, Malawi, Mozambique, Panama, South Africa, and Uganda.

tems featuring public trials and clear limits on pretrial detention.

In Central and Eastern Europe and the New Independent States, advisors are helping reform judicial procedures, train judges, revamp law school curricula, and develop bar associations. Effective work in court reform requires strong political support. Where this is lacking, we have focused on building constituencies and local NGOs to push for judicial reform.

USAID is making human rights a more visible objective, working with local and international NGOs to increase support for human rights monitoring and education. For example, Latin American partners, including the Inter-American Institute for Human Rights and indigenous NGOs, actively spread awareness of citizen rights. Publications advocating human rights are now available in every country in the region.

'In Malawi, Mozambique, South Africa and Ukraine, USAID assistance played an important role in voter registration, and turnout exceeded expectations.'

Elections and Political Processes

Providing channels for citizens to negotiate conflicting interests peacefully and to participate actively in government decision-making is at the heart of the democratic process. To this end, USAID supports open, honest elections; vigorous, effective legislatures; and more competent, representative political parties. Seventeen Missions have established objectives in this area; of seven for which data are available, six are showing progress toward their targets.

USAID's election support emphasizes building local capacity to conduct and monitor elections and educating citizens about the elections process and their role in it. Assistance to electoral tribunals in Bolivia, El Salvador, Panama, Mozambique, and South Africa helped ensure elections that were accepted as legitimate. In Bolivia, USAID was successful in building electoral institutions and supporting registration of 1.4 million voters in 1993; attention has now shifted to local issues. In Malawi, Mozambique, South Africa and Ukraine, USAID assistance played an important role in voter registration, and turnout exceeded expectations for elections held during 1994.

As part of the effort to strengthen the political process, particularly following transition elections, USAID has sought to reinforce the role and capacity of legislatures. These efforts have helped legislatures in several countries obtain more and better information for decision-making. In Central and Eastern Europe, for example, programs have built legislative research and information systems independent of those for the executive branch in eight countries.

Civil Society

USAID supports a wide range of NGOs that champion reforms essential for democratic governance, including labor federations, business associations, policy think tanks, and human rights, pro-democracy and environmental groups. Many of these civil society organizations spearheaded pro-democracy reform movements in their countries. Twelve sustainable development Missions have identified this as a major focus of their democracy programs.

USAID support strengthened democratic reform in Chile and Thailand. In Thailand, labor unions and environmental organizations receiving USAID assistance for sector-specific activities played central roles in the national campaign to restore elected civilian government in 1992. The same groups are now promoting constitutional reforms to ensure greater accountability in public life, limit the political role of the military, and build strong local government.

In Chile, seven elections from 1988 through 1993 were crucial to restoring democratic governance. During this period, two organizations received USAID assistance to organize massive voter education campaigns. Their efforts contributed significantly to Chile's peaceful transition to democracy.

Accountable Governance

Executive branches that are arbitrary, narrowly based, inept, and corrupt pose a primary obstacle to sustainable development. They erode public confidence, threaten political stability, stifle individual and group initiative, and create an unpredictable environment for social and economic investment. Fourteen sustainable development Missions are pursuing objectives in accountable governance. According to results reported to date for eight Missions, seven are showing progress toward their targets.

Much of USAID's assistance aims at decentralizing power and authority from strong central governments to local communities and broadening opportunities for direct citizen participation in political processes. In Honduras and Nicaragua, for example, USAID-supported programs have established a tradition of frequent town meetings and opened other decision-making bodies to citizens.

In El Salvador, Guatemala, and Mozambique, USAID has facilitated public dialogue about the role of the military in democratic governments and supported reintegration of soldiers into civilian life.

Increased Information Flow

Citizens must be well informed to participate effectively in democratic processes. This requires media that are unbiased, legitimate, able to investigate and analyze events, and free from government interference. In many developing countries, the media are fettered by government restrictions, their own ineptitude and irresponsibility, and a lack of public confidence in what they report.

In recent years, progress has been made in Africa, Asia, Latin America, Central and Eastern Europe, and the New Independent States in improving the capacity and openness of the media. USAID support to The Asia Foundation helped develop journalistic skills in the press and mass media in Bangladesh, Indonesia, Nepal, and Sri Lanka. In Madagascar, USAID trained journalists in economic reform and accountability. In Central America, USAID trained 50 percent of the region's journalists and media managers in journalistic ethics. In 1989, citizens of the region had little faith in the media; by 1994, a public opinion poll found the media ranked second to the Catholic Church in credibility.

Learning from Experience

Although USAID's major emphasis on building democracy is recent, we have already learned important lessons from experience:

- Democracy must be substantially homegrown and cannot be imposed on the basis of a preconceived model. For this reason, USAID programs are designed following an assessment of existing conditions within a country.

- Adoption of democratic rule comes most reliably when there are strong demands for reform from vigorous citizen groups. Once reforms are introduced, these groups also play a watchdog role in ensuring that politicians and officials adhere to new democratic rules.

- Although international monitoring plays an important role in the conduct of elections, sustainable democratic development requires local capacity to monitor elections.

- Ensuring fair and impartial judicial systems is a high-risk strategy in countries where political will is lacking. Thus, as articulated in a recent six-country evaluation of donor Rule of Law programs, USAID must often support constituency groups that advocate legal and judicial reform, in addition to programs helping revise legal codes and judicial administration.

Stabilizing World Population Growth and Protecting Human Health

Strategy and Objectives

RAPID POPULATION growth and poor health are inextricably linked to the factors that keep nations poor. They are also closely associated with low status and limited rights for women. USAID's strategy to stabilize population growth and protect human health has five priorities:

- preventing unwanted pregnancies and abortions;
- reducing deaths of children from preventable diseases;
- decreasing pregnancy-related deaths;
- preventing transmission of sexually related diseases such as HIV/AIDS; and
- increasing the basic education of girls and women.

USAID is a leading donor in this sector. Its technical leadership and support for country programs have contributed directly to dramatic results in lowered mortality and fertility and significant movement toward stabilizing world population. Annual world population growth dropped from 2 percent in the 1960s to 1.57 percent in the 1990s. This is the lowest growth rate since the 1940s and has happened while fewer children are dying and people in general are living longer. Improvements in infant and child survival and achievement of desired smaller family size have occurred particularly rapidly in countries where USAID has concentrated its assistance.

Results

Ninety percent (37) of USAID's sustainable development Missions are pursuing objectives in population or health. The impact of USAID assistance is particularly notable in family planning and child survival, where USAID has the longest track record. With our development partners, we have contributed to major changes in access to services, quality of care, individual health status, health and family planning options and practices, and average family size. These are among the best documented results in the field of development, a direct consequence of USAID's long-term investment in demographic and health surveys and research and training. There are also promising results in newer areas such as maternal health, on which USAID is beginning to focus.

Family Planning

In 34 sustainable development countries, the Agency is helping implement programs that enable families to achieve desired family size. Most programs are reaching or exceeding their objectives. In the 28 countries that have received the largest amount of population assistance, average family size has decreased from 6.1 children in the 1960s to 4.2 in 1992. In five USAID-assisted countries, the percentage of couples using modern contraceptive methods has increased by more than 2 percent a year since the late 1980s. In almost all other USAID-assisted countries for which we have recent data, average annual increases in the contraceptive prevalence rate have exceeded 1 percent. These results are especially impressive since the number of people to be served increases substantially every year. Just maintaining existing levels of contraceptive use requires expanded service delivery.

USAID's contribution to moderating population growth is shown in countries like Bangladesh, Colombia, Egypt, Indonesia, Kenya, Mexico, and Morocco where we have been the major provider of technical and financial assistance for years. In each country,

a clear pattern has emerged of increased family planning knowledge, expanded and improved service delivery, increased contraceptive use, and decreased desired and actual family size.

Tanzania provides a dramatic example of how our assistance contributes to national-level changes. In 1990, when USAID began its first population project, most family planning clinics lacked essential supplies and trained staff. Assistance focused on improving management and supply systems, providing better staff skills, and expanding client information and choices. Since 1991, modern contraceptive use has more than doubled, from 7 percent to 15 percent.

Child Survival

The death of a child from a preventable disease is still too common. A recent survey of 30 developing nations found that at least 25 percent of women of reproductive age have lost at least one child. USAID works with its partners to reach the international goal of reducing child mortality rates by one-third in this decade. Twenty-eight Missions have set child survival objectives. Of the eight Missions reporting results to date, six are achieving their targets.

> *"From 1985 through 1992, infant mortality declined by 10 percent in USAID-assisted countries."*

Although the HIV/AIDS pandemic may be eroding previous gains in child survival in some African countries, overall there have been important improvements in child health in the past decade. From 1985 through 1992, infant mortality declined by 10 percent in USAID-assisted countries. In some countries the decline was even greater, ranging from 17 percent in Bolivia to almost 50 percent in Honduras. During the same period, mortality rates for children under 5 in USAID-assisted countries dropped by 10 percent to 40 percent. In Egypt, child deaths before the age of 5 dropped from 130 per 1,000 in 1985 to 85 per 1,000 in 1990.

USAID is contributing to increased immunization coverage. From 1980 to 1990, the percentage of children immunized against major preventable diseases increased from 20 percent to 80 percent. Worldwide, this increase saves the lives of an estimated 2.8 million children every year. In 1994, polio was eradicated in the Western Hemisphere by a multinational effort in which the United States was the lead donor.

In the 1970s, USAID was the chief supporter of research in Bangladesh that led to development of oral rehydration therapy to prevent deaths from diarrhea. With USAID assistance, use of ORT during diarrheal episodes among children continued to increase, from 12 percent in 1984 to 46 percent in 1992. This treatment saves children's lives in the United States as well as in developing countries. It prevents an estimated one million child deaths worldwide each year.

By working with partners, we are able to leverage other resources. This is well illustrated by the vitamin A program in the Philippines. First, the Philippine Department of Health, Helen Keller International (a U.S. private voluntary organization), and Hoffman-LaRoche (a U.S. pharmaceutical company) joined forces with USAID in a campaign to prevent blindness by distributing vitamin A capsules to 90 percent of preschool children. Now, a longer-term solution—making low-cost vitamin A-fortified margarine available in local markets—has been developed by the Nutrition Center of the Philippines (a local NGO), Johns Hopkins University, and Procter and Gamble, all working in partnership with USAID.

Maternal Health

Of all health statistics, maternal mortality is the one that shows the greatest disparity between the developed and developing world. African, Asian, and Haitian women are up to 200 times more likely to die as a result of pregnancy than women from industrial countries.

With programs in 24 sustainable development countries, USAID is working toward the worldwide goal of reducing maternal mortality by half by the year 2000. While it is unlikely that this ambitious goal can be met, USAID-assisted demonstration projects in countries such as Bolivia and Indonesia are showing that better care during pregnancy and delivery can save women's and babies' lives. In Bolivia, for example, a pilot project in 50 rural communities, which focused on improved self-diagnosis of maternal and neonatal health problems and referral and improved care for those with complications, reduced the death rate of babies under 1 month of age from 117 per 1,000 live births to 44. Maternal deaths from pregnancy-related causes in the pilot communities decreased from 11 to 7 a year.

Preventing Transmission of Sexually Related Diseases, Including HIV/AIDS

USAID is the leading bilateral donor providing technical and other support for programs to prevent the transmission of sexually related diseases. Since 1986, we have provided more than $500 million for HIV/AIDS prevention. Seventeen Missions are pursuing objectives in this area through programs aimed at promoting safer sexual behavior through information, education and communication; increasing correct use of condoms; improving treatment services; and working with government and community leaders to develop policies that support effective prevention activities.

In Africa, where USAID has provided the most support, knowledge of HIV/AIDS has increased dramatically. The majority of adults can identify at least two effective methods of lessening the risk of contracting HIV/AIDS. In Thailand, USAID helped a national program slow the spread of the virus. We are helping other countries become familiar with the lessons learned in Thailand.

Basic Education for Girls and Women

Basic education, especially for women and girls, is also a focus of USAID's economic growth strategy. Results from our programs in this area were discussed in the economic growth section above.

Learning from Experience

Operations research, analysis, and information on program performance have helped us achieve our objectives in stabilizing population and protecting human health. Among the lessons learned are these:

- USAID's ability to combine effective management and collaborative programming with technical approaches has been an important element in our success. Technical interventions such as increased immunization, use of oral rehydration therapy, vitamin A supplementation, child spacing, and breastfeeding should be combined with management improvements such as better handling of vaccines and other critical supplies, decentralized administration, and close collaboration among host country and donor agencies.
- It is important to address the sustainability of family planning and health services at the early stages of program planning. Sustaining programs requires improved management, removing legal or regulatory barriers to efficient service delivery, stronger local institutions, better trained managers and service providers, and involving the private sector through innovative approaches such as social marketing.
- Providing a high quality of care and, where feasible, a range of services together is extremely important.

Protecting the Environment

Strategy and Objectives

ENVIRONMENTAL PROBLEMS increasingly threaten the economic and political interests of the United States and the world at large. Degradation of rural and urban environments has led to increases in human illness, loss of economic productivity, and a reduced standard of living for countless people in the developing world. Environmental degradation in these countries also affects Americans directly through the loss of economically important biological diversity and rising levels of greenhouse gases. These problems require international cooperation.

USAID is working with U.S. and host country partners to support the sustainable development objectives of Agenda 21—the recommendations from the U.N. Conference on Environment and Development (1992 Rio Earth Summit). USAID programs address long-term threats to the global environment, particularly loss of biodiversity and global climate change. They also promote sustainable economic growth locally, nationally, and regionally by modifying policies and practices that have damaged the environment and by building local institutions to address environmental problems.

Programs to address global objectives concentrate on a limited number of countries where progress is likely to have the greatest impact worldwide.[9] Selected results of USAID's biological diversity programs are described below. USAID's impacts on global climate change are not yet well documented, as these initiatives are new to the Agency. USAID is engaged in major efforts to reduce greenhouse gas emissions in key countries. Details on this effort can be found in our June 1994 report to Congress, *Global Climate Change: The USAID Response*.

Programs to protect the environment at national and local levels also figure prominently in a wide range of sustainable development countries. They seek to protect biological resources, promote environmentally sound urban and industrial development, foster efficient use of renewable and non-renewable energy, improve the availability and quality of water, and encourage better stewardship of natural resources.

Activities related to energy and water are important in many countries, but they have often been components of broader development activities. As a result, impacts have frequently been assessed more in terms of their economic and social consequences rather than on strictly environmental criteria. Also, the environmental impacts of certain water and energy activities are often reported under other environmental objectives. For example, assistance for wastewater treatment activities in Egypt are reported in the section on urban and industrial development, and coastal resource management pilot activities in Sri Lanka, Ecuador, and Thailand appear in the natural resource management discussion.

This document reports on the impacts of activities in the areas where USAID has had more long standing or focused programs—biodiversity protection, stewardship of the natural resource base, and urban and industrial pollution prevention—and where a more significant body of results is available.

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[9] The key countries for global warming are Brazil, India, Indonesia, Kazakhstan, Mexico, Philippines, Poland, Russia, and Ukraine. While active in a number of countries with biodiversity concerns, USAID is in the process of identifying priority countries for its biodiversity investments. That list tentatively includes the following countries or regions: Bolivia, Brazil, the Central African region, Central America, Ecuador, India, Indonesia, Mexico, Papua New Guinea, Peru, the Philippines, Russia, and Thailand.

Results

Sixty percent (25) of the sustainable development Missions have one or more environmental objectives. These Missions are spread widely across Asia, Africa, and Latin America and the Caribbean.

Biodiversity

At current rates of destruction, it is estimated that 5 percent to 10 percent of all living plant and animal species will be extinct by 2025. Against this threat, significant human and financial resources have been mobilized to protect biologically rich habitats. The results are impressive. Between 1980 and 1990, the amount of land set aside by the nations of the world in protected areas increased 40 percent, from 4.5 million square kilometers to 6.5 million. Of these, 4.1 million square kilometers are in developing countries—an area about three times the size of Alaska.

USAID is an active partner in this effort. In 1994, we supported more than 90 biodiversity activities in 40 countries. Thirteen sustainable development Missions have major programs in this area. Five have reported results to date and all are achieving or exceeding their objectives.

Through the Parks in Peril program, USAID support has led to creation of 26 protected areas covering 5.6 million hectares in 12 countries. Noel Kempff Mercado Park in Bolivia is one example. Lumber extraction within the park has declined, takings of river turtles and their eggs have decreased, confiscation of illegal products is down 66 percent, and responsible tourism visits increased by 400 percent from 1992 to 1994. In the Philippines, debt-for-nature swaps have endowed a $25 million environmental fund. Interest earned has financed more than 100 projects designed and implemented by grass-roots environmental NGOs.

> *'USAID support has led to creation of 26 protected areas covering 5.6 million hectares in 12 countries.'*

Not all the news is positive, however. Many protected areas are too small, fragmented, or degraded to offer real sanctuary for embattled species. Disputes over land tenure conditions and inadequate enforcement activities result in ineffective protection of many other protected areas. Opportunities to generate revenues from sustainable use of protected habitats are still being missed. These lessons are being incorporated into the next generation of environmental activities.

Natural Resources Management

Maintaining the productivity of natural resources, particularly for agriculture, is an area in which USAID has built significant expertise. Eighteen Missions now have natural resource objectives. Of the nine reporting results, six are achieving or exceeding performance targets. Concern about negative environmental effects of agricultural practices led USAID to develop and promote new technologies to maintain or increase long-term productivity, and involve farmers—men and women—more actively in the process.

For example, in Honduras, we are helping transform destructive hillside agricultural practices and provide farm families with land-use technologies that decrease erosion and increase crop yields. The number of poor hillside-farming households adopting environmentally sound cultivation practices doubled to more than 21,000 between 1989 and 1993, reducing soil erosion by 70,000 tons. At the same time, 10,000 participating families increased their yields at least 30 percent. Extension training activities carried out by male and female community leaders is speeding the dissemination of improved technologies among neighboring farmers. USAID has decreased deforestation and promoted reforestation in several countries. In Pakistan, communities that suffer from fuelwood shortages are promoting tree farming after policy and economic reforms established a market for seedlings. More than 100

97

million trees have been planted on private farmlands, with good survival rates.

In the Philippines and Nepal, where forests are rapidly disappearing, new laws transfer management of public forests to local communities. In the Philippines, more than 12 million hectares are now communally managed and are beginning to show increased forest regeneration and improved soil and water retention, bringing economic benefits to local communities.

Support for integrated pest management (IPM) is also reducing environmental damage and increasing yields. In Indonesia, a catalytic USAID investment in a multi-donor project helped to show how reducing pesticide use can boost farm incomes from rice cultivation. In 1986, the government began training farmers how to distinguish between pests and their natural predators and how to calculate whether the predators were doing a better job of keeping down pests than chemicals. As a result of this program, rice yields among farmers using IPM are approximately 15 percent higher compared to other farmers under similar conditions and pesticide use is down 65 percent nationwide. IPM reduced environmental damage and health risks to farmers and saved $120 million in insecticide subsidies.

"Strategies that increase local stewardship by empowering and encouraging participation of local people are more effective than those that rely on government agencies alone."

Pilot activities in coastal resources management have had major impacts through policy changes and participatory approaches in several countries. In Thailand a model strategy for local/national partnerships in managing the country's coral reefs has now been extended to mangrove wetlands and the coastal zone as a whole. This expanded program, financed by the Thai government, will lead to better management of shrimp farming and tourism, activities not previously managed sustainably.

In Sri Lanka, we helped create a new planning system to control coastal erosion through adoption of set-back regulations and environmental impact assessments for all activities that alter the coastal area. In Ecuador, 194 groups of fishermen, mollusc collectors, shrimp farmers, and tourism and residential developers now work with government agencies in five special management areas to set coastal policies.

Urban and Industrial Pollution

Benefits of urban and industrial development are being increasingly offset by the high social costs of environmental problems. This problem is a target of programs in eight sustainable development countries, as well as in the ENI region. USAID is working to transfer U.S. domestic experience to its work overseas, ranging from legal and policy changes at the national level to pollution audits for individual plants affecting particular neighborhoods.

USAID supports expanded wastewater treatment in Egypt, Honduras, India, Indonesia, Jamaica, Jordan, and Thailand. In Egypt, where we finance major wastewater infrastructure, the percent of wastewater treated in Cairo and Alexandria increased from 40 percent to 75 percent, reducing by 81,000 tons a year the pollutants entering the Nile, the sole source of water for most Egyptians.

Housing Guaranty (HG) programs have leveraged reforms that result in expanded provision of potable water, sewers, and solid waste disposal on a sustainable basis. Quito, Ecuador, provides a good example. There technical assistance and the promise of HG funds led to reform of the Municipal Water Authority. New accounting and information systems improved budgeting, service extensions, tariff collection, and leak detection, lowering operating costs by 25 percent.

Moreover, USAID advisors showed that construction codes were over-engineered, resulting in prohibitively high new-service costs. After revising the codes, new service costs became affordable for low-income families. In 3 years, the Water Authority has made 35,000 new household connections and upgraded services to Quito's marginal neighborhoods, benefiting 180,000 people. The Authority, now financially solid, has obtained private loans and is extending service to the remaining 10 percent of Quito's population currently lacking piped water.

Efforts to decrease industrial pollution are also having significant impacts. In Tunisia, a pollution audit at a lead battery plant led the owner to invest $8,000 in new equipment and change its operating procedures. Operating costs dropped by $770,000 a year and lead dust and lead-contaminated water emissions were cut by 60 percent. As news of this savings spread, other battery makers implemented the same changes without USAID assistance.

Learning from Experience

Two lessons stand out from efforts to protect the environment:

- Strategies that increase local stewardship by empowering and encouraging participation of local people are more effective than those that rely on government agencies alone. Whether for managing a nature reserve, cleaning up a polluted river, changing farming systems, or reforming environmental policies, local stewardship is essential to sustained success.
- Linking sound environmental practices to real economic benefits—"win-win" strategies—characterize our more effective programs. Evaluations show the environment will more likely be managed well when tangible economic benefit can be derived from doing so. Sustainable upland agriculture practices are adopted readily if they increase local farm incomes; parks are protected if communities share entry fees.

Providing Humanitarian Assistance and Aiding Post-Crisis Transitions

Strategy and Objectives

AS SUPERPOWER tensions ease in the 1990s, religious and ethnic rivalries are leading to armed conflict, widespread dislocation, and death and suffering on a massive scale, especially in Africa and the Balkans. These conflicts destroy social, political, and economic institutions and set the development process back by decades.

Natural disasters, too, can erase years of progress in minutes. USAID's humanitarian programs seek to save lives and reduce suffering in the face of disasters, return individuals to self-sufficiency, and establish conditions for countries to move toward sustainable development and democracy in the aftermath of crises. In these efforts, we work as partners with U.S. and local NGOs, other bilateral donors, U.N. organizations and the recipients themselves.

USAID has four objectives for its humanitarian assistance:

- timely delivery of disaster relief and short-term rehabilitation;
- preventing disasters and reducing the vulnerability of populations at risk;
- preserving the basic institutions of civil governance during periods of crisis and transition; and
- protecting the food security and health of vulnerable groups during conflicts or periods of reform.

In 1994, humanitarian assistance was provided to more than 50 countries; the majority of funds went to the former Yugoslavia, Haiti, and 13 African countries. Emergency food assistance alone reached an estimated 58 million people in 18 countries with daily rations. USAID responded to 60 declared disasters, more than 40 percent of which were complex crises involving civil conflict.

Results

Timely Delivery of Disaster Relief

USAID assistance reduced suffering, saved thousands of lives, protected development progress, and hastened the return to sustainable development after crises. We responded quickly to an earthquake in India, a cyclone in Mozambique, flooding in Tajikistan, landslides in Colombia, volcanic mudflows in the Philippines, and 33 other natural disasters with food, medical supplies, temporary shelter, and other relief.

USAID and the rest of the international relief community have become more proficient at responding to rapid-onset disasters. The number of such disasters decreased 25 percent from 1992 to 1994, while USAID expenditures dropped by half, indicating improved efficiency. There is also a growing capability to respond to drought emergencies. Timely delivery of food and other resources and U.S. leadership of the donor effort in response to the 1992 drought in southern Africa prevented mass migration and starvation of hundreds of thousands of people. At the same time, it fostered long-term sustainable development in the region.

In 1994, the U.S. response to complex emergencies was controversial, but it achieved significant results. In Bosnia-Herzegovina, food and other assistance helped prevent widespread death from starvation and exposure in the winter of 1993-94. In Rwandan refugee camps in Zaire, the Department of Defense and USAID provided a potable-water system that broke the back of a cholera epidemic among the camp's 800,000 inhabitants. In Angola, Liberia, and Sudan, 25 million people dislocated by civil war were fed with PL-480 food aid delivered by NGOs and the World Food Program.

Preventing Disasters and Reducing the Vulnerability of Populations at Risk

USAID's efforts to help prevent, prepare for, and mitigate disasters has paid big dividends. Early-warning systems for famine (FEWS) and pestilence in Africa, and elsewhere for volcanoes, have become increasingly effective in saving lives, property and rehabilitation costs. FEWS data and reporting across Africa have allowed donors and governments to target food aid to affected people more quickly. In Malawi, for example, FEWS staff helped the government develop an effective food distribution schedule based on crop estimates.

In West Africa, USAID's Emergency Locust/Grasshopper Assistance allowed Mauritania, Senegal, and The Gambia to avoid major crop losses during a locust outbreak in 1993. And in the Philippines, warnings from a local volcanology institute, using USAID-funded equipment and advisors, enabled early evacuation of at least 80,000 people and saved an estimated $1 billion in property when Mount Pinatubo erupted in 1991.

> *"In 1994, humanitarian assistance was provided to more than 50 countries....Emergency food assistance alone reached an estimated 58 million people."*

Training programs have also built the capacity of governments and NGOs in Latin America to respond to disasters. Governments there now need fewer U.S. resources in times of crisis. For example, in Colombia local authorities trained by USAID were able to respond to a 1994 earthquake with minimal outside assistance, in marked contrast to 1985, when $2.75 million was provided after an earthquake of similar scale.

Preserving Civil Governance During Crisis and Transition

Transition initiatives are extremely difficult owing to the environments in which they take place, frequently involving armed conflict. USAID efforts in Bosnia, Rwanda, and Somalia have shown little progress. However, support to Mozambique helped that country emerge from 17 years of civil strife and the 1992 drought to hold free and fair multi-party elections in October 1994. Recent efforts to restore democracy in Haiti have also been promising.

Protecting Vulnerable Groups

In strife-torn Ethiopia and Mozambique, working through networks of PVOs and government-to-government food-aid programs, USAID provided safety nets for vulnerable groups, kept farmers on their land, and helped them keep tools and other assets until the crises passed. The number of emergency food-aid recipients has now dropped significantly in these countries. Emergency food provided a critical safety net for 26,000 people in Gaza-West Bank during the transition to autonomous rule, for more than 1.2 million vulnerable people in Haiti through its recent political crisis, and for 3,500 Guatemalan refugees who had fled to Mexico.

Learning from Experience

From our experience in humanitarian and post-crisis transition, we have learned several key lessons. Among them:

- Regular attention to the transition from relief to development in program planning has high payoffs. To ignore disaster risks in planning sustainable development programs, or conversely, to ignore the development and transition implications of emergency conditions and of emergency assistance can be costly. This lesson is especially important for the countries of the Greater Horn of Africa, probably the most food-insecure in the world. USAID is a key donor in the region. In our strategy

there, the relief-to-development continuum is a major planning concept for addressing food insecurity.

Early detection and warning of potential hazards or emergencies is the most important way to avert major disasters. USAID is expanding its early-warning systems into new regions and new sectors.

- Social safety net programs are most effective when designed to help beneficiaries participate actively in recovery and development activities. Governments must be genuinely committed to compensatory programs if they are to succeed.

Central and Eastern Europe and the New Independent States

Strategy and Objectives

THE CHANGES that swept Central and Eastern Europe and the Soviet Union in 1989-91 were historic. They prompted a unique and innovative U.S. assistance program led by USAID. As these countries emerged from communist rule, economic activity was centrally controlled, private ownership was virtually non-existent in the former Soviet Union and some of its satellites, and little was known about how to establish free-market economies and democracy. Governments were not based on the will of the people nor accountable to them. Energy was used inefficiently, and pollution was widespread. Progress against these challenges has been impressive, but much remains to be done.

USAID's ENI programs have three priorities:

- *economic restructuring*, to foster competitive, market-oriented economies in which the majority of resources are privately owned and managed;
- *democracy*, to support transparent and accountable governance and empower citizens through political processes; and
- *social sector restructuring*, to strengthen the capacity of some countries to ease hardships of at-risk groups during the transition and restructure social benefits to make them sustainable.

Results

Economic Restructuring

USAID programs are helping transfer state-owned assets to the private sector, establish more stable business environments, facilitate expansion of private enterprise, promote fiscal and financial sector reform, and support sustainable uses of natural resources. Central to this effort are USAID-funded advisors who actively help draft policies, legislation, and regulatory procedures needed to break up monopolies, establish markets, and strengthen competition.

Assistance in privatizing industry and in new business start-up has contributed substantially to private sector growth in many countries. In Russia, USAID helped establish a nationwide voucher system, which enabled 70 percent of Russian industry to be privatized and 40 million Russians to become shareholders. As a result, more than 40 percent of industrial workers are now in the private sector, and 25 percent of Russian households own their homes. An estimated 65 percent of Czech Gross Domestic Product (GDP) is now produced in the private sector. New private sectors in eight countries—Albania, Estonia, Hungary, Latvia, Lithuania, Poland, Russia, and Slovakia—each produce 50 percent to 55 percent of GDP. In the remaining countries, the private sector share of GDP in mid-1994 ranged between 20 percent and 40 percent. Land privatization, however, has been more complex, and progress considerably slower.

USAID-created Enterprise Funds in Central and Eastern Europe have sustained 21,000 jobs, created 11,000 more, and generated over $60 million in earnings. Twenty-three joint ventures with U.S. companies have been created, attracting $150 million in private foreign investment.

Appropriate energy pricing and the sustainable use of natural resources are also key to a market economy. Advisors are working to improve pricing policies and to introduce new energy-efficient technologies. They have trained more than 20 local private companies in Bulgaria, Hungary, and Romania in energy efficiency business development, while demonstrating U.S. energy efficiency equipment at more than 40 plants. These demonstrations generated immediate savings

of $16 million in energy costs from investments of $1.2 million. Energy audits and demonstrations have improved efficiency by as much as 30 percent in urban heating systems in Armenia, Belarus, Kazakhstan, the Kyrgyz Republic, Russia, and Ukraine. Use of U.S. equipment costing $1 million resulted in an estimated annual savings of $14 million in these systems.

Savings from environmental assistance are also considerable. Through waste minimization programs, participating industries have saved more than $17 million from waste recycling, resource conservation, and reduction in payments for pollution fees and fines. Fiv cities in Poland have saved more than $2 million by redesigning new wastewater treatment plants. Private consultants trained by USAID are now being contracted by other cities to design similar solutions for their wastewater treatment plants. Plant managers who participated in the industrial waste minimization program are marketing new technologies to their peers throughout the region.

Lasting improvements in the region's environment will also be achieved from policy changes directly resulting from USAID assistance. To date, these include environmental impact assessment laws in the Czech Republic and Slovakia, an auto fuel tax to reduce carbon monoxide emissions in Budapest, and appropriate increases in environmental fees and user charges in Poland.

Democracy

USAID has helped countries hold credible and effective elections across the region. We have learned, however, that free elections by themselves do not guarantee that political reform will continue. Successful democratic change results from an array of reforms to strengthen democratic processes, including the rule of law, autonomous local government, and a strong civil society, including an independent media. Our ENI democracy programs have achieved significant results in each area.

With USAID help, many parliaments in the region have enacted critical political reforms, including new election laws that help ensure fair and democratic elections. Hungary, the Kyrgyz Republic, and Russia have adopted new constitutions, and elections and civil liberties laws. Advisors helped draft provisions of Russia's new civil code that guarantee freedom of contract and protection of private property, laying the foundation for development of new commercial laws needed for a market-based economy.

Pluralistic democratic non-governmental organizations were virtually non-existent under communism. By helping to establish a legal basis for creating non-governmental organizations, USAID has enabled NGOs to flourish across the region. Other activities that have increased the participation of citizens and NGOs in the life of their communities and nations include strengthening local NGO capacity, legal assistance, education reforms, and support to youth, human rights, environmental, business, media, civic, and charitable womens' groups.

> *"By helping to establish a legal basis for creating non-governmental organizations, USAID has enabled NGOs to flourish across the region."*

Judicial systems in Kazakhstan, Russia, and Ukraine, and most of Central and Eastern Europe, have become more professional, independent, and better equipped to resolve private property and criminal justice issues. U.S. assistance is also facilitating decentralization and increased accountability of governments. For example, municipal officials in Bulgaria, the Czech Republic, Poland, Romania, and Russia received training in financial management and provision of urban services.

Social Sector Restructuring

The transition to market-based economies is threatened by legacies of the past.

Bankruptcy and eventual collapse of the previous system have resulted in massive, unpredictable changes in people's lives because of high inflation, unemployment, and reduction of state-subsidized social services. Public support for reform requires that people believe their current hardships will be addressed by moving to a market economy. Thus, USAID has supported a mix of activities and policies in the social sector.

We have provided immediate help to ease hunger, winter cold, and other hardships in strife-torn republics. We have coordinated with the U.S. Department of Agriculture to supply essential food products to more than two million people. Epidemics of measles and other diseases have been prevented by vaccinating more than 500,000 children in Central Asia.

Thirty-one partnerships between U.S. hospitals and health facilities in ENI countries have transferred medical skills and Western management practices, improving productivity. Women's access to modern reproductive health services has been increased in the Central Asian republics. Environmental health threats at specific sites have been significantly reduced through USAID assistance.

USAID also is encouraging ENI governments to introduce private sector management practices to social services. Results of housing reforms in Russia and Hungary already show that increased revenues from higher rents more than cover the cost of increased housing allowances for the neediest.

Learning from Experience

Key lessons from our programs in the ENI region include:

- USAID learned early in the ENI program that the high costs of assisting with reforms made it important to use our funds to leverage financing available from other donors. This approach has been particularly successful in private sector development, environment, energy, and humanitarian assistance.
- If the quality of life of citizens improves in line with their expectations, political changes are more likely to be sustained.
- No single aspect of democracy programming can guarantee the success or sustainability of democratic transitions. Integrated approaches that simultaneously address the political, social, and economic dimensions of change are essential to sustaining progress toward vast systemic change. U.S. assistance must be shaped and sequenced to help build constituencies for sustaining economic and political reforms.
- Much of USAID's assistance to the private sector has been directed at individual firms. In order to increase the impact of this assistance, we need to extract the broader lessons from our activities and make them available more widely through training centers, business associations, and banks.
- In the environment and energy areas in particular, scarce assistance resources should target high-profile "hot spots" to ensure that results are seen and replicated.

Challenges for the Next Year

USAID has made significant progress, particularly in the last year, in focusing on results. Substantial effort and resources have already been invested, but more is required. USAID must be able to report its results more comprehensively and conclusively, to have a better idea of why and under what circumstances certain approaches work best, to make performance information available more quickly and easily to all managers, and to do this without major new expenditures on management systems. Our agenda for moving along this path in 1995 includes:

- Building on 4 years of experience with Mission strategic planning and the sustainable development strategies developed last year, we will prepare an Agency-wide results framework. It will include performance indicators to assess the results of our development work more uniformly and process indicators to track our internal progress in managing for results.
- Choosing accurate, inexpensive, and easily used performance indicators, at both the operating unit and Agency level, is a complex, analytically difficult task. It will undoubtedly require various iterations as we learn from experience. We will give increased attention to identifying good indicators in 1995, especially for democracy and environment programs.
- USAID will complete development and begin installation of a corporate information system. Among other things, it will include indicators and targets from all strategic plans and the most current information on progress toward these targets. When complete, the system will reduce formal reporting requirements, increase our ability to analyze and report on program performance, allow managers to make decisions better informed by the progress of their activities and lessons of experience, and permit broader, quicker dissemination of results.
- With another year of measuring progress toward strategic and intermediate objectives, and clear guidance from headquarters on performance indicators that are best for measuring Agency-wide success, USAID will be better able to identify programs and approaches that are more, and less, successful in achieving their targets. This will let us concentrate on the most effective programs and learn from experience with them. This will require Missions and bureaus to devote greater analytical and technical resources to performance measurement and evaluation.

Appendix: Countries included in the Annual Performance Report

Sustainable Development Countries

Africa

Benin
Burundi
Ethiopia
Gambia
Ghana
Guinea
Guinea-Bissau
Kenya
Madagascar
Malawi
Mali
Mozambique
Namibia
Niger
Nigeria
Senegal
South Africa
Tanzania
Uganda
Zambia
Zimbabwe

Asia and the Near East

Bangladesh
Egypt
India
Indonesia
Jordan
Morocco
Nepal
Philippines
Sri Lanka

Latin America & the Caribbean

Bolivia
Dominican Republic
Ecuador
El Salvador
Guatemala
Guyana
Honduras
Jamaica
Nicaragua
Paraguay
Peru

Europe & New Independent States

Europe

Albania
Bosnia
Bulgaria
Croatia
Czech Republic
Estonia
Hungary
Latvia
Lithuania
Macedonia
Poland
Romania
Slovakia
Slovenia

NIS

Armenia
Azerbaijan
Belarus
Georgia
Kazakhstan
Kyrgyzstan
Moldova
Russia
Tajikistan
Turkmenistan
Ukraine
Uzbekistan

Annual Report on Program Performance 1994

DRAFT

AGENCY FOR INTERNATIONAL DEVELOPMENT

Center for Development Information and Evaluation
Bureau for Policy and Program Coordination

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DRAFT

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1. Introduction

THE PROGRESS of other nations matters to the United States. Growth of democracy facilitates more peaceful resolution of disputes and greater acceptance of values and principles we embrace. Economic growth benefits both poor people overseas and U.S. companies and workers who produce the goods they buy. Improved health and lower population growth reduce the spread of disease and pressures for migration. Sound uses of local environments sustain the world's resources and enhance the quality of life for all the Earth's inhabitants. And smooth transitions away from communism, ethnic domination, or conflict lead to greater regional and worldwide stability and prosperity.

A focused, well-managed development assistance program is in the United States' interest, but only if it produces *results*. USAID is committed to setting meaningful objectives and collecting "measurable results that vindicate our investments." It is also reinventing itself, "becoming more flexible, responsive, and willing to take risks."[1] This report provides evidence, from Mission reports, central evaluations, and other data collected over the past year, that USAID is achieving measurable progress through its development and humanitarian relief programs.

To achieve results, USAID must listen to and work closely with its partners and customers, learn from its experience, and improve its systems and incentives in response. In 1994 we published *Strategies for Sustainable Development* and developed guidelines for USAID managers to follow in implementing the strategies defined therein. A directive on strategic planning was issued that underlines USAID's commitment to performance measurement and requires all offices in the field and at Washington headquarters to set clear program objectives, establish performance indicators and targets, and collect baseline information by April 1995. Operations and other support systems were reengineered to focus them more clearly on results.

In 1995 USAID will develop an Agency strategic plan and results framework that will include objectives and indicators of performance that we will monitor across all programs worldwide. The plan will also specify man-

[1] J. Brian Atwood, USAID Administrator, at the American Enterprise Institute, Washington, D.C., October 17, 1994.

agement performance indicators and targets to help track how well we are managing for results. The full benefit of USAID's improved ability to identify, report, and use program performance results will be realized over the next 2 to 3 years. Nonetheless, we are already able to identify many of the effects our programs are having and to profit from lessons we are learning.

USAID's mission is to promote sustainable development—economic and social growth that does not exhaust the resources of a country; that respects and safeguards the economic, cultural, and natural environment; that creates opportunities for enterprises and incomes to grow; and that builds effective institutions and empowers citizens. Our programs address the four principal interrelated threats to sustainable development: poverty and food insecurity, lack of democratic institutions and processes, rapid population growth and poor health, and environmental degradation.

But USAID alone does not—cannot—*achieve* sustainable development. It can help, facilitate, even accelerate development, but the major task must be carried out by the developing country itself. Sustainable development is built on a sense of ownership and participation. To be successful, this effort requires partnerships among USAID, host governments, nongovernmental organizations, other donors, and the communities and ordinary people of the countries where we work.

On behalf of the American people, USAID also responds to natural and manmade disasters that cause human suffering and diminish the prospects for sustainable development. Where possible, we help countries recover from violent conflicts and move toward sustainable development. In addition, USAID plays a leading role in supporting the historic transition of the nations of Central and Eastern Europe and the former Soviet Union—and others such as South Africa, Ethiopia, Mozambique, and Haiti—to more democratic free-market societies.

During the past 3 years (FYs 1992–94), USAID-funded programs totaled nearly $16 billion (not including cash transfers to Israel and Turkey). Of this amount, $11.7 billion was provided to countries in Africa, Asia, the Near East, and Latin America and the Caribbean. Of the $11.7 billion, $6.9 billion (59 percent) went toward encouraging economic growth, $2.9 billion (25 percent) toward helping stabilize population growth and protect health, $1.2 billion (10 percent) toward protecting the environment, and $0.6 billion (5 percent) toward building democracy.[2] In addition, USAID provided $1.3 billion for humanitarian assistance and aid to postcrisis transitions, and $3.0 billion to support the political and economic transitions in Central and Eastern Europe and the new independent states of the former Soviet Union (ENI). Table 1.1 breaks these numbers down by funding source.

Although it draws on experience and examples from all of USAID's programs, this report focuses on programs in 41 countries in Africa, Asia, the Near East, and Latin America and the Caribbean where the Agency has decided to concentrate its sustainable development resources.[3] It also describes accomplishments of humanitarian and postcrisis assistance efforts worldwide and results to date from significant investments in the ENI region.

[2] Because of rounding, figures and percentages do not add up to $11.7 billion and 100 percent, respectively.

[3] Sustainable development countries are those that USAID has determined to have good potential for sustainable growth, that respect internationally recognized human rights or are moving in a positive direction in this regard, and that need assistance and have shown they can and will use outside help effectively. Unless otherwise noted, performance in these 41 countries is the basis for analysis in this report relating to our sustainable development programs. USAID also supports programs in more than 50 other countries. These include the ENI nations as well as countries (1) that have a development problem of global significance, (2) where our activities emphasize crisis response or humanitarian assistance, or (3) where USAID bilateral assistance is being completed within the next 2 years.

Table 1.1. USAID Budget Allocations to the Five Sustainable Development Priorities FYs 1992–94[a] ($000,000)

Funding Source	Encouraging Economic Growth	Stabilizing Population Growth	Protecting the Environment	Building Democracy	Humanitarian Assistance	Total
Development Assistance Fund	1,205	1,859	484	173	59	3,780
Development Fund for Africa	1,284	784	233	180	30	2,511
Economic Support Fund[b]	3,492	299	512	271	39	4,613
Eastern Europe	1,177	72	195	76	–	1,520
New independent states	1,117	102	131	119	–	1,469
International disaster assistance	–	–	–	–	354	354
PL 480 Title II	–	–	–	–	822	822
PL 480 Title III	926	–	–	–	–	926
Total	9,201	3,116	1,555	819	1,304	15,995

[a] FY 1994 figures are estimates

[b] Excludes cash transfers to Israel ($3.6 billion) and Turkey ($201 million) and for the South Pacific Tuna Treaty ($38 million)

Strategic Planning and Performance Measurement

Since 1991 (earlier in Africa), USAID Missions have designed strategic plans that identify strategic objectives and intermediate outcomes, corresponding indicators and targets, and key assumptions for their programs.[4] Strategic objectives are the most significant and ambitious results that a unit believes can be achieved in the planning period (typically 5–8 years) with a defined level of resources (staff, program funds, operational expense funds). Performance indicators and targets are identified for each objective and outcome. Targets specify the amount of change expected in an indicator in a given time. Indicators serve the dual purpose of measuring progress toward Mission objectives and providing information for senior managers in Washington to report on overall Agency performance.

By monitoring the indicators annually, managers can modify activities and tactics where necessary to achieve their objectives. The indicators and the objectives are collected centrally in the Program Performance Information for Strategic Management (PRISM) database, which will be available to all Agency personnel in Washington in early 1995 and to all staff worldwide later in the year.

During the past year, Mission plans were revised to reflect USAID's new sustainable development strategies. To some extent, progress in making these adjustments came at the expense of the Missions' ability to report on performance. Since some objectives previously established were modified, there was a

[4] USAID's ENI programs have developed a separate but conceptually compatible system for monitoring and measuring results in response to their unique program and management setting. The system is described at the end of chapter 7.

need to establish new performance indicators.

As of October 1994, all 41 sustainable development Missions—100 percent—have approved strategic plans, up from 75 percent in 1992. Figure 1.1 categorizes the principal objectives from these countries in accord, as much as possible, with the key strategies described in *Strategies for Sustainable Development*. Seventy percent of these Missions (compared with 40 percent in 1992) have set performance targets for half or more of their progress indicators. Results have been reported for 50 percent of the Missions' strategic objectives and 70 percent of their intermediate outcomes.

Information in this report is drawn from Mission reports that compare actual performance results against their targets. It is supplemented with material from project and program evaluations and other data collected during the past year.

Agency Analytical Frameworks for 1994

To analyze and summarize Mission performance, analysts in the Center for Development Information and Evaluation adapted the analytical frameworks used in the 1993 report to reflect the new sustainable development emphases in the four priority areas. The frameworks are hierarchies of causally related objectives and outcomes. Figure 1.1 shows the top three levels of the framework. The framework begins with the Agency's mission at the top and displays the principal objectives in each sustainable development sector below. The lower levels of the frameworks in each sector, not shown in this report, indicate how Mission objectives and outcomes contribute to Agency objectives. The frameworks are two-dimensional presentations of complex development models. They are useful communication tools for discussing and analyzing the Agency's programs, but the methodology also has its limitations—discussed briefly in box 1.1.

Table 1.2 shows that 98 percent of sustainable development Missions have objectives in the economic growth area, 71 percent in democracy, 90 percent in population and health, and 61 percent in environment. The table shows the proportions of Missions in each development priority for the three regions with sustainable development programs: sub-Saharan Africa (AFR), Asia and the Near East (ANE), and Latin America and the Caribbean (LAC).

Although almost every Mission has economic growth programs, and 9 out of 10 Missions in every region have population and health programs, there are significant differences in the other priorities. In environment, a larger share of ANE Missions have objectives than have the other two regions, especially AFR. A much higher proportion of LAC Missions have democracy objectives than have the others.

Cross-Cutting Issues: Women and Participation

USAID is committed to empowering women as a vital part of all development assistance. Given that women and girls in much of the world are disproportionately poor, ill, and exploited, improving the status

Table 1.2. Number and Proportion of Missions in Each Region With Objectives by Development Priority

Priority	AFR (n=21)	ANE (n=9)	LAC (n=11)	Total (n=41)
Democracy	13 (62%)	6 (67%)	10 (91%)	29 (71%)
Economic growth	20 (95%)	9 (100%)	11 (100%)	40 (98%)
Population/health	19 (90%)	8 (89%)	10 (91%)	37 (90%)
Environment	9 (43 %)	8 (89%)	8 (73%)	25 (61%)

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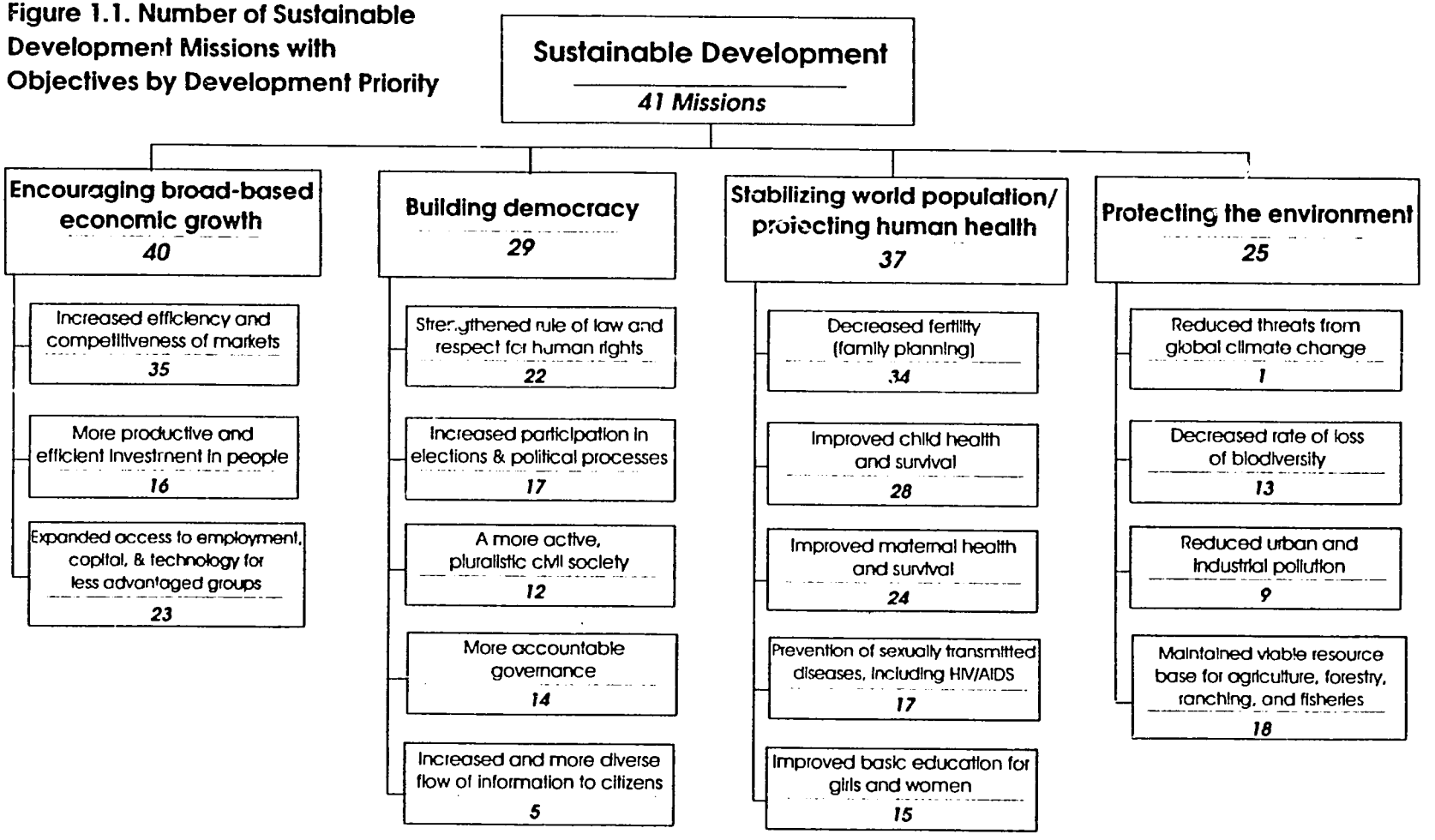
Figure 1.1. Number of Sustainable Development Missions with Objectives by Development Priority



Box 1.1. Performance Measurement, Evaluation, and Reporting Results

During the writing of this report it became apparent that there is considerable uncertainty about the role of performance measurement and evaluation in reporting results.

Performance measurement is one of the tools managers use to improve their results. The system is built around a clearly defined hierarchy of objectives, which are derived from development theory and practical experience. For each objective one or a limited set of indicators are measured regularly to ascertain progress being made toward the objective. Performance measurement answers questions about *whether* results are being achieved on schedule.

Evaluations answer questions about *how* results are being achieved and *why*. They examine a program's sustainability and its intended and unintended results. They enable us to describe and understand the full impact of our activities and add to development theory. In this way they go far beyond performance measurement systems. Measures of performance indicators are useful in evaluations, but they provide only a portion of the information required for impact assessment.

USAID is increasingly able to determine the progress it is making toward a growing proportion of its objectives. The performance information system is providing a firmer foundation for reporting results that can be amplified and highlighted with information from strategically designed impact assessments and special sector studies.

Performance data and evaluation results must be used carefully, because there is a tendency to treat them as the same thing and draw inappropriate conclusions. Four issues need to be kept in mind as we further develop and use the system:

(1) Measuring the "right" thing. Ideally, USAID wants to measure changes in the quality of life of poor people in developing countries resulting from USAID programs. No direct measure of this exists, so the Agency is forced to use one or more proxy measures (for example, change in average incomes, numbers of children vaccinated, numbers of borrowers in microenterprise programs) that only partially reflect our efforts and their outcomes. Drawing conclusions about impact from proxies should be done only with caution.

(2) What is the USAID contribution? USAID faces a dilemma in choosing objectives. Objectives within the Agency's control tend to be relatively narrow, whereas those it wants to achieve are broad and susceptible to many other influences besides USAID. The problem is compounded if we use only indicators that are still narrower than their associated objectives. For example, the inflation rate is used by some Missions as an indicator of policy and regulatory reform. As domestic political factors, central bank policy, and other external influences (such as the International Monetary Fund and World Bank) are also involved, the link between USAID activities and the desired outcome is tenuous and should be interpreted with care. Performances measures should not be used to answer this question. It should be addressed in a full evaluation study.

(3) Results are available from yesterday's, not today's, priorities. USAID Missions make strategic choices, and select performance indicators, on the basis of their assessment of current development problems and their ability to maximize their impact on those problems. A strategic plan is forward looking. Most of the planned expenditures, and consequently most of the results, still lie in the future. During 1994, performance data were available for only two thirds of Mission objectives. The areas for which data are available tended to be in areas where the Mission has been working for some time. As these may not be current priority concerns, the data do not always meet strategic needs. The problem will decline as strategies are implemented and results data related to those strategies become available.

(4) Aggregating results. Because of differing country situations, Missions have somewhat different objectives and often have different indicators for similar or closely related objectives. Country programs begin and end at different points in time, so that aggregate country performance data reflect some periods when USAID did not influence outcomes. This means that individual program results can seldom be added together to provide a broader picture of USAID impact. This concern will be lessened as Missions revise their objectives to fit more closely with those in the Agency's strategic plan and select performance indicators suggested in the Agency results frameworks.

of women is an important goal in its own right. In addition, women's empowerment is fundamental to sustainable development. Research over the past 2 decades has documented substantial payoffs from investing in women by alleviating poverty and promoting sustainable development. Education programs for women and girls have a higher return than other social sector investments. Educated women have healthier, smaller families and better economic opportunities, and they are more likely to ensure that their own daughters receive an education.

Women's participation is critical in each of USAID's priorities:

- *Economic growth.* Some 800 million women participate in the labor force worldwide, and 70 percent of female workers live in developing countries. Increasing their productivity and earnings is key to sustained economic growth. Small and microenterprise financial service assistance has produced impressive results.
- *Democracy and governance.* Women's limited role and restricted legal rights must be improved to ensure broad-based participation in democratic civil society. Activities in areas such as local government, women's legal literacy, and women's human rights are making progress toward these ends.
- *Population, health, and nutrition.* Improving women's health, reproductive health, and access to family planning has far-reaching effects on fertility, infant mortality, children's education, and population stabilization. USAID has made significant progress in each of these areas, particularly when activities have been linked with female education.
- *Environment.* In their roles as farmers, entrepreneurs, and workers, and through their household responsibilities, women have an important impact on management of the environment. Attention to institutional and market barriers that affect their use of resources is critical for sustainable development.

***

Launching the participation initiative in October 1993, Administrator Atwood stated:

> There is nothing more basic to the development process than participation.... Participation describes both the end and the means; both the kind of results we seek, and the way that we, as providers of development and humanitarian assistance, must nurture those results.[5]

The statement includes 10 principles that will guide the planning and implementation of our development programs. Through a series of monthly forums, "lessons learned" regarding participation in a number of aspects of the Agency's programs were identified, discussed, and then published for all agency staff.

Structure of This Report

Chapters 2 through 5 describe the progress the Agency is making toward its key objectives in each of the four development priorities: economic growth, democracy, population and health, and the environment. Chapter 6 covers humanitarian assistance, and Chapter 7, the ENI programs. Each chapter describes the strategy USAID is pursuing, Mission objectives defined as of September 1994, results USAID programs have achieved, and the lessons learned from experience. A final chapter discusses progress the Agency has made in managing for results. It also outlines the principal challenges the Agency faces in managing for results in 1995.

[5] "Statement of Principles on Participatory Development," November 1993.

5. Protecting the Environment

ENVIRONMENTAL PROBLEMS increasingly threaten the long-term growth and stability of developing countries and imperil the economic and political interests of the United States and the world at large. Both industrial and developing nations contribute to this threat.

Human activities are disrupting the Earth's global life-support systems. Explosive and poorly managed urbanization has contributed significantly to air and water pollution and the accumulation of garbage and toxic wastes worldwide. Atmospheric concentrations of greenhouse gases continue to rise, with the potential consequence of catastrophic global climate changes. Loss of plant and animal species and their habitats depletes the natural world for future generations and eliminates raw materials for advances in medicine, agriculture, and other fields. The well-being of the United States is directly threatened by worldwide environmental degradation. As the magnitude of this problem has become apparent, USAID is expanding the scope of its environmental programs. As the Agency strengthens its monitoring and evaluation efforts, it is learning to use its limited resources more effectively.

Strategic Goals

To address these problems, USAID pursues two strategic goals:

- Reducing long-term threats to the global environment, particularly from the loss of biodiversity and from the possibility of rapid climate change
- Promoting sustainable economic growth locally, regionally, and nationally by addressing environmental and economic practices that impede development

Globally, USAID emphasizes work that addresses the causes of atmospheric greenhouse gas buildup and the reduction of the planet's genetic, species, and ecosystem diversity. Locally, the Agency stresses improving human health and economic well-being by curtailing the degradation of forest resources and the contamination of air, water, and soil resulting from industrial, agricultural, and household activity.

Operational Approaches

USAID pursues an integrated approach to environmental issues as outlined in Agenda 21 of the 1992 United Nations Con-

ference on Environment and Development guidelines for economically sustainable development. The Agency recognizes that the underlying causes of environmental degradation are often the pressures of poverty and rapid population growth. Consequently, USAID programs in every sphere of development—environment, economic growth, population and health, democracy—need to be designed with conscious regard for their impact on the natural environment and their potential for improving environmental stewardship.

USAID has learned that solutions begin at the local level, even for environmental problems with global implications. The Agency supports environmental initiatives by empowering local governments, communities, and nongovernmental organizations (NGOs) to articulate local concerns and to initiate actions that reverse or prevent degradation. The Agency promotes the direct involvement of individuals, households, and communities in decisions that affect their environment, locally and more broadly.

To sustain the environmental impact of its work, USAID encourages recipient countries to develop effective institutional and policy capacity. This facilitates the flow of information, encourages consultations in-country, and supports economically efficient and environmentally sound policies. It also promotes the development, transfer, and adoption of technologies and practices that enhance environmentally sound economic growth.

USAID's Environmental Budget

USAID investments in the environment have been maintained at a level exceeding $500 million during the past three years. The emphasis has been on forestry, agroforestry, sustainable agriculture, and water resources—especially wastewater treatment. This emphasis has been augmented by activities to reduce urban and industrial pollution, improve coastal resource management, and promote biodiversity conservation. For example, USAID will have spent more than $66 million—or just over 10 percent of FY 1994 environmental funds—in a wide range of biodiversity conservation activities, including park and protected-area conservation and the sustainable economic use of biological resources.

USAID's environmental portfolio accounted for 11 percent of total FY 1994 Agency bilateral development assistance (see figure 5.1), or roughly $660 million. This was distributed in approximately equal thirds among Asia and the Near East (with Egypt as primary recipient), Europe and the new independent states of the former Soviet Union, and all other countries (see figure 5.2).

Strategies and Performance Results

To facilitate discussion of USAID's environmental results, the remainder of this chapter follows an analytic framework (see figure 5.3) composed of six sectors, with global climate change at one end and natural resource base management at the other. This framework differs slightly from the one used in the core report. That report uses more broadly defined environmental sectors to show results more comprehensively and focuses less on strategies and objectives. Because USAID activities in the energy and water sectors either are more recent or are strongly related to other environmental programs, they are reported in the core document under "other environmental objectives." This chapter highlights the range of environmental activities USAID has undertaken as well as those it is committed to pursuing, often as an outgrowth of previous activities.

Data to support the descriptive analysis come from the Agency's Program Performance Information for Strategic Management (PRISM) database. It provides performance information on 41 sustainable development countries. Of those countries, 25, or nearly two thirds, have one or more strategic environmental objectives. USAID Missions adopting these objectives are spread widely across the three geographical areas, as depicted in table 5.1.

Figure 5.1. Proportion of FY 1994 Budget Allocated to Protect the Environment (as a percentage of total USAID bilateral development assistance)

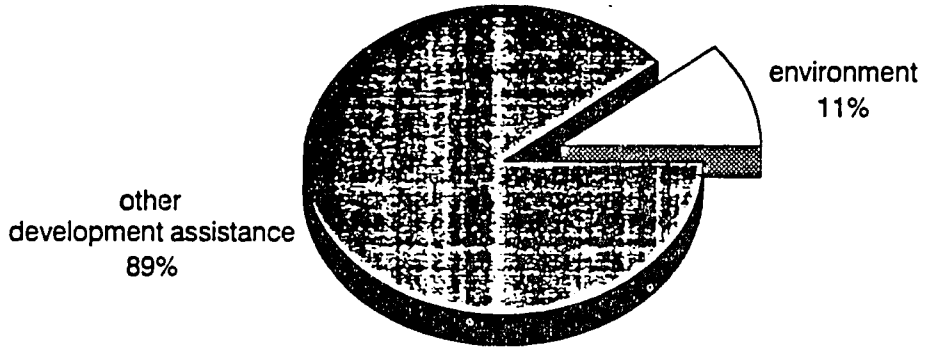
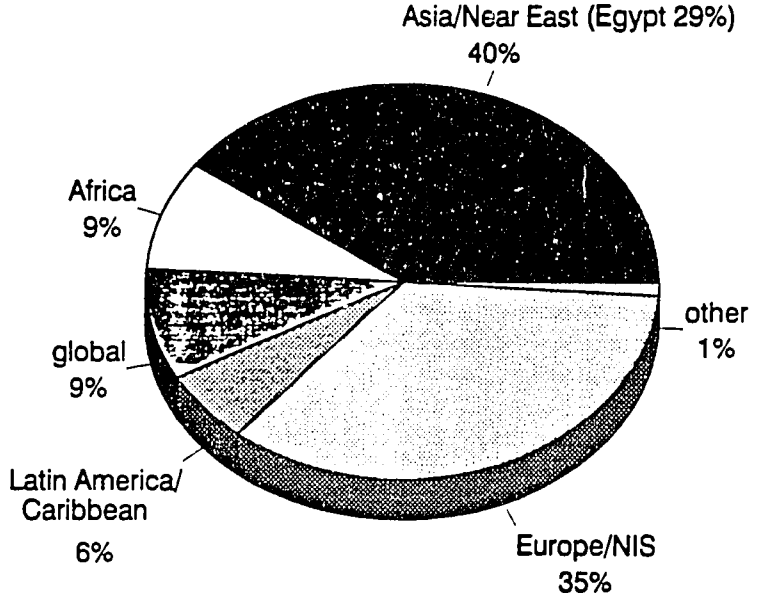
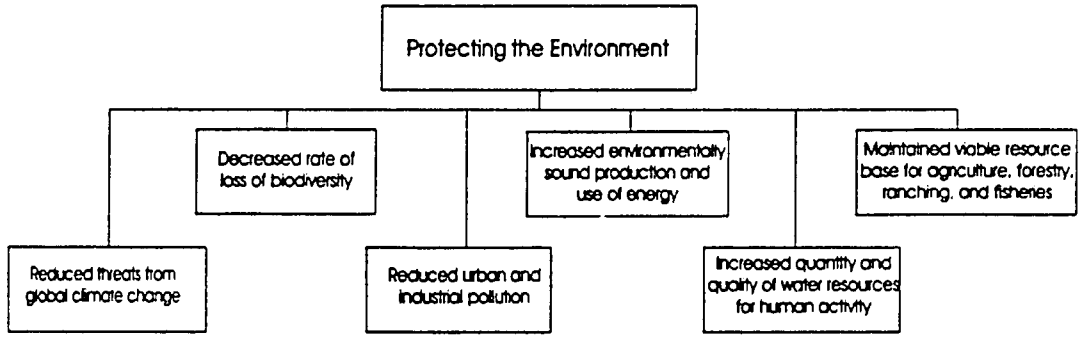


Figure 5.2. USAID Environment Budget by Bureau, FY 1994 (budget = $660 million)



Source: Bureau for Management

Figure 5.3. Agency Objectives in the Environment



The 11 countries in the Latin America and Caribbean region have recently added objectives dealing with urban and water issues to their more traditional biodiversity and natural resource management activities. Nine African Missions, while maintaining a focus on natural resource management, have added biodiversity protection goals to their portfolios. In the Near East, traditional concerns for energy and water quality and availability are prominent. The environmental strategies of many Asian countries are now targeted at pollution prevention and resource base concerns associated with rapid industrialization. The Agency is increasingly investing its resources in emerging and complex environmental issues, as evidenced by the geographic balance and the broader range of environmental activities undertaken.

Table 5.2 shows the number of objectives by environmental sector. The highest number of strategies is in traditional natural resource base management (41 percent), with biodiversity close behind (30 percent). There are fewer Mission-based strategies in such areas as global climate change (2 percent) and energy (2 percent). This reflects, in part, the fact that these environmental problems are newer—compared with natural resource base management—and that the Agency's understanding of which kinds of developmental strategies work best in the field is limited (but growing). Also, many of USAID's efforts in global climate change and energy are being implemented and monitored at a regional or Washington-based level.

USAID Missions are "mixing and matching" different strategies to achieve more long-term and broad-based environmental results. This reflects the cross-sectoral complexity of environmental threats as well as the Agency's emphasis on sustainability. In Africa, where environmental degradation of the natural resource base has been acute—with more direct threats to human livelihood—many countries have narrowed their targets. For example, eight Missions have single strategic objectives addressing a single critical environmental problem. Madagascar has an additional objective of protecting biodiversity. In Latin America and the Caribbean, only one Mission has a single environmental objective. Four have two objectives tying resource management with biodiversity conservation, and three Missions combine resource management and habitat protection with urban and industrial concerns. In Asia and the Near East, four countries have single environmental objec-

Table 5.1. Sustainable Development Missions per Region With Environmental Objectives

	AFR (n=21)	ANE (n=9)	LAC (n=11)	Total
Missions with environmental objectives	9 (43%)	8 (89%)	8 (73%)	25 (61%)

tives either in resource management or urban and industrial issues. The remaining four combine urban and industrial management with rural resource management.

All of USAID's environmental activities are closely coordinated with the individual strategies of the Agency's sustainable development countries. Some Agency activities build on Mission efforts and go well beyond them. Still other USAID environmental activities are implemented and monitored in key countries—such as Mexico and Brazil—where the Agency does not maintain a traditional field Mission, or at the regional office or USAID Washington.

Global Climate Change

The possibility of rapid climate change induced by increasing concentrations of greenhouse gases presents a serious potential long-term threat to the global environment. If current trends continue, some scientists estimate, the global mean temperature could rise by 1.5 to 4.5 degrees Celsius by the end of the next century. Such an increase could be accompanied by an average global sea-level rise of 20 to 70 centimeters, a significant increase in the frequency and severity of extreme weather events, and changes in the timing and distribution of precipitation. Countries with a high reliance on agriculture and forest production and countries dependent on low-lying coastal areas would likely be the most adversely affected by major changes in climate. Developing countries are projected to account for 70 percent of greenhouse gas emissions by the year 2025.

USAID supports efforts to reduce environmental threats from climate change. The Agency has identified nine key countries for potential investment of resources to reduce emissions from industrial development and energy production. They are Brazil, India, Indonesia, Kazakhstan, Mexico, the Philippines, Poland, Russia, and Ukraine. USAID is identifying countries that are major contributors to forest and agricultural sources and sinks of greenhouse gases. The Agency seeks to maintain and increase forest cover in these countries, since forests remove significant amounts of atmospheric carbon dioxide, a major greenhouse gas. The list tentatively includes Bolivia, Brazil, the Central African region, Central America, Ecuador, India, Indonesia, Mexico, Papua New Guinea, Peru, the Philippines, Thailand, and Russia.

The impact of USAID investments in global climate change activities is not yet well documented. Global climate change initiatives are relatively new to the Agency and are concentrated in countries where USAID has had no previous activity or only limited field experience. Most of these countries are just being incorporated into the Agency performance monitoring system, and their programs have not yet yielded measurable

Table 5.2. Environmental Objectives of Sustainable Development Missions, by Focus Area

Program Objectives	
Global climate change	1 (2%)
Biodiversity	13 (30%)
Urban/industrial	8 (18%)
Energy	1 (2%)
Water	3 (7%)
Natural resource base	18 (41%)
Total	44 (100%)

results. Nevertheless, Brazil, Mexico, and India stand out as being the furthest along in building strong programs to reduce greenhouse-gas emissions and to reduce deforestation.

India, for example, is aggressively leveraging investments by multilateral banks and the private sector, training government and public sector officials, and promoting improvements in energy efficiency through environmental technology cooperation. USAID's $20 million Energy Management Consultation and Training project has leveraged more than $1.2 billion in World Bank and Asian Development Bank funding for development of power projects and improvements in energy efficiency. Through the Global Environment Facility, USAID is supporting the Greenhouse Gas Pollution Prevention project. It will directly supplant 40 to 60 megawatts of fossil energy systems with high-efficiency and renewable alternatives. Corresponding reductions of greenhouse-gas emissions are estimated to be 170,000 to 260,000 tons of carbon dioxide per year. The Agency is also supporting research on feed formulations in India that could reduce livestock methane emissions by 75 percent.

In Brazil, USAID began working in the forestry sector because the conversion of forests to other land uses releases the largest amount of carbon dioxide in Latin America. The Agency is now supporting the country's climate-change efforts in forestry with an energy efficiency initiative. USAID has trained a corps of Brazilian men and women to conduct an ongoing series of environmental assessment courses, largely for employees of the fledgling state environmental agencies of Amazonia. Trainees were recently involved in the first set of public hearings in the Brazilian Amazon convened to review the environmental implications of a poorly planned industrial development project. Six Amazonian NGOs have also been trained to improve their capacity to collect gender-related information and to increase participation of women in the design, implementation, and evaluation of sustainable projects. Increased public participation in the decision-making process is an important first step toward an effective Amazonian forestry policy.

USAID's program in Mexico initially concentrated on forestry and management of protected areas. It now includes a growing energy conservation and efficiency component. This program is implemented principally in collaboration with Mexican state and federal government organizations. To date, USAID has promoted development of environmentally sound microenterprises and nontraditional export crops for buffer zones around six protected areas. These buffer zones have created alternative sources of income for the local population, thereby reducing the risk of destructive incursions into protected areas. USAID has developed ongoing projects in energy training, demand-side management, integrated resource planning, energy efficiency, renewable energy technologies, and biomass cogeneration. It has also encouraged privatization of energy services. These efforts will strengthen market-driven technology cooperation between the United States and Mexico.

Biodiversity

Economic and population pressures are increasing the destruction of habitats and leading to major species extinction. From 1980 through 1990 tropical forests shrank at an average rate of 15.4 million hectares (0.8 percent) a year. At this rate, 5 to 10 percent of tropical forest plant and animal species may face extinction within the next 30 years. Marine and other aquatic ecosystems are facing a similar plight. Sixty to 70 percent of the coral reefs in Southeast Asia are in poor condition because of deforestation, coral mining, and fishing with dynamite.

People throughout the developing world rely on a great variety of biological resources for food, fuel, housing materials, and economic security. Loss of plant and animal species impairs the proper functioning of ecosystems, reduces the genetic stock for agricultural development, and limits our ability to respond to new diseases. Medicines derived from local flora and fauna form the basis of primary health care for 80 percent of people in developing countries. Globally, the annual market value of medicinal drugs containing active ingredients derived from plants is $40 billion.

USAID is undertaking activities at both the national and global levels to reduce biodiversity loss. In FY 1994, the Agency was working on more than 90 projects with biodiversity components in 40 countries. Globally, the Agency is targeting countries with the highest levels of biological diversity for development of innovative conservation initiatives. Public–private ventures are being designed to support USAID's traditional emphasis on protected-area creation and management. In other USAID-assisted countries, including Bolivia, Ecuador, Indonesia, Jamaica, Tanzania, and Uganda, the Agency is improving management of protected areas, promoting effective regulation of land use in areas not formally protected, and increasing economic benefits from local biodiversity conservation.

Efforts to manage natural habitats for conservation and sustainable use of biological resources are being undertaken by 13 USAID-assisted sustainable development countries. Seven are in Latin America and the Caribbean, where new programs in ecotourism, bioprospecting (the exploration of biodiversity for commercially valuable genetic and biochemical resources), and marketing of nontimber forest products are gaining momentum. Three are in Africa, where ecotourism is also generating interest. Three are in the Asia and Near East region, where ecotourism and the use and marketing of nontimber products is a high priority. Many strategies in this sector have their origins in natural resource management and have taken on biodiversity components in response to community needs for economic opportunities.

USAID biodiversity programs also emphasize the long-term sustainability of protected areas. Through its participation in the Parks in Peril Program for Latin America, for example, USAID has contributed to the improved management of 27 protected areas covering more that 5.6 million hectares of terrestrial and marine habitats in 12 countries. The project has encouraged both government organizations and NGOs to employ community residents to build and maintain park facilities. It has also trained men and women rangers to patrol and enforce park regulations. As of mid-1994, nearly 300 park rangers had been trained; they are now working to protect park areas. As a result of these activities, illegal deforestation, hunting, and fishing have declined at many sites. A recent evaluation shows that greater stress on social issues, including the role of women in conservation activities, would generate additional community benefits.

Noel Kempff Mercado National Park in Bolivia is a good example of the effect of USAID's involvement. Since the program began in 1990, lumber extraction has decreased markedly. A monitoring system is being implemented to measure habitat changes and fluctuations in species abundance, distribution, and status. The poaching of endangered river turtles and their eggs has decreased—and river turtle sightings have increased. The park has benefited from a two-thirds drop in the confiscation of arms and illegal products and a simultaneous increase in the use of the protected areas for environmentally compatible activities such as tourism and recreation. A 400 percent increase in tourist visits to the park from 1992 through 1994 has created a new source of income for the local population.

Since the mid-1980s, USAID has obligated nearly $100 million for biodiversity programs to help the island nation of Madagascar reduce unsustainable forest loss. That loss is estimated at 200,000 hectares a year. Integrated conservation and development projects were implemented to conserve biodiversity in six new protected areas. Technical assistance was also provided to the public institution responsible for managing the national protected area system. To date, protective-area development grants totaling more than $17 million have been awarded to international, U.S., and local operators for five of the six targeted protected areas. In addition, a system of dividing park entrance fees equally between local people and government institutions has led communities—which now see concrete economic benefits—toward greater acceptance of protected areas.

Experience shows that distributing benefits from the conservation of biodiversity locally encourages local resource protec-

tion. Most programs in the sustainable use of biological resources are still young, but preliminary results are promising. For example, a pilot USAID project that has yielded concrete results after only a few years is the Solomon Islands ecotourism and ngali nut oil processing activity. The latter is designed to meet the needs of local landowners who were anxious to develop alternatives to logging for employment. Ngali nuts are collected from trees found in the primary and secondary forest. They are processed to extract an oil that is being sold to a U.S. cosmetics company. In 1994 the community sold its first 200 liters of oil and earned an operating profit of $800 from the transaction.

Decreasing the rate of loss of biodiversity also requires policy reform. Recent USAID-supported policy efforts have resulted in an assessment of conservation needs in Papua New Guinea. The efforts have also led to a biodiversity strategic plan for Bulgaria. Policy reform in fields such as land tenure, revenue sharing, and administrative jurisdiction over protected areas are strengthening protected-areas management in several regions. A new emphasis on innovative financing mechanisms will also likely benefit the environment. This includes support for biodiversity prospecting ventures that link pharmaceutical companies seeking new products with local communities charged with maintaining protected areas. It also includes debt-for-nature swaps. In these arrangements, loans are forgiven, with debt converted into local funds for environmental protection. New foundations are being established with mandates to protect and preserve the environment.

In the Philippines, for example, debt-for-nature swaps have resulted in one of the largest USAID-funded environmental endowments in the world. The interest earned on the $25 million Foundation for the Philippine Environment endowment fund has provided more than 100 grants to grass-roots NGOs throughout the country, thus strengthening local capacity for environmental stewardship. Resulting NGO activities include publication of an influential book on corruption in the logging industry, establishment and management of marine reserves, and funding of recurrent costs associated with protected-area management. The endowment will enable this new independent foundation to contribute to the conservation activities of local communities for the foreseeable future.

In 1992 the Enterprise for the Americas Initiative was created to help the people of Latin America and the Caribbean through market-oriented reforms and economic growth. The initiative uses debt reduction, investment reforms, and community-based environmental conservation. USAID oversees the environmental component and has facilitated debt conversion in Argentina, Bolivia, Chile, Colombia, El Salvador, Jamaica, and Uruguay. These debt conversions have made more that $150 million in local funds available to support environmental activities and help establish environmental foundations.

Urban/Industrial

Forty-five percent of the global population now lives in urban areas. The benefits of job creation, raised incomes, and increased productivity associated with urbanization and industrial development are increasingly offset by the high social costs of urban population growth and environmental pollution in developing countries.

Eight sustainable development countries have activities that promote environmentally sound urban and industrial development. This represents a significant increase from a year ago. USAID activities that have shown promise in the rapidly industrializing countries of Asia and the Near East are now being undertaken in Latin America, where urban population is growing at 3 percent a year. A number of environmental activities that have health and economic benefits are often grouped under the urban/industrial heading. These include energy and conservation, pollution prevention from public and private sources, and provision of water and waste management services to underserved areas.

Urban projects and programs supported by USAID in 1994 were funded principally through housing guaranty programs and parallel grants. USAID increasingly uses housing guaranty funds to encourage institutional

and legislative reforms in developing countries. Such reforms help supply shelter and related services most needed by low-income families. Services include water and sewerage lines and solid-waste collection and disposal systems. When in place, the services directly improve human health and work productivity. These guaranty loans are not authorized unless policies that hinder provision of basic urban services to low-income families are changed.

In Quito, Ecuador, for example, USAID used housing guaranty funds to encourage legislative reform of the municipal water authority. A parallel grant was made to provide technical assistance. As a result, the water authority installed a new accounting and information management system that improved budgetary decisions, tariff structures, water-leak detection, and plans for service extensions. These improvements lowered operating costs by 25 percent. Additionally, USAID-funded technical assistance showed that the water authority's construction codes were overengineered, resulting in prohibitively high new service costs for low-income neighborhoods. After the codes were revised, the cost of new service became affordable for many of Quito's poorer families.

In the 3 years since receiving USAID assistance, the municipal water authority has constructed 35,000 new household water connections and upgraded 60 percent of existing services to Quito's marginal neighborhoods. These actions have benefited 180,000 people. The water authority, now on a solid financial footing, has obtained loans from lending institutions and private sector investors for future expansions and is extending service to the remaining 10 percent of Quito's population who lack piped potable-water service.

The Agency is also involved in increasing the amount of wastewater treated annually in Egypt, Honduras, India, Indonesia, Jamaica, Jordan, and Thailand. In Cairo and Alexandria, for example, construction of municipal wastewater treatment plants funded by USAID is near completion. In 1994 the percent of wastewater treated by these facilities increased to 75 percent from 40 percent. The plants reduce the amount of pollutants entering the Nile River and its tributaries—the sole sources of water for most Egyptians—by 81,000 tons annually.

The Agency's emphasis on industrial pollution prevention and control is being expanded in all regions to include urban planning and waste management strategies. USAID is involving the private sector and NGOs to stimulate local initiatives and increase environmental services, while providing a market for U.S. clean technologies. USAID's activities emphasize training, privatization where appropriate, industrial policy and regulatory reform, and the transfer of pollution prevention equipment. Preliminary results from the Agency's new emphasis on pollution prevention look promising.

For example, after a pollution prevention assessment, a lead-battery plant in Tunisia invested $10,000 of its own funds in new equipment and changed its operating and maintenance procedures. As a result, the plant has lowered its operating costs by $500,000 a year and reduced its lead-dust and lead-contaminated-water emissions by 60 percent. USAID will cease to operate in Tunisia later this year, but the pollution prevention activities will be continued by Agency-trained engineers. USAID is expanding its pollution prevention activities in several key sustainable development countries including Chile, Ecuador, Egypt, India, Indonesia, and Morocco. The Agency anticipates positive results.

Other efforts to cut pollution have been similarly successful. At a Chilean tannery, for example, USAID provided technical assistance and introduced technologies that have reduced waste in streams and decreased health risks associated with the tanning process. By adding alkali to chrome-laden wastewater and reusing the solution, the facility has saved on raw-material costs and reduced the chrome concentration in the waste stream from 1 gram per liter to 0.3 grams per liter. More efficient process-control methods have allowed the tannery to reduce sulfates and volatile organic fumes by 50 percent. The tannery has cut water consumption in half by using process water in batches rather than letting the water run continuously.

Energy

Energy needs in the developing world are growing seven times faster than in the industrial world. However, energy shortages are still common in more than 50 percent of USAID-assisted countries. That has retarded growth by as much as $1 lost in the gross national product for every 1 kilowatt not produced. Energy production and use are often major causes of the global accumulation of greenhouse gases and of local air pollution and regional acid rain problems. Thus USAID seeks to provide environmentally sound energy for social and economic development by promoting policy reform, energy efficiency, renewable energy sources, and cleaner forms of nonrenewable energy such as natural gas. The Agency also stresses improving efficiency in energy production through training and privatization.

USAID investments in environmentally sound energy production and energy conservation have positive outcomes in several areas. Cogeneration (use of waste heat to generate electricity) and increased use of renewable energy expand economic opportunities and improve the quality of life for urban and rural populations. Adoption of energy efficiency and conservation techniques allows countries to better manage their energy resources and reduces the environmental impact of producing each kilowatt-hour of electricity for development. In countries with growing industrial sectors, energy-related investments are increasingly coupled with efforts to improve urban and industrial policy. Policy changes are designed to improve the economic environment for technology adoption, private investment, and realistic cost recovery for power sectors.

Egypt, for example, reports major investments to increase the availability and production efficiency of energy. Another area where USAID has an energy thrust is the countries of Central and Eastern Europe and the former Soviet Union. There the Agency is supporting global climate change objectives. In many other countries, energy efficiency has been part of technology adoption activities under a broader industrial development program or as components of economic growth objectives.

USAID's efforts in the energy sector help create markets for U.S. products and technologies. Over the past decade, the Agency has expended approximately $15 million in targeted technical assistance to bring about a transformation of developing countries' energy sectors. That has opened up a private power market valued at more than $50 billion. Private power generation alone is expected to reduce pollution emissions per unit of energy service by at least 20 percent.

Since 1990 USAID has trained energy professionals from 91 developing countries. Graduates have played crucial roles in promoting the adoption of environmentally sound energy and conservation technologies by their countries. For example, Ugandan alumni of the training program helped liberalize Uganda's oil-pricing policies. Nigerian graduates facilitated the transition of that country's energy sector to greater commercialization and privatization. In numerous cases, USAID-trained engineers have formed private consulting and engineering design firms in their own countries The firms use the principles of energy conservation and environmentally sound technologies in construction and industrial design work.

The Agency has also emphasized renewable energy use worldwide. USAID's Biomass Energy Systems and Technology project has assisted sugar mill cogeneration projects at 31 mills in 10 countries, resulting in a combined installed capacity of 239 megawatts. Carbon dioxide emissions prevented by these interventions are estimated to be between 1,300 and 2,750 tons annually.

One of those facilities is El Viejo sugar mill in Costa Rica. Agency-provided technical assistance to the mill helped catalyze Central America's first private sector sale of power generated from sugar cane residue. (The residue was previously wasted.) El Viejo sells 11 megawatts of power to the country's national utility. Approximately $100,000 in USAID technical assistance helped leverage a $2.5 million investment by the mill. Additionally, USAID cosponsored a feasibility analysis in Costa Rica for the development of a 20-megawatt wind power plant. With a $120,000 investment USAID leveraged a $3 million grant from the Global

Environment Facility and a $24 million loan from the Inter-American Development Bank. As a result, Costa Rica will have additional energy for development and will create less pollution producing it.

Use of renewable energy is also a major thrust in Egypt. There USAID is rehabilitating the Aswan High Dam Power Station, the largest source of electric-energy generation in Egypt. Its annual production of nearly 8 billion kilowatt-hours equals the electric energy produced by the combustion of 2 million tons of oil. USAID's program has directly helped Egypt make full use of the Nile River flow to produce energy using a clean, renewable energy source. The program has also helped Egypt design the best replacement hydroturbines. They increase by 5 percent the efficiency of the conversion of hydraulic to electric energy.

By replacing the turbines at Aswan, Egypt can postpone the necessity of building a comparable oil-fired power plant. Such a plant would generate 7.7 million tons of carbon dioxide, 118,000 tons of sulfur dioxide, 2,000 tons of nitrous oxides, and nearly 7,000 tons of particulates annually. Installation of more than 50 combustion analyzers has allowed industries to adjust their combustion efficiencies and save 7 percent on their energy use and cut emissions of carbon dioxide, sulfur dioxide, and nitrous oxides by 800, 5,000, and 600 tons, respectively.

USAID also supports energy conservation programs in India, Mexico, Morocco, and Pakistan. In these and other rapidly industrializing developing countries, energy waste frequently threatens sustainable economic growth. In Pakistan, for example, the growth of energy use since 1968 has outstripped gross domestic product growth by 2 percent annually. That places Pakistan on a clearly unsustainable path of economic development. Pakistan's coal, petroleum, and natural gas reserves, and its remaining potential capacity for hydroelectric power generation, are limited. Currently the country depends on world markets to supply about one third of its energy needs.

Fortunately, Pakistan has significant potential for energy conservation. A comprehensive national energy conservation effort could increase available energy supplies by 15 to 25 percent. With support from the Government of Pakistan, USAID implemented an energy conservation program that led to a 4 percent drop in energy losses and $37.6 million in savings.

Since 1990, USAID-trained engineers have conducted energy audits for 387 Pakistani companies that achieved an estimated average energy efficiency improvement of 6.3 percent for these firms. This led to an average 50 percent reduction in hydrocarbon and carbon dioxide emissions by the participating firms. Automobile and boiler tune-ups conducted during 1992–93 resulted in reductions of 14.7 million tons of carbon dioxide. USAID will cease to operate in Pakistan later this year, but the Agency leaves behind a well-trained cadre of public and private sector engineers who will carry on these conservation efforts. Lessons learned from USAID's energy conservation experience in Pakistan are being used to design the Agency's newer programs in the sustainable development countries of Morocco, Egypt, and India.

Water Resources

Twenty-six countries, mostly in Africa and the Middle East, are considered to be water-scarce. That is, lack of water impedes food production, economic development, and environmental protection. More than a billion people in developing countries (855 million rural and 170 million urban residents) lack access to clean water for drinking, cooking, and washing. Diseases related to inadequate water supply and sanitation measures account for nearly 15 percent of all deaths and nearly two thirds of illnesses in developing countries. In 1991 more than 3 million children worldwide died as a direct result of waterborne diseases stemming from unsanitary drinking and bathing water. Pollution in coastal environments and overfishing of marine stocks are contributing to a decline in fish catches, the sole source of protein for one fifth of the world's population.

USAID is addressing the destruction and unsustainable use of the world's freshwater and coastal resources through a variety of related activities. Three Missions have ex-

plicit objectives to protect the quantity and quality of water resources for human activities. But this is really an underestimation of Agency efforts in this area, because activities to support water resources are likely to be reported under different sectors, such as urban–industrial or natural resource base management.

For example, wastewater treatment in large cities may fall under a Mission's urban objective. Water conservation for agricultural support may be under a Mission's objectives to manage the natural resource base. Also, watershed protection may be considered part of habitat protection activities for biodiversity rather than part of water resources. Regardless, USAID is making steady progress to improve distribution and to reduce waste of the urban water supply. Major efforts are under way in Jordan and Egypt. As part of the centrally funded Coastal Resources Management project, Ecuador, Sri Lanka, and Thailand have pilot projects to protect coastal resources. In support of its environmental and health objectives, USAID has invested heavily in urban and rural water supply and sanitation activities in a number of developing countries.

USAID initiatives to combat the degradation of coastal resources emphasize a coordinated management approach directed toward breaking down institutional barriers. Pilot programs in Ecuador, Sri Lanka, and Thailand, for example, are introducing policy reforms designed to cut bureaucratic obstacles and infighting over jurisdictional and administrative responsibilities. As a result of USAID's policy-reform assistance, each of these countries has now created a single interagency coastal zone authority to further objectives in sustainable resource management.

In Thailand the Agency promoted a model national coral reef strategy that mapped out a comprehensive plan for local and national partnership. In 1992 the Thai government took over elements of the pilot project and has extended it to mangrove wetlands and additional coastal zones. This program allows for such progressive and sustainable coastal uses as mariculture (the cultivation of marine organisms) and ecotourism. Assistance from USAID in Sri Lanka has resulted in a new integrated national planning process. It seeks to control coastal erosion through adopting shoreline development regulations and requiring environmental impact assessments for all activities that physically alter the coastal area.

USAID seeks to build constituencies for integrated coastal resources management among local-level resource users and government authorities. It also works to increase the technical and managerial capabilities of indigenous personnel through training and publications. In Ecuador, for example, 194 user groups (made up of artisanal fishermen, mollusk collectors, shrimp farmers, and tourism and residential developers) are now working directly with government agencies in five special management areas to establish sustainable coastal zone policies.

The Irrigation Support Program for Asia and the Near East conducted a study in 1992 of water development and use in four medium-size cities and surrounding agricultural areas in Egypt, Morocco, Pakistan, and Thailand. The study assessed whether water development and use supported long-term adequacy and quality of water resources. The results showed that USAID-supported and other donor efforts to irrigate agriculture, promote urban and industrial development, and increase hydropower had been mostly realized. The study also found problems that in some instances had not been addressed by any of the donors. It noted, for example, a failure to include sufficient drainage facilities in irrigation systems, ineffective treatment of all industrial waste, and insufficient capacity of systems to dispose of sewage and control waterborne diseases.

The study concluded that better planning and more coordinated policy actions are needed to maintain water quality and quantity for human uses. Improved management of public water systems and increased industrial and public conservation measures are needed. The Agency took measures to help minimize the unintended effects. In Egypt, for example, USAID has strengthened management and operating efficiency in the municipal water authority. As a result, Egypt has been able to supply 740,000 people with more reliable and safer water service.

For 14 years the Agency's Water and Sanitation for Health project has worked with other U.S. agencies, with host governments, and with NGOs to design, implement, and evaluate water and sanitation projects. The project has fielded more than 800 technical assistance teams to 85 countries to provide information, transfer technology, and provide training resources in support of USAID efforts. Two such teams (in Guatemala and El Salvador) developed specific recommendations that were submitted to government water authorities for improving collection of data and implementing a monitoring system for the water and sanitation sector.

In 1993 the Agency's Center for Development Information and Evaluation evaluated child survival programs in six countries. The evaluation indicated that installation of water and sanitation lowered the incidence of diarrhea and other childhood diseases and reduced infant mortalities in half the countries. When cholera reemerged in the Americas, USAID played a central role in helping nations develop and implement national plans to combat the disease. The recently ended Water and Sanitation for Health project, and its successor, the Environmental Health project, are supporting the development of environmental health assessments—analytical tools to help developing countries investigate, characterize, and set priorities for environmental health problems.

Natural Resource Base

Environmental degradation is weakening the productivity and potential of the natural resource base on which economic development and social well-being depend. Nearly 11 percent of the Earth's fertile soil has been so eroded, chemically altered, or physically compacted as to damage its agricultural function. And although the global demand for food may be three times greater in 2050 than it is today, per capita food production is declining. Pesticide use in developing countries continues to increase. Although pesticide poisoning now affects approximately 25 million people, crop loss due to pest infestations has not decreased measurably.

Between 1980 and 1990, tropical forest areas shrank on average 15.4 million hectares a year. These forests are extremely diverse biological communities that produce a range of products including firewood and charcoal, lumber, paper, and crops such as coffee, oil palm, and rubber. Firewood, the most common forest product in developing countries, is the major cooking and heating fuel in most rural communities and in many urban areas. Although 30 percent of tropical forest cover is considered to be under some form of management, the United Nations Food and Agriculture Organization found that there has been no significant increase in sustainable managed forest area. Clearly, lack of effective stewardship of the natural resource base threatens sustainable development on many fronts.

USAID has built its developmental expertise around, and had the longest history of involvement in, efforts to maintain the productivity of forests, agricultural lands, watersheds, and fisheries. The Agency is undertaking these activities in 18 of the 25 sustainable development countries with environmental strategic objectives. In all geographic regions, the primary approach to accomplish this objective has been introducing appropriate practices and technologies and increasing local control over and stewardship of the natural resource base. The emphasis in some countries has shifted from traditional agricultural production and technology development to multifaceted programs addressing behavioral change, institutional and policy reform and economic growth. This leads to changing land-use practices and, when coupled with needed policy reforms, gives countries the motivation and tools to conserve and protect their environment.

USAID works primarily in the lowest income countries where agriculture is the dominant sector or where the economy is shifting from agriculture to industry. A dynamic agricultural sector is essential to sustaining broad-based economic growth. Agriculture in turn depends on responsible stewardship of renewable natural resources. Growing concern for the environmental effects of traditional agriculture has, in recent

years, led the Agency to develop and promote techniques and technologies that maintain or increase the productivity of the resource base over the long term and that involve local farmers—men and women—more actively in this process.

In Senegal, for example, USAID introduced two technological innovations that increase productivity and have positive effects on the environment. Specifically, 800 treadle pumps for small-scale market gardeners have been locally produced and sold since 1990 with USAID support. Farmers using this treadle pump have increased their median irrigated area by 68 percent. Their median annual income from market gardening has gone up by nearly $600. Because the pump does not consume nonrenewable diesel fuel (as do motorized pumps) this technology is better environmentally and less likely to affect the fragile water table.

In another activity, the Agency promoted production and use of a ceramic-lined charcoal stove for use in Senegalese households. By burning an average of 1.6 kilograms less charcoal per day, users are saving $119 (predevaluation) over the 2-year life of the stove. Each of the 5,000 stoves in use year-round in 1993 reduced charcoal consumption by 584 kilograms. That translated into a reduction in deforestation of 508 hectares that year.

USAID has been a global leader in promoting integrated pest management, a set of technologies designed to reduce chemical use in agriculture by integrating biological control methods into pest reduction strategies. In the largest experiment ever undertaken using integrated pest management, USAID-supported scientists in Indonesia showed that cutting back on pesticide amounts, and sometimes even eliminating the chemicals altogether, can boost yields.

In 1986 the Indonesian government adopted a national integrated pest management program and began training farmers to distinguish pests from predators and to calculate whether the predators were doing a better job of keeping down the pests than chemicals could. After training, farmers decreased the number of pesticide applications per field by more than 60 percent. Returns among those farmers were approximately one third higher than those to farmers not using integrated pest management but cultivating under similar conditions. Use of these techniques is saving the government $120 million in insecticide subsidies to farmers. Environmental damage and health risks are down, and rice crop yields have increased by 15 percent.

In Honduras, USAID has emphasized changing destructive hillside agricultural practices and providing marginal farm families with agricultural technologies that decrease erosion and increase crop yields. The Land Use Productivity Enhancement project has increased the number of poor hillside-farming households adopting environmentally sound cultivation practices to 21,221 in 1993–94 from 11,000 in 1989. This has contributed to an estimated 70,000-ton decrease in soil-erosion losses. Moreover, in 1993–94, 10,000 families had achieved at least a 30 percent increase in average basic grain yields.

The project's midterm evaluation showed that integrating men and women in the activities would enhance the effectiveness of the enhancement effort. As a result, the project has incorporated entire rural households in its extension training activities. Community leaders, approximately one third of whom are women, promote and teach neighbors about technologies. They also provide technical outreach activities such as raising family gardens and building more efficient wood-burning stoves.

Cassava, a staple food for more than 200 million Africans, has been described as Africa's best hope for overcoming famine. It grows best in poor soils, does not require fertilizer, and can survive drought when other crops fail. With USAID support, plant breeders have crossed cultivated varieties of cassava with a wild species to produce a new plant. This new variety, when grown under typical field conditions, yields between 50 and 70 tons per hectare. That compares with an average of 12 tons per hectare with traditional cassava varieties.

The Agency has funded development of a package of cassava-processing equipment that has benefited women in significant ways.

It reduces processing time, increases efficiency, and improves the quality of the final product. By using this technology, women in 40 villages in the Nigerian state of Bauchi have raised their average incomes by 337 percent. The amount of cassava lost during processing has been halved, from 22 to 10 percent. Moreover, the quantity of fuelwood required to fry a given amount of cassava has been reduced by more than 25 percent. That saves processing costs and conserves scarce fuelwood. Use of this technology has spread throughout Cameroon, Ghana, Nigeria.

USAID has decreased deforestation and promoted reforestation in several countries. In Pakistan, communities that suffer from fuelwood shortages are promoting tree farming with Agency assistance, after policy and economic reforms established a market for seedlings. More than 100 million trees have been planted on private farmlands, with good survival rates.

In Nepal and the Philippines, where forests are rapidly disappearing, new laws transfer management of public forests to local communities. In the Philippines more than 12 million hectares are now communally managed and are beginning to show forest regeneration and improved soil and water retention—and with those improvements, greater economic benefits to local communities. The USAID-supported Asia Sustainable Forest Management Network is studying and promoting successful examples of community-controlled forest management. Among the examples are the dramatic declines in slash-and-burn farming and illegal logging realized by 49 Philippine communities protecting 50,000 hectares.

Community control over resources is not in itself a panacea. In the early 1980s, USAID and the Government of The Gambia sought to address the problem of rampant deforestation by introducing community woodlots to increase fuelwood production. The underlying assumption was that the community would work to establish and maintain the woodlots and that everyone would benefit during the course of pruning and harvesting. This assumption was not based on the reality of the local community. The new concept did not achieve expected goals because it entailed a great amount of labor, was difficult to maintain, and required community members to learn new husbandry practices. In addition, there was no strong incentive to participate in a community woodlot because of uncertainty about who controlled its products.

USAID recently initiated a project in The Gambia that benefits from these lessons. The new project emphasizes "community resource management agreements," which help ensure that the community will benefit from its participation in managing common resources. Though not legally binding, these agreements are signed by village leaders, local government representatives, and NGO representatives.

In Africa many USAID programs have helped develop national environmental action plans. Most experts consider such plans to be the first critical step to protecting the environment. Overall, 47 countries now have completed or are completing their action plans. Sixty-five countries have completed or are completing a tropical forestry action plan, also considered critical for protecting the environment.

Participation, Integration, and Partnership

USAID programs are designed to benefit the people of developing countries. Until relatively recently, however, these programs did not explicitly recognize the crucial role of the Agency's development partners. In its 1994 publication *Strategies for Sustainable Development,* USAID committed itself to pursuing approaches based on the aspirations and experience of ordinary people. The Agency also committed itself to involve, respond to, and be accountable to the people who will live with the results of its development efforts.

Through numerous activities, the Agency is building indigenous capacity, enhancing participation, and encouraging accountability, transparency, decentralization, and empowerment of communities and individuals. Rather than being passive recipients of aid, women and men are increasingly active in the design and implementation of projects and in the distribution of benefits. Greater reliance on local expertise has

opened up a whole range of opportunities and challenges. The Agency's experience in pursuing participatory approaches shows how complex—but essential—these issues are.

Participatory development extends beyond project design and implementation. It includes a mechanism for evaluating the results of development activities and an opportunity to make adjustments that are responsive to the evolving needs of local communities. To overcome the tendency of projects to benefit only local elites, USAID is using gender analysis and techniques for data collection and consensus building such as participatory rural appraisal. This is a development planning methodology that helps different groups and institutions in a given community agree on a common course of action and take an active role in organizing the contributions of the various outside agencies. USAID has helped spread the use of participatory rural appraisal techniques by funding production of the *Participatory Rural Appraisal Handbook,* a guide for village leaders and field extension officers working in local resource management. In a number of African countries, this handbook is being used to engage communities in soil-erosion control and small-scale irrigation (Kenya), agroforestry and sacred-site protection and management (Ghana), and land terracing (Uganda).

Use of participatory rural appraisal techniques has helped field-based development officers understand why certain technologies are more readily accepted. It has also shown them how to design technologies that take advantage of locally available resources and meet the financial and physical limitations of recipient communities. Community commitment to environmentally sound projects can lead to greater cohesiveness and increased risk-sharing among community members. Low-cost loans and community social services supported by USAID are often made available to a wider range of people as a result of their participation in projects. Local involvement in projects has shown that use of familiar techniques and practices increases acceptance and enhances long-term changes in land use practice.

The U.S.–Asia Environmental Partnership (U.S.–AEP) is another example of the Agency's emphasis on partnership—in this case between government, business, and NGOs in the United States and Asia. It aims to solve serious and growing environmental problems that threaten continued Asian economic growth. This 5-year, $100 million project, begun in 1992, will result in an additional $400 million leveraged by public, private, and nongovernmental partners to solve existing environmental problems. The partnership is active in 34 Asian countries and is supported by 25 U.S. government departments and agencies. It has set ambitious targets, including sponsoring at least 200 fellows, 50 business exchanges, and 30 grants for biodiversity activities annually. As of June 1994 the project had granted 100 fellowships, about a third of them to women.

Thailand and Nepal provide examples of the partnership's work. In Thailand, studies show that high levels of lead in the air from vehicle emissions cause IQ loss in children in Bangkok. Three-wheeled taxis called *tuk-tuks* contribute significantly to mobile sources of air pollution in that city. The U.S.–AEP brought together the largest tuk-tuk manufacturer with U.S. electric-car makers to transfer the newer technology to Thailand. As a result, the tuk-tuk manufacturer last year began production and pilot testing of electric tuk-tuks.

The Thailand experience has encouraged a similar venture in Nepal. The capital, Kathmandu, suffers from air pollution problems comparable to Bangkok's. The Nepalis expect to have a fleet of electric *tempus* (their version of tuk-tuks) numbering in the hundreds in Kathmandu by the end of 1995.

In another activity, U.S.–AEP is assessing the environmental situation at Mae Moh, a lignite power plant in northern Thailand. This plant provides 27 percent of the country's electricity but also is largely responsible for a dangerous air pollution problem. On request from the Thai government, the U.S.–AEP has been instrumental in linking government agencies and private sector businesses to assess and ameliorate the situation. The partnership paid for air-monitoring equip-

ment to be installed at the plant. It also opened discussions for the planning of a nationwide air-quality-monitoring network to be developed in 1994.

The partnership is forging partnerships with the private sector in the United States and abroad that promote economic and environmental efficiency. In 2 years, 235 environmental business exchanges have taken place under the partnership. That has resulted in approximately $3 million in sales of environmental goods and services. U.S.–AEP, in partnership with the Department of Commerce, has established nine technology representation offices. They have been instrumental in the sale of $18 million worth of U.S.–supplied environmental equipment and service and design contracts.

Lessons Learned

USAID and its development partners have learned valuable lessons that are being incorporated into the design and implementation of the Agency's activities. Five key lessons stand out:

(1) Environmental problems are caused by the way people use resources. Workable solutions must focus on the needs of project beneficiaries, most often local individuals and community members, and on the policy environment that influences their behavior. Strategies that give local people stewardship over their natural resources are more effective than those that rely on government agencies alone. Local commitment to improved stewardship, whether for managing a nature reserve, cleaning up a polluted river, changing farming systems, or reforming environmental policies, is essential to sustained success.

Promoting local stewardship places greater responsibilities on local communities to define the cultural and gender obstacles and opportunities in access to, and use of, resources. Failure to consider the role of women has been one of the major causes of failures in development work in sectors such as agriculture. Too often the targets of awareness and participation efforts were government officials, local leaders, and male heads of households, even when women or children were important producers, stakeholders, and participants.

Sustainable changes in rules governing access to resources, especially land, require both time and legal authority. Such changes are often best supported through policy dialogue and economic reform. Exclusive emphasis on new technologies can lead to failure if the intended beneficiaries are going to reject them for cultural or other considerations. USAID must renew and strengthen its efforts to ensure that innovative land use practices are sustainable.

(2) Full participation is essential. USAID environmental activities must more clearly define whom they are trying to reach and fully engage all participants. Evaluations show that greater local participation in the early stages of projects increases the likelihood that the tangible economic benefits of sound environmental management practices will accrue to those who incur the costs. Sustainable upland agriculture practices are adopted readily if they increase local farm incomes; parks are protected if communities share entry fees. USAID must strengthen and renew its efforts to ensure that control over resources is vested in those who have the greatest stake in their sustainable use. These "win–win" strategies characterize the Agency's more effective programs.

On another dimension, full participation means that the public as well as the private sector must be involved. And that involvement must be better coordinated, to achieve sustainable environmental results. Public–private partnerships, especially in energy and industrial–urban sectors, show promise. USAID should strengthen and encourage a number of developmental strategies that tap into private sector strengths. These include privatization of environmental services and jointly developed and monitored environmental technologies that stress efficiency and cost savings. They include as well shared planning and funding by governments, local municipalities, and business leaders to establish viable land-use policies and provide balanced and informed input to industrial site

location, transportation, waste management, and related zoning issues.

(3) Private voluntary organizations (PVOs) and nongovernmental organizations (NGOs) show great promise. USAID's experience working with PVOs and NGOs has included both successes and failures. It appears to vary according to country conditions. On the positive side, PVOs and NGOs can be more effective than government agencies in reaching the unserved, including women. PVOs and NGOs are known for adapting innovative labor-intensive technology to local conditions and using technologies that can operate effectively on limited budgets.

On the negative side, PVO and NGO projects often cannot be replicated because they do not include monitoring, reporting, and evaluation. The limited technical and management staff of many PVOs and NGOs makes it difficult to conduct rigorous technical analyses or baseline studies. USAID should continue to work with these organizations to tap their unique energy and grassroots appeal while requiring more measurement expertise and greater accountability.

(4) Environmental damage often is driven by poverty and food insecurity. Poverty and uncertain food supplies deprive men and women of the possibility of making rational long-term choices about how to use resources. Although environmental problems have widespread repercussions on every societal level, it is the low-income groups in rural and urban areas who generally suffer disproportionate harm from environmental mismanagement.

As the natural resource base is degraded, certain segments of the population, in particular poor and landless farmers, are forced onto progressively more fragile lands. There they get less return for their labor and are often forced to further degrade the land to survive. Urban refugees living in slums without sewage or sanitation services, as well as industries whose disposal of wastes are unregulated, can add significantly to water pollution. Many of the urban refugees are "environmental" refugees, fleeing areas where the natural resource base has been overused and undermanaged. Efforts to ameliorate poverty and food insecurity will contribute significantly toward solving many environmental problems.

(5) Environmental problems have systemic effects. The effects of environmental problems are rarely confined to local environments, nor are they limited to the particular sector of activity in which they occur. Most environmental problems have effects that are ultimately national or global. These problems must be defined broadly to include green, brown, and blue issues and the interactions among them. This is especially true in cases such as watershed management, where reduction of forest and agricultural cover can increase soil erosion and downstream turbidity, ultimately affecting coastal zone resources.

Experimental projects should always work within the context of an overall long-term development strategy even though funds may not be immediately available to carry out the whole strategy. Until recently, USAID tropical forestry and biodiversity activities did not address the broader legal and policy context in which they operated. That often prevented projects from meeting their objectives.

8. Managing for Results

BUILDING ON STRATEGIC PLANNING and performance measurement activities begun in the Africa Bureau in 1989, USAID has embraced the opportunities and challenges of managing for results. The Agency is measuring the results of all of its sustainable development programs as a "performance measurement pilot" under the Government Performance and Results Act of 1993. It is experimenting with new ways of doing business as a "reinvention laboratory" under the Vice President's National Performance Review. The Agency is reengineering how it plans, delivers, and judges development assistance to make the greatest possible difference in the lives of poor people in the developing world and to demonstrate to Congress and the American public that their tax dollars are being well spent.

USAID's FY 1995 and FY 1996 congressional presentations described the results the Agency seeks and has achieved with its programs, not just the inputs it wants to fund. Under the Agency's new strategic management directives, more than 75 of the Missions and offices have developed formal strategic plans, with specific performance objectives and indicators. The Agency is systematically including results information from its programs as a factor in budget decisions, so that future resources can be allocated where they will make the most difference for development.

These efforts are being built on the Agency's Program Performance Information for Strategic Management (PRISM) system, which has put USAID at the cutting edge of performance measurement and results management throughout the government (see box 8.1). But there are many challenges to planning, measuring, and managing for results that must still be overcome. This chapter summarizes USAID's progress and outlines further steps that need to be taken.

What Have We Done About Managing for Results?

Initially, much of USAID's progress in managing for results was driven from the bottom up. It reflected the strategic plans and best practices of Missions and bureaus. Beginning in 1993, however, it also reflected an increasing commitment by the Agency's leadership to refocus USAID's sustainable development mission and to manage programs more strategically for development results.

Box 8.1. Status of Performance Measurement in USAID's Sustainable Development Missions

As of October 1994, all sustainable development Missions had approved strategic plans, up from 75 percent in 1992. The application of strategic planning was examined for 38 of the 41 sustainable development countries. Findings:

- Seventy percent of the Missions, compared with 40 percent in 1992, have set performance targets for the majority of their performance indicators.
- Results data have been reported for 50 percent of the strategic objectives and 70 percent of the program outcomes.
- Three quarters of the performance targets appeared to be within the capacity of the Missions to achieve within 8 years.
- Eighty percent of the program outcomes were clearly contributing to the achievement of a strategic objective—the relationships of the remaining 20 percent need further clarification.
- Objectives were usually stated as results. Often several results were rolled into one objective and progress on each dimension could not be clearly ascertained.
- More than two thirds of the objectives had clear, appropriate, measurable indicators. Missions need to direct their attention to the remaining third as they further develop their measurement systems during 1995.

Over the past year, the Agency initiated reforms to strengthen and expand its ability to use this information and manage for results by reengineering the way it does business to reflect core values of participation, results orientation, customer focus, and employee empowerment. Some of the key elements of managing for results in USAID include

- Consistent Agencywide policies and procedures for planning and implementing programs, with clearly articulated priorities and goals that provide a framework for operational-level planning and a basis for Agencywide performance assessment
- Operational-level strategic planning that defines clear development objectives, how these objectives will be achieved, and how their achievement makes a difference in people's lives
- Full involvement by line managers, who actively collect and use performance information to improve development results
- Emphasis on partnerships—with host governments, other donors, private voluntary organizations (PVOs) and nongovernmental organizations (NGOs), contractors, and customers—as the primary mechanism through which development results are achieved
- Performance targets that reflect ambitious but achievable benchmarks—results that operating units, with the help of their partners, are capable of achieving
- A commitment to being a "learning organization" that understands the lessons of experience and shares those lessons as fully and transparently as possible

During the past year, USAID has taken a number of specific actions to further its ability to manage for results. They include the following:

(1) October 1993. The Administrator issues the policy paper on "Enhancing USAID's Ability to Manage for Results." The paper describes the vision and goals of managing for results and summarizes "best practices" for strategic planning and performance measurement by Missions and offices. It outlines a new strategic planning and performance review process based on this results orientation.

(2) November 1993. The Administrator issues his "Statement of Principles on Participatory Development." He stresses that "broad access by people to their country's economy and participation in their society's decision-making processes are results we seek to support, ... and ... there needs to be broad participation by people in defining development priorities and approaches." The statement includes 10 principles to guide the planning and implementation of USAID's development programs.

(3) January 1994. The Administrator sends a cable to all Missions and offices establishing a "Strategic Management Framework for USAID" that is common to all Agency programs. The framework emphasizes strong policy leadership from USAID/Washington combined with empowerment of field managers to undertake strategic planning "informed by the voices of our customers—the intended beneficiaries of our assistance."

(4) March 1994. The Agency redefines its mission and charts its plans in *Strategies for Sustainable Development.* These strategies "define long-term objectives, specify their relevance to the United States, describe the ways in which those objectives will be pursued, and identify mechanisms to implement the plan and standards to measure success." The papers are the product of extensive consultations with members of Congress and congressional staff, representatives of other U.S. Government agencies, members of the development community, and USAID's own development experts both here and abroad.

(5) April 1994. USAID's overall approach for reengineering the planning, implementation, and evaluation of development assistance is described in a report "Results Oriented Operation Reengineering." Missions and offices are asked to nominate themselves as "reinvention labs ... where employees are encouraged to think boldly and to focus on the achievement of results; where end-users participate in the formulation of strategies, implementation, and monitoring; and where people in the Mission and in USAID/Washington are organized in teams to support mission strategic objectives [and] are encouraged to go beyond the conceptual bounds of the reengineering report."

(6) May 1994. The "Agency Directive for Setting and Monitoring Program Strategies" is sent to all Missions and offices. This policy paper formally establishes strategic plans from operating units as the basic framework for programming assistance and reporting results. It sets April 1995 as the date by which all operating units are to comply with the requirements of the directive. The directive requires that country program strategic plans include all USAID assistance to that country, including nonemergency food aid and centrally managed field support resources. The plans should also represent an integrated agenda of sustainable development activities, exploiting, where possible, the synergies that exist across substantive program areas. The directive also "gives new prominence to the need to undertake our programming with fuller participation of our development partners, including other donors."

(7) June 1994. "Guidelines for Strategic Plans" are issued in draft to the regional Bureaus and Missions for field testing and comment. Simultaneously they are shared with a wide range of development partners, including NGOs, academic, and professional organizations. The guidelines provide operating units with additional information regarding how they should implement the March 1994 strategies in their strategic plans.

(8) July 1994. The Office of Management and Budget designates USAID's sustainable development activities as a pilot project for performance measurement for FYs 1995 and 1996 under the Government Performance and Results Act. As a pilot, USAID is committed to expanding and deepening strategic management in more than 40 sustainable development programs, better linking performance measures to Agency programming and management systems, and testing broader management reforms aimed at enhancing the Agency's ability to manage for results.

(9) August 1994. The Budget Business Area Analysis team issues the first detailed "reengineering" report. The report contains the blueprints for a corporate information system that will "support management decision-making at all levels, streamline and control the distribution of funds to operating units, and simplify and facilitate the preparation of budget presentation and external submissions to the Office of Management and Budget and the Congress." Planning for related reforms in Agency procurement, financial management, and human resources systems continues.

(10) *August 1994.* Central and regional Bureaus review FY 1996 budget submissions from each Bureau. These budgets are organ-

Box 8.2. Reengineering Development Assistance in USAID

In May 1994, USAID's Operations Business Area Analysis team began reengineering the way USAID plans, delivers, and judges its development assistance. The team's job was to describe how USAID could become truly "best in its class," a worldwide leader in development assistance by building on best practices within the Agency and beyond. The team's report describes the key steps in improving USAID's ability to manage for results and achieve the best possible development outcomes for the Agency's customers. It provides much of the basis for the new ways of doing business that USAID will implement next fall.

Reengineering will build on, and in many ways subsume, the strategic planning and performance measurement approaches described in this report. Strategic plans, results frameworks, performance indicators, targets, results reports, and resource requests will become USAID's standard operating procedures. They will be supported by a corporate information system that will minimize formal reporting and enable performance data, once entered, to be available to all who need them.

ized by strategic objective, and resource allocation decisions take results data into account.

(11) *December 1994.* The "Operations Reengineering Report" is issued. Building on the framework outlined in May, this report provides more detailed plans for reengineering the way USAID plans, achieves, and judges development results. The Administrator endorses the report's recommendations and mandates the Agency to move full speed ahead with systems design and implementation (see box 8.2).

What Have We Learned From Managing for Results?

USAID is transforming its decision-making processes. The Africa Bureau and the Latin America and the Caribbean Bureau, having the longest experience, are becoming increasingly sophisticated in analyzing results and using performance information in decision-making. The Asia and Near East Bureau is working with its Missions to establish strategic plans and performance measurement systems and to marshal performance information for program reviews. In Washington-based central and regional Bureaus strategic planning began in earnest during the past year. All of the Bureaus are working hard to create a uniform system for assessing Agencywide performance—an issue of vital concern to top management.

Managing for results is beginning to make a significant difference in the way USAID does business.

Managing for results has changed how the Agency reports and shares information

Performance Reviews for Mission programs are now organized around objectives and results. Operating units that clearly and convincingly communicate their strategies and demonstrate that results are being achieved are doing better in program and resource decisions.

The Latin America/Caribbean Bureau, for example, conducts intensive 2-week Action Plan reviews over a 6-month period for all its Missions. These reviews look at country, program, and management performance. They have a major bearing on the Bureau's program and budget decisions. All Action Plans from Latin America/Caribbean Missions now reflect approved strategies, and most include specific performance targets. Each Mission begins its Action Plan with a progress report that provides both a narrative assessment and empirical measures of results for each objective. This information is readily available for inclusion in critical documents such as the Bureau budget submission.

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It is reported Bureauwide in an annual summary.

Analytical frameworks developed by the Center for Development Information and Evaluation have helped the Latin America/Caribbean Bureau relate Mission objectives to the Agency's four broader sustainable development themes. This has permitted a ready overview of Mission programs and clarified how Mission objectives contribute to Agency goals. It has also facilitated consideration of cross-cutting issues such as participation and women in development.

Missions have also used the analytical frameworks to help articulate the underlying logic of their strategy, compare their objectives and indicators with those of other Missions, and relate their programs to broader Agency goals. USAID/El Salvador, for example, used the analytical frameworks in identifying key questions and issues for its economic growth evaluation.

While basic data on operating unit objectives and results is available through the PRISM database, new information systems being developed under reengineering will enable the Agency to share more performance information more quickly and easily. These new information systems can also provide Missions with access to a more extensive array of benchmarks and comparisons being developed by CDIE to help operating units clarify their strategies and choose appropriate indicators and targets.

Managing for results has helped the Agency become more focused

USAID's emphasis on managing for results has helped the Agency become clearer about what it stands for and what it wants to accomplish. The Agency's resources are more focused on (1) programs that achieve results, (2) fewer countries, (3) impacts on people.

Some of the ways the Agency has concentrated its activities can be illustrated by the Africa Bureau's experience. Concerned about the future of Africa, Congress in 1987 created the Development Fund for Africa. The fund reflected a commitment from Congress to provide more consistent funding for African development and to permit greater flexibility in the use of these funds in return for a comprehensive results orientation in USAID's Africa program. Since 1988 the Africa Bureau has moved to manage more effectively for results. Examples:

(1) An increasing proportion of funds are being invested in a smaller number of countries that are most likely to achieve sustainable development. Nine African Missions were identified for early closing. This eliminated countries (a) that were poor development partners, (b) that had graduated from the need for USAID assistance, or (c) in which USAID programs were too small to make a significant difference. By FY 1996 just 15 country programs will account for 75 percent of USAID's assistance to the region.

(2) Within countries, resources have become increasingly directed at achieving fewer but more important development results. Over time, activities that have made little contribution to strategic objectives have been phased out or terminated. Additional resources have been shifted to new activities that contribute to key objectives.

(3) Emphasis on customers has increased. According to a recent survey, 9 out of every 10 African Missions regularly involve local people and institutions in project design. In Botswana, for example, participation by villagers in an environmental program convinced the Government that local communities could manage wildlife resources in a sustainable way. That has resulted in the devolution of authority to local communities. In South Africa, USAID's collaborative style—for example, involving all interested stakeholders in designing an education program—has strengthened support for USAID's efforts while enhancing their legitimacy and credibility.

Managing for results has improved USAID's understanding of what its programs are achieving

The Africa Bureau had the earliest start in managing for results. Since 1990 each African Mission has submitted an annual Assessment of Program Impact to report on

program performance. These reports provided the basis for annual "impact week" reviews assessing country and regional trends in each development sector. Findings from these reviews have been summarized each year for Washington and the field. The Africa Bureau reported on overall results achieved and lessons learned in *Africa: Growth Renewed, Hope Rekindled*, published in 1993.

USAID as a whole, however, is still developing a similar Agencywide capability to summarize and compare results across programs. Two years ago the Agency's first annual report on program performance organized Mission objectives and targets into more manageable categories of comparable programs. Last year, with more detailed data from more Missions, the second program performance report developed "analytical frameworks" articulating the logical connections among all of USAID's efforts in each thematic area. This analysis not only improved understanding of existing programs but also influenced the policy formulation that led to the Agency's new strategies for sustainable development.

This year the report draws on a still wider range of Mission and other data to begin comparing results across programs and assessing their contribution to Agencywide performance. Next year will see more consistent definitions and data on Agencywide objectives and results. The Agency can expect to go yet further in analyzing its contribution to sustainable development.

As data on objectives and results have improved, so too has the quality of Washington reviews of field programs. The reviews have shifted from a primary focus on inputs and pipelines to a much broader discussion of objectives and outcomes—a discussion that will be increasingly informed by comparative data from similar programs.

Managing for results has made a difference in the field

USAID is managing for results, and this has made a difference in a number of Missions where it has been used the longest. For example,

(1) USAID's child survival efforts in Madagascar in 1993 and 1994 emphasized reducing mortality from diarrheal disease. But performance data showed these efforts were insufficient, given continuing high levels of undernutrition—a key factor in infant mortality. More than 50 percent of the children in Madagascar were reported as stunted, the highest rate in Africa. On the basis of these data, the Mission expanded its child survival efforts to include a stronger emphasis on improving breastfeeding and early nutrition practices.

(2) In Malawi, performance monitoring of HIV/AIDS incidence showed the disease was spreading most rapidly among young women 15 through 23 years of age, with infection rates for girls 15 through 19 twice that for boys. As a result, the Mission targeted very young women as a priority in its AIDS prevention efforts.

(3) USAID/Honduras reduced the number of its strategic objectives, leading to a corresponding reduction in the number of activities and Mission staff. Several efforts that contributed only marginally to remaining objectives, or were unrelated, were dropped from the portfolio. All new activities, and amendments to existing activities, contribute directly to desired results.

(4) For USAID/Jamaica, strategic objectives, performance data, and "strategic objective committees" provided a new results-oriented framework for expanded host country dialogue. In November 1993, the Mission began carrying out annual project management reviews with counterparts. The first series of five reviews has led to significant project restructuring and a much clearer shared understanding of the results being sought. Review of the Inner Kingston Development project, for example, led to drastic cuts in operating expenses, streamlined staffing, and a redirecting of efforts to clearly identified critical objectives. Review of the Agricultural Export Services project, identified the need for greater exporter participation and closer cooperation with relevant NGOs and PVOs.

(5) USAID/Ghana hoped to increase numeracy and literacy of primary school leavers to 80 percent by the year 2000. But

baseline performance data showed that numeracy and literacy levels of primary school students were much lower than expected. (The data were collected through the first nationwide competency test, developed and implemented in 1992 with USAID assistance.) As a result, the Mission not only reduced its overly ambitious targets but substantially redirected its efforts toward educational quality.

(6) Although performance data showed that microenterprise lending supported by USAID/Bolivia was serving more than 55,000 customers, the data also made clear that existing lending practices could make only a small contribution to Bolivia's microenterprise needs. By refocusing its strategy on the supervisory and regulatory framework for licensed lending institutions, however, USAID now hopes to serve as many as 250,000 microenterprises by the end of the decade.

What's Next?

By April 1995 all central Bureaus and Missions will have developed performance measurements systems for all their objectives. Missions will have established baselines and performance targets for all their indicators. By the 1996 reporting cycle, all of these operating units should be reporting results for *all* their objectives.

As a complement to Mission and office-level measurement and reporting, USAID has also begun defining Agencywide goals and indicators. This spring and summer the Agency will complete a Results Framework. It will identify the wider results that USAID is seeking in each of the five thematic areas, the key intermediate results that contribute to these changes, and associated Agencywide indicators. This will

- Provide more coherent policy direction to operating units
- Permit more effective reporting of Agency performance and accomplishments across key program areas
- Signal when strategies or approaches are not contributing to sustainable development

USAID still faces many challenges in carrying out these tasks. They include integrating Agencywide objectives developed in Washington with those developed by country Missions, ensuring that objectives specified by operating units are within their capacity to achieve, integrating performance measurement with evaluation to better understand the reasons for success and failure and the broader impact of programs, and expanding the use of performance information in decision-making.

USAID will implement a reengineered way of doing business beginning in October 1995. This reengineering will create a coherent and consistent Agencywide framework for managing for results, serving our customers, empowering our employees, and enhancing participation. One of its features will be a fully automated corporate information system. A true corporate database will greatly enhance indicator selection and benchmarking, facilitate (and minimize) formal reporting, and provide entry into a wider world of supporting development information.

The ultimate goal, as USAID moves toward this system, is to replace most formal reporting with more transparent information sharing. The aim is to make objectives and results from anywhere in the Agency freely and easily available to anyone who needs them.

By next year, the existing PRISM performance measurement database should be part of a much larger and more effective Agencywide information system. Data on objectives and intermediate results, on targets and indicators, and on expected and actual performance will no longer need to be separately entered, reported, and compiled. Instead, it will be part of an ongoing system for developing strategies and managing activities. This should contribute greatly to the Agency's ability to utilize performance information as it continuously improves as a learning organization.

DRAFT

Developing and Using Indicators of Sustainable Development in Africa: An Overview

Prepared for the Network for Environment and Sustainable Development in Africa (NESDA)

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1. Background and Purpose

There are at least two basic starting points in developing indicators of sustainable development in Africa: the first is to work with policymakers and the public to determine more clearly what issues and problems need to be assessed, thus helping to identify the demand for indicators; the second is to work with the statisticians and those who monitor development to better determine what information is available, or could be developed, to use as indicators. The challenge, then, is to bring these two disciplines together, match demand with supply, and initiate a process of providing the public with indicators that can be used to assess changes in conditions and progress towards development targets and goals.

Although the process of indicator development and use can be stated in simple terms, the process itself is time-consuming, difficult, expensive, often contentious, and continually changing because of new problems and new science, but it is absolutely essential for planning and assessing sustainable development. Where would we be if we didn't have basic indicators of economic production and income, population size, rates of migration and growth, life expectancy and years of schooling, estimates of crop and food production, availability of sanitation and safe drinking water, statistics on land use and forestry production, and indicators of national parks and wildlife?

In the past, policymakers relied principally on a few economic and social indicators to guide their deliberations. Now decision makers in Africa have to be concerned not only with social and economic conditions, but also take into consideration the natural resource and environmental consequences of policies, programs, and projects if development is to be sustainable in the long term; and they must be able to link conditions and trends in their own countries at national, provincial, and local levels with conditions in neighboring countries, the African continent, and the world as a whole. The scope of decision-making has expanded from past and present to the future; from social and economic development to environment and sustainable development; and from local and national to global. As decision-making has expanded, so has the need for good information, particularly statistical indicators.

In previous workshops, NESDA staff and participants have brainstormed on how to define and operationalize the concept of sustainable development. There has been considerable agreement on definitions of sustainable development and the need to consider at least seven different aspects -- governance, natural resources, population, technology, economics, heritage, and human welfare.1 In preparation for this workshop, the organizers have settled on three dimensions -- the economic, ecological, and

social -- and they have further limited the discussion to the natural resources and the environment.2 An initial listing of categories and sample indicators was also prepared.3

Building on the above work, this paper has three principal objectives. To provide:

- an overview of indicators: uses, concepts, definitions, types, and frameworks;
- identification of some of the major problems and issues concerned with indicator development and guidelines that can be used to address problems in developing indicators; and
- presentation of a strategy for indicator development at the national level.

The paper is intended to provide ideas and concepts and some practical guidance in developing indicators, particularly at the national level. In the appendix, a listing of indicator data for African countries in included along with other information resources that may be helpful to participants.

2. Environmental Indicators: Uses, Definitions, Types, and Frameworks

The current interest in integrating environmental concerns with economic issues and in assessing progress toward sustainable development has fueled a growth in the demand for environmental indicators.

Policy relevant indicators are used to assess the environmental conditions and trends of a province, country, region, and the globe; to compare countries and regions; to forecast and project trends of resource use and pollution; to provide early warning of risks and impacts; and to assess conditions in relation to specific goals and targets. They are essential in developing and designing policies, programs, and projects, in managing resources, and in assessing impacts.

In particular, the National Environmental Action Plans (NEAP) have developed in Africa, with the support of the Network for Environment and sustainable Development in Africa (NESDA), are faced with the need for indicators to assess the state of the environment and assess the root causes of environmental degradation. There indicators are the statistical underpinning that will guide future strategies. NEAP Secretariats in the individual countries are also in need of environmental indicators to assess progress as they implement plans and programs. They want to know, for example, how well they are doing and they want

to share this information with the public and the international community. It is not surprising, therefore, that NESDA has given priority attention to the development and use of indicators in its work plans.

A. Defining Environmental Indicators

Environmental indicators are statistical measures that tell us about the status of an environmental concern in relation to a broad social goal such as economic welfare, human health, social welfare and equity, ecological sustainability, aesthetic appreciation, and more. The key point is that an environmental indicator is defined by its relationship to people and their values, and is therefore linked to the other two dimensions identified in previous NESDA workshop discussions. An indicator by definition must indicate something. Environmental indicators indicate how well or poorly societies are doing to achieve a perceived goal.4

An ideal indicator meets four criteria:

- It is a reliable statistical measure;
- It is measured in a comparable fashion over time and space;
- Its changes can be assessed against a scientifically valid norm or standard; and
- It bears upon a clearly identifiable social goal.

In short, indicators should be based on data collection and processing techniques that are of known quality; be composed of time series and interspatial comparisons so that changes and differences can be observed; grow out of or reflect the best knowledge of established models of natural and human-induced phenomena; and generally be agreed upon as showing progress toward or away from accepted social goals.

Sometimes there is a fifth criterion: that an indicator be based on information that is useable by decision-makers. That means developing indicators at the level of an administrative unit for which policy is made, most often the nation or province.

The most important aspect of indicator work is that indicators be developed and used for a specific purpose. For example, in assessing progress towards the goal of conserving biological diversity, data on the number of species, populations, and their distribution can be used as indicators at global, regional, national, and ecosystem levels. If, however, the goal is to assess the most important threats to biodiversity, a different set of indicators would be chosen, such as changes in land use, harvesting rates, and habitat contamination. If the goal is to examine the most important responses on the part of institutions and individuals to conserve biodiversity, an

entirely different set of indicators would be selected, such as public attitudes and the expenditures of government and the private sector on conservation. All of these sets are indicators of biodiversity conservation. They are useful primarily in relation to the purpose they are to serve.

It can also be helpful to distinguish between indicators developed for making policy and those developed to design, manage, and assess outputs and impacts from projects and programs.5 In many cases the indicator that is used to assess the impact of a project aimed at conserving local soils and land -- soil erosion, productivity, land availability and suitability, fallow periods -- are the same indicators that decision makers would use at a provincial or national level to guide policies. However, the methods, sampling techniques, and data processing may be quite different.

Another important distinction is between the development of indicators of environmental conditions -- soils, land, water, wildlife, crops, sanitation, etc. -- and indicators of process. For most countries in Africa, the goal of sustainable development will require increasing crop and food production through increases in productivity (labor and land), while at the same time maintaining or enhancing the quality of the natural environment. To bring about change, at least two conditions have to be met. Farmers, fishermen, hunters, and foresters have to adopt practices that lead to both increases in productivity and long term sustainability of the land and water; and secondly, the policies of local, provincial, and national governments and other organizations have to support adoption of practices. Indicators of adoptive practices and new policies are difficult to quantify in the same manner as natural resource, economic, and social conditions. Other techniques and measurements are often required. These may include documentation of national and provincial laws and policies, measures of institutional support, budgets, employment and training, monitoring, research and development, gender differences, and measures of public opinion and satisfaction.6

Indicators can range from the simplest statistic to complex, aggregated indexes. A simple measure of dissolved oxygen in freshwater ecosystems can be a good indicator of one of the conditions needed to support aquatic life. The concentration of ozone or particulates in urban air can be used to indicate the quality of the air in terms of its impact on human health. Soil moisture and vegetative cover can be a good indicator of the conditions supportive of crop production. The changing concentration of carbon dioxide in the atmosphere is considered an important early warning indicator of potential climate change. More complex indicators summarize conditions across a number of variables, such as the Greenhouse Gas Index. That index is composed of measurements or estimates of the annual net emissions

of major greenhouse gases -- carbon dioxide, methane, and chlorofluorocarbons. These measurements are weighted by the infrared absorptivity of each gas and its effective lifetime, converted to common units, and combined to a single number for each country. Life expectancy, gross national product, and price indices are all indexes of individual measurements which can be used to assess progress toward social goals.

Indicators are indirect measures of goals that cannot be measured directly. In a recent study, staff from the World Resources Institute and the World Conservation Union worked together to identify a set of biodiversity indicators that could be used to assess conservation. It proved impossible to define biodiversity so that its conservation could be indicated directly with a single measurement. It was necessary to redefine the goal into sub-goals for conserving species, genes, and communities. Even with this procedure, no single indicator could be identified for each of these categories. Instead, sets of indicators were developed for each goal. The final list contained 22 indicators.7

Much of this discussion focuses on indicators that are intended to be policy-relevant. By this it is meant that the indicators should be relevant to making policies, but they do not necessarily indicate just what policies should be undertaken or what decisions should be made. For example, an increase in the deforestation rate often suggests that natural forests are being exploited for timber at rates that cannot be sustained over time. However, the policy response will likely be very different if the cause is over exploitive logging, rapidly expanding slash and burn agriculture, or forest clearing for livestock grazing. The indicator here is rapidly deforestation, but the policy response would be different in each case.

Finally, a distinction needs to be made between the development of a (possibly large) set or sets of indicators and a single indicator or index. A single environment index is clearly ideal from the point of view of having maximum impact on environmental policy at a national level: the GNP and the unemployment index play just such a role in economic and social policy. Because of the complexity and variety of environmental concerns, such a degree of aggregation is extremely difficult and, carelessly done, risks being meaningless. For many purposes, it will be necessary to specify a set of goals and link individual indicators to each. This process usually leads to the creation of a set of indicators, be it for biodiversity conservation, environmental quality, resource sustainability, sanitation, or sustainable development. Nonetheless, it is important to seek methods and conceptual approaches that allow aggregation to a few key environmental indicators, if not to one. One such concept is that of grouping indicators into meaningful clusters that can potentially be aggregated into single indices.

B. Policy Analysis Frameworks

A policy analysis framework provides a means of organizing environmental indicators in ways useful for decision-makers and the public. In particular, it provides a way to show cause-effect relationships that link pressures to the state of an environment, the state of the environment to human impacts, impacts to responses on the part of individual households, businesses, and governments. As such, a framework helps policymakers and the public to see environmental problems as interconnected and to design and implement policies that address problems at the appropriate levels.

In the past, a number of analytical frameworks were used to identify, develop, and communicate indicators. These included the media approach (air, water, land, and living resources), which was used to compile indicators of environmental quality and quantity; the goals approach, which was used to select indicators according to legal and administrative mandates, usually at the national level; the sector approach, which examined indicators of environmental impact from the perspective of transportation, industry, urbanization, agriculture, and other sectors. Perhaps the most widely-used framework is the simple pressure-state-response framework, which serves to identify and develop indicators in a way that linked effects (state) with causes (pressures) and the causes and effects with public and private actions (responses).

1. The Pressure-State-Response Framework

A number of national and international organizations have found the pressure-state-response (P-S-R) framework to be a very useful way to select and organize indicators, and one of the easiest to understand and use. Initially proposed by Canadians Tony Friend, David Rapport, and others, the P-S-R framework has been adopted by the Organization for Economic Cooperation and Development and used as a method for organizing chapters in its periodic report "The State of the Environment" and for organizing its 1991 report, "Environmental Indicators, A Preliminary Set".8 In 1991, Canada, using this approach, released "A Report on Canada's Progress Towards a National Set of Environmental Indicators".9 Sometimes a fourth element, impacts, is added. The basic elements of this framework are described below. Also included is a brief discussion of performance indicators.

Pressures. Environmental pressures include both social pressures and natural fluctuations that disturb the environment from baseline conditions. Social pressures on the environment can be divided into underlying (indirect) pressures (such as population growth and type of economic activity -- agriculture, industry, transportation, energy, trade, etc.) and proximate (or

direct) pressures (such as raw sewage discharges into a village or town, or emissions of air pollutants, or over intensive farming of soils). In both cases, the goal is to measure change. Indicators of pressures are essential to help policymakers and the public understand and address environmental issues. Because pressures are the basic causes of environmental problems, they are often the most economically efficient place to attack the problems. In Africa, the data needed to develop indicators of pressures are often easier to obtain than other environmental information.

Environmental States. The state or condition of the environment is one of the main concerns of policymakers. What is happening to the environment and how is it changing? Ultimately, the natural environment is society's life support system. It is commonly divided between renewable and nonrenewable natural resources (forests, farmland, fisheries, water, wildlife, minerals, etc.) and the quality of the three media: air, water, and land. Indicators of the state of the environment include primarily measures of quantity -- amounts of natural resource remaining, for example -- and quality -- the condition of the soil, concentrations of disease vectors in water, for example. Since society may heavily modify the natural environment with agriculture, roads, buildings, machinery, or other products, state-of-the-environment indicators also include such measures as sanitation and housing conditions.

Frequently, standards reflecting important social values are set for state-of-the-environment indicators. For example, the World Health Organization and other national and international bodies set maximum concentration standards for many pollutants in the three media and in food. Although state-of-the-environment indicators are important in themselves, they are most useful to policy-makers and the public when supplemented with indicators of pressures and impacts, which link the cause and effect of changes in the environment.

Environmental Impacts. Environmental impacts are the effects that changes in environmental conditions can have on society. They include health impacts, economic impacts, other socioeconomic impacts, and changes in the ecosystems themselves. Health impacts can arise from exposure to pollutants, increased or new exposure to natural pathogens, disruptions in food supply, or increased risk from other manmade or natural hazards. Indicators include incidence of environmentally related diseases or injury and death rates from hazards. Environmental health impacts are often difficult to quantify because of insufficient knowledge of cause-effect (dose-response) relationships. As a result, health impacts are described as risks. With sufficient knowledge, they are expressed as a ratio between a change in the state of the environment and a change in morbidity or mortality.

Direct economic losses from changes in environmental conditions can be determined by estimating the costs from lost productivity due to health impacts, reduction in agricultural productivity from pollution or soil degradation, depletion of natural resources, material damages, time lost to congestion, and more. (Economic losses are especially difficult to calculate when the underlying biological or physical impacts of changes in environmental quality cannot be accurately quantified.)

Other socioeconomic impacts, often highly subjective and difficult to quantify, particularly in monetary terms, include loss of aesthetic, recreational, and cultural amenities.

Society may also suffer losses through damage to ecological life-support systems. Such losses are especially difficult to quantify because they involve non-marketed goods and services that society takes for granted (for example, the environment's capacity to assimilate wastes) or because the effects of losing these goods and services would only be felt by future generations (for example, mining groundwater reserves).

Response. Response indicators measure what society is doing to deal with environmental problems. Society may respond by reducing underlying or proximate pressures (for example, by installing sewer lines to remove human wastes from inhabited areas), by improving the state of the environment (for example, by cleaning up solid or hazardous waste sites or by reintroducing threatened species or restoring a wetland), or by taking defensive action against impacts (for example, boiling water to kill microbes in drinking water, or changing farming practices).

Response indicators include measures of public opinion, environmental expenditures, environmental licensing and other regulatory actions, incentives, protection and clean-up efforts, research and training, changes in policies and institutions, changes in land use practices, and even information and environmental reporting. As noted above, some of the most important responses -- changes in incentives and policies -- are difficult to quantify.

Performance. Indicators of performance can be taken from any of the above categories. One can use measures of pressure, state, impact, and response as indicators of performance. The key element is the determination of a target. When targets have been set by organizations such as governments, international organizations, and private groups (based in large part on good science and documented practices), then it should be possible to develop and use indicators to assess movement toward or away from the target on a periodic and timely basis.

At this point a distinction should be made between goals and targets. Goals (such as environmental quality and sustainable

and equitable development) are often not strictly achievable, that is, one cannot say precisely when society has reached the goal, although indicators can be used to suggest whether there is movement in the right or wrong direction. Targets are different. Targets can be set and indicators can be chosen to measure progress towards them. Communities, countries, and the world as a whole have increasingly established environmental and development goals that almost everyone agrees with, such as maintaining the global climate within natural fluctuations and conserving biological diversity. However, targets are only set for some of these goals or for some aspects of the goals. There are goals for conserving biological diversity and some countries have set targets for halting the loss of species; others have targets for establishing and protecting remaining habitats.

2. Other Frameworks for Developing Environment and Natural Resource Indicators

Though much of the work on indicators is based on the pressure-state-response framework, there are other approaches, including some that do not fit into this framework.

A framework that is more comprehensive than pressure-state-response but comparable in many ways is that based on mass and material balances. Such an approach tracks the flows of material removed from the environment, transformed by human and industrial activity, and returned to the environment either as waste and pollutant streams or dispersed through dissipative uses. Hard to implement in practice, this approach nonetheless provides a more complete view of the pressures human activity places on the environment.

A number of researchers are using a natural resource and environmental accounting framework to improve and expand existing indicators of economic production, particularly indicators of net national and sector product and capital. Natural resource accounting attempts to improve measures of resource stocks and flows and value. It also attempts to capture measures of degradation and damage. Both of these efforts lead to better indicators with which to make investments in resource management, restoration, production, and investments.10

Another approach is that of ecological sustainability. Here the terminology changes from a human welfare and goals approach to an ecosystems approach. Indicators of stability, irreversibility, integrity, resilience, diversity, and sustainability are suggested for a given ecosystem at various geographic scales. Indicators of nutrient and energy flows, biomass, species diversity, contamination, stress, and other biogeophysical processes are being developed. The most pressing problem with this framework are the "so what" and "who cares" questions. When are indicators of diversity, for example,

meaningful to society and what do changes in diversity tell us? Can changes in ecosystem dynamics be linked to human welfare at scales that policy-makers understand and find useful? One of the most interesting concepts emerging from this work is that of the precautionary principle. It states that where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures.11

Finally, and perhaps most important for this workshop, is a sustainable development framework. Such frameworks are being constructed and used by policy-makers to incorporate a wide set of human values and to develop a new set of indicators. There are two basic approaches to sustainable development indicators: economic-centered and multi-dimensional.

The economic-centered approach looks at indicators of natural and human capital stock. David Pearce and colleagues distinguish between weak sustainability, where growth in human capital can be substituted for natural capital (as long as critical ecosystem services are maintained), and strong sustainability, where growth in human capital cannot come at the expense of remaining total natural capital.12 The principal issues faced by economists and ecologists working in this area are determining measures of critical natural capital and compiling data for all forms of capital. Other economists argue that the main task should be to improve measures of income rather than capital because real income is a better measure of sustainability.

Another critical issue in both the economic and ecological approach to sustainability is to determine the benchmarks, thresholds, or standards with which to judge or determine the sustainable use of a resource. There is a growing body of scientific literature that can be used to help policy makers and project managers set targets for the sustained use of a resource. Micro indicators of rooting depth, soil moisture and texture, vegetative cover, erosion, and other properties of land, water, and soils are being developed (and in some cases combined into indexes) that can suggest targets for land managers. These are the constraints that all farming technologies -- traditional and modern -- have to take into consideration.

The multidimensional approach suggests that policy-makers need indicators (or a single index, if possible) in at least five domains: a natural resource and environmental quality domain, an economic growth domain, a social domain (education, health, welfare), an equity domain (inter and intra generational), and a political rights domain (freedom, human rights, democratic participation). The NESDA proceedings have suggested a seven dimension approach in which population and technology are added.

The Commission on Sustainable Development has prepared a working list of sustainable development indicators. However, the list was so lengthy that the staff was asked to see if the indicators could be aggregated into a set of indices.13

Some experts have suggested a reverse approach to sustainability, the unsustainability approach. If things are getting worse, then the starting point for change is to reduce the rate of deterioration. A trend may be viewed as unsustainable, but without knowing what would be sustainable. The task is, can a few indicators be developed that would at least reduce the rate of deterioration? If productivity is declining, then the first task is to arrest the rate of decline. If remaining natural forests are being depleted at a rate of 1.0% or more per annum, the first task is to lower that rate, while determining what could be a better use of remaining natural forests.

At this point, it may not be essential that any one analytical framework is determined the best, but it is essential that indicators be developed in the context of a framework that supports policy analysis.

3. Issues and Guidelines for Indicator Development

There are seven major issues that need to be addressed in developing better environmental indicators for sustainable development. Guidelines on how these issues may be addressed follow.

A. Purpose and Audience

The most basic issue in indicator development is the need to clearly determine and define the purpose of an indicator and its intended uses. Are the indicators to be used for policy planning, for policy review and assessment, for reporting on the state of the environment, for early warning, for communication to the public, or for managing and assessing impacts of projects, or some other use? Will the indicator be used to allocate resources?

The goals provided by Agenda 21 are an excellent starting point for the development of a new set of environmental and sustainable development indicators. But, it is incumbent on each country, province, and local administrative unit to review its goals and targets. Purposes cannot be delivered from the top, they must emerge through a process of consultation, deliberation, and assessment.

Two frequently identified purposes for indicator development are: the need to assess the changing condition of ecosystems in relation to human welfare and long-term sustainability and the need to measure performance. Are nations achieving the goals and targets they set?

Guidelines for Indicator Development

1. Clarify the purpose of developing a single indicator or set of indicators. There is no perfect set of indicators, but many sets for many purposes and uses.

2. Make use of existing mandates to highlight the growing need for indicators at national, provincial, and local levels.

3. Focus on the needs of policy-makers. Be selective: an important goal is to identify a few useable, meaningful indicators, a minimum set that can be managed and reported easily. It may help to start with "proxy" indicators. One or two key statistics can make a difference. Although there is demand for a single index of sustainable development, progress can also be made one indicator at a time. The process of learning by doing is probably going to be more effective than waiting for the perfect indicator or set of indicators.

4. Base the selection of indicators on instinct as well as on a carefully thought-out rationale. Even better, focus on indicators that work, that are useful.

5. Encourage and support indicator development and use at all levels of government administration and for all major scales of ecosystem function.

6. Continuously assess the need for and usefulness of indicators, particularly in light of changing social values and goals, new technologies, and opportunities for public participation.

7. Assess the use and misuse of indicators and use these results to improve communication as well as selection.

B. Conceptual Frameworks

A number of analytical frameworks are being used to develop and organize sets of indicators. These include the pressure-state-response approach, the resource and ecological sustainability approach, the economic and resource accounting approach, the natural resource management framework, the sustainable development approach, and others. The question is:

What analytical framework is most suitable for the purpose and audience? What analytical frameworks are available and do they incorporate the values and scientific understanding that is needed to select indicators useful for making policy?

Guidelines for Indicator Development

8. Focus on developing indicators that link and relate environmental conditions to human welfare, measured in all important dimensions (economic, ecological, social, aesthetic, other). But, be willing to make use of proxy indicators even if they are based on incomplete frameworks.

9. Develop indicators at geographic scales and for administrative units appropriate to the decisions and policies that have to be made.

10. Integrate development and use of indicators at local, national, regional, and global levels.

C. Standards, Thresholds, and Benchmarks

Establishing standards, thresholds, and benchmarks is a third issue. The standards for determining impacts on human health are better developed than are standards for assessing natural resource sustainability. For example, how much primary forest, wetland, and grasslands can be used (consumed) before major damage is done to the ecosystem and the human societies that depend on it? Can units of ecosystem health be developed and applied in ways comparable to human health and economic development? Can indicator researchers develop a series of scientific rules of thumb (damage functions and benefit functions) that can be used in the interim as they learn more about the resources and the ecosystem functions?

Further, are the right resources being measured by indicators? Mostly, indicators are developed for non-renewable resources (minerals) and renewable resources (agricultural lands, forests, wetlands, grasslands, wildlife, freshwater, and coastal and marine resources), but what of the environmental services that those resources provide? How well are these understood and what indicators can be developed to assess their effectiveness and sustainability?

Thresholds or standards are essential in developing targets, and targets are essential if performance is to be measured.

Guidelines for Indicator Development

11. Encourage policy-makers to establish goals and targets, using the best available information on thresholds and standards.

12. Stimulate research on standards or thresholds. At a minimum, develop a common set of scientific "rules of thumb" that can be used to set preliminary targets for performance indicators.

13. Can healthy ecosystems be defined in terms useful to decision-making? Is this metaphor helpful in determining policy-relevant thresholds and targets?

D. Environmental Monitoring, Data Availability, and Data Quality

Having the data to develop an indicator is crucial. Indicators are based on available data and the best data are available from environmental monitoring and collection programs that are institutionalized and ongoing. However, national and provincial environmental monitoring programs in most African countries are not well developed. Data needed for basic indicators of natural resource stocks and flows (endowments, change, and conditions) are not compiled on a periodic basis; data on ecosystem conditions and services are compiled infrequently; data on pollution and sanitation are also infrequently compiled.

Data are rarely comparable over time (time series) and space (by country and ecosystem), and a considerable amount of basic data is of unknown and undocumented quality.

There are also important issues of gaining access to basic environmental data because of government and private sector requirements for secrecy and privacy and scientific jealousy. And information is costly. Much of the information is in scientific archives, retained by project managers, and stored in computers in donor countries or in regional organizations and is difficult to locate and access.

Guidelines for Indicator Development

14. Wherever possible, be practical and make use of existing statistics in developing indicators. There are frequently informal indicators and traditional information sources that can be tapped. Often administrative files, social surveys, censuses, aerial photos, project information, and other

sources can be used to develop provincial and local indicators.

15. The development and use of indicators for policy-makers will help influence the development and maintenance of environmental monitoring programs. In the long term, the demand will determine the supply of policy relevant data.

16. Support creation of data directories and environmental data reports as steps towards the development of better indicators.

E. Scientific Understanding and Index Development

The best indicators are those based on solid scientific understanding of environmental processes and detailed knowledge of traditional and modern uses of land. Indicators will need to be continually revised and improved, based on new knowledge and understanding of social and natural phenomena and continuous environmental monitoring.

One of the most difficult problems in developing new indices of environmental quality and resource sustainability is the inability to combine disparate data. What is the basis for aggregating parameters (single variable indicators) into indexes? What methods are available and how reliable and valid are they? When and how can measures of soil conditions be combined into an indicator of soil degradation, soil suitability, or risk?

The Netherlands has made a major effort to develop aggregated single indexes to use as indicators of their seven national environmental policy planning themes. They have relied on physical and chemical measures such as potential eutrophication, acidification, toxification, solid waste disposal, local disturbance, ozone depletion, and carbon dioxide emissions. Each indicator is assessed in terms of agreed upon targets. Can similar kinds of indexes be developed for soils, forests, biodiversity, water resources, and coastal resources, which are more pressing environmental and development issues for Africa?14

Guidelines for Indicator Development

17. Expand research on ecosystem services (structures and functions) to better understand linkages between changes in ecosystems and human welfare.

18. There is still considerable effort needed to understand human impacts on natural systems, to determine and quantify cause and effect. Can scientists document land use

practices that sustain soils, water, and wildlife in an African context? Can this information be used to guide the selection of targets and indicators?

19. Scientists and policy-makers speak different languages. What is needed to integrate ecological knowledge and concerns with policy-making rhetoric is a new common currency. Research that combines economic and ecological units of measure, or develops a new integrative measure, will be essential if an indexes of environmental or resource sustainability are to be developed.

F. Communication and Reporting

Unlike scientific indicators, policy-relevant indicators have to reach a much wider audience to be used effectively. They have to fit within a context that the public and policymakers can understand and find useful and meaningful. They have to be understood by educators, the media, and others who communicate directly with the public.

Indicators are usually presented in graphical and map form, are presented to the public on a periodic basis, are presented in a timely fashion and with enough documentation and analytical interpretation so the user can understand the major limitations of the data and the analysis and get a sense of changing conditions and trends, linkages, and policy relevance.

Distribution of indicator reports to the public and the media is costly, and in many countries and cultures this is not the way people get and share news about societal information. While indictor and environmental reports are essential, alternative means of communicating and distributing indicator information to the public are needed.

Guidelines for Indicator Development

20. Ensure distribution and dissemination of indicator information through appropriate indicator and data reports, state-of-environment and sustainable development reports, NEAP assessments and strategy documents, sector studies, bulletins, and other ways of reaching targeted audiences.

21. Support efforts needed to communicate environmental indicators periodically through the news media.

22. Support efforts to conduct performance reviews and assess program impact as ways to increase the demand for and use of environmental indicators.

G. Institutional Arrangements and Information Policies

Underlying the above six issues are the fundamental problems dealing with the policies and institutions of government, the private sector, and the research community. Under growing pressure from the public, government institutions are beginning to establish goals for sustainable development and they are beginning to develop the plans, strategies, and policies that should adjust incentives and, hopefully, lead to changed behavior. Only small efforts have been made to begin to work cooperatively to develop the new environmental and development information that will help guide this process.

Guidelines for Indicator Development

23. Ensure, to the extent possible, that indicators are credible for the purpose and use they are intended. Credibility depends on the quality of the monitoring, the quality of the analysis, and the quality and periodicity of the reporting.

24. Strengthen institutions at national, provincial, and regional levels to develop and report environmental indicators.

4. Strategies for Indicator Development

Outlined below are a number of basic elements of a strategy that governments and governmental bodies (local, national, regional, waterbasin, etc.) in collaboration with universities, NGOs, and other private sector organizations can follow in strengthening their indicator programs.

1. Establish environmental indicator development and use as a high priority within the organization.

2. Provide the policy, institutional, staff support, and technologies required to carry out an expanded work program. One or two qualified staff with access to data, a computer, and duplicator can make a real difference.

3. Link environmental indicator development to economic policy and planning and to the statistical and indicator work of agriculture, energy, industry, transportation, health, demography, and other important sectors. It is essential to encourage experts in these fields to help with the development and institutionalization of environmental indicators.

4. Develop a periodic environmental indicator report or comparable publication. These reports can build on the data and analyses contained in statistical compendia, state-of-environment reports, sustainable development reports, and others. Make sure the reports reach the media. Develop new mechanisms for communicating indicators to the public.

5. Support a research and development effort through workshops, papers, and joint activities with sectoral ministries and research institutes. Support efforts to evaluate the use and usefulness of indicators.

6. Support training workshops and other activities that lead to greater awareness of the use and value of indicators, strengthen analytical capacities, and strengthen institutions engaged in environmental and natural resource monitoring programs.

6. Make a concerted effort to incorporate the ideas and work of subnational governments, NGOs, and private industry.

7. Work with statistical and scientific organizations to develop standard classifications, thresholds and benchmarks, and improve monitoring programs, analytical tools, and other means to better understand the accuracy and reliability of the information.

8. Take advantage of opportunities to integrate environmental indicators in existing plans, publications, and reports of the government.

Developing and using indicators is not new in Africa. Individuals, households, local and national organizations, and regional organizations continually develop and use indicators on a periodic basis.

However, with new information technologies -- computers, software, telecommunications, e-mail, printers -- many organizations can participate in the analysis and reporting of environmental indicators in the context of sustainable development. Indicators can be used to strengthen indigenous democratic institutions and they can help to build increased understanding and awareness of the public.

Appendix 1. References

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Appendix 2. Information Resources

1. Indicator Database for Africa.

In addition to this paper and a paper on biomass indicators, my colleagues and I at the World Resources Institute have compiled an up-to-date set of 55 natural resource and environmental indicator data tables at the national level for all 53 countries and 7 regions in Africa. These are presented here at the workshop in draft form to provide evidence of the considerable amount of statistical information available in Africa on the environment and natural resources. We also very much want your suggestions and comments on how these may be improved over time. A diskette version will be available within two months.

2. Preliminary Indicators for Monitoring Changes in the Natural Resource Base

Starting from the assumption that all land and water projects will have environmental impacts, Fred Weber identifies five categories of resources that should be monitored before, during, and after a project. He also provides information on some of the methods that can be used to develop these indicators.

3. Catalogue of Natural Resource Management Indicators

In support of work with the US Agency for International Development, a Catalogue of Natural Resource Management indicators was prepared. It lists some of the kinds of indicators that can be used to assess impact of projects and programs as well as measures of local resource conditions.

4. Country Data Sampler for Cote d'Ivoire

In cooperation with the government of Cote d'Ivoire and a number of other organizations, we have developed a computerized set of 20 maps at 1:1,000,000 based on the Digital Chart of the World which can be viewed, queried, and printed for use by policy makers. The so-called Country Data Sampler contains maps on infrastructure, natural resources, and demography. These can be used to calculate indicators at the subnational level. A brief description of the CDS is available. A comparable CDS can be developed for each country.

5. 1993 Directory of Country Environmental Studies

A copy of the WRI 1993 Directory of Country Environmental Studies is available in hardcopy and diskette. The Directory provides a listing of all national environmental studies for

Africa and a brief annotation for each. Most of these reports contain valuable information that can be used as indicators.

The Bank's Work on ESD Indicators

A Source Guide

Overview

The Bank uses various channels to document and seek comments on its work on indicators of environmentally sustainable development (ESD). There are formal and informal channels; aimed at technical or generalists audiences; dealing with specific issues or aiming for policy-oriented summaries. This is true for the small team working on indicators in the Immediate Office of the Environment Department (ENV), as well as more generally. This paper pulls together key documentation prepared by the indicator team, as a user guide to its materials.

The quality and availability of systematic data on biological, physical, and sociological aspects of development is very weak. Improving the rigor of measurement and monitoring of environmentally sustainable development (ESD) is a high priority of the the Bank's new ESD vice presidency. ESDVP began allocating significant resources to this effort in FY94, and has established a Thematic Team on Indicators, Methodologies, and Concepts under the leadership of Andrew Steer (Director, ENV).

However, more is involved than devising new sets of tabulated data. Much of the substance of ESD is emerging in text (like environmental assessments and action plans) and geographic information systems (particularly in targeting problems within countries); a major challenge will be to coordinate work among information systems. This implies a work program reaching beyond the ESD Vice Presidency and exploring innovative approaches to information with potential application to other areas of interest to the Bank. For practical reasons, the present effort will work outward from the Bank's Environment Department to devise a knowledge-base that combines indicators, text and geographic information systems (GIS), for use throughout ESDVP and developed with attention to wider Bank use.

This is an ambitious plan. For that reason, near-term goals have been set as well, notably organizing and disseminating indicators and texts already available to the Bank. This should help demonstrate that the Bank is taking a proactive and practical stance on evaluating and monitoring ESD, without losing sight of the fundamental changes that are necessary but also will take time to show results. Background papers on three "legs" of work on a knowledge-base are being prepared (substance, organization of work, and informatics); draft environmental indicators and supporting texts and visual aids will be circulated in early FY95, in electronic as well as hardcopy forms. What follows focuses on tabulated data and the indicators derived from them; separate notes will be prepared on text- and image-oriented efforts for the knowledge-

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base. The possibility of dissemination in a formal departmental series[1] is also being considered, with a working title of Indicating Environmental Sustainability. A new, policy-oriented and data-rich Bank publication, tentatively entitled *Monitoring Environmental Progress* **[12]**, is expected to emerge from this series, in 1995.

Retrospective[2]

During FY94 ENV established a team to work on environmental indicators.[3] After a stock-taking exercise **[1]**, a preliminary framework was devised **[3]** mainly from work initiated elsewhere, since the Bank is more a user than compiler. Consultations with NGOs as well as other international agencies and national authorities followed.[4] A general discussion of these efforts is given in the FY94 edition of *The Bank and the Environment* (repeated below).

ENV's framework for indicators, covering social and economic as well as ecological issues, was recast based on comments received by end-FY94. "Optimally inaccurate indicators," as developed in above-mentioned materials, have been generated at the national level for forestry, biodiversity, subsoil assets, water quality, "green" national accounts, material throughput, global climate change, taxes and subsidies (energy and electricity only); and are well advanced for uses of natural sinks (air pollution, acidification, eutrophication, and toxification). These indicators are being reviewed by outside experts (e.g., FAO on forestry) and in the Bank (e.g., the central forestry team), as much to crystalize plans for further work as to decide what are the best indicators that can be compiled, now.

Indicator work also proceeded in the context of *Portfolio Management, Next Steps*. While the environment is not a sector, the team has been ensuring appropriate components within sectoral efforts, notably forestry and agriculture (land quality) but also urban, transport, water, and poverty. ENV spear-headed work on performance indicators for biodiversity and pollution abatement. A draft report on this work was circulated to the Thematic Team on Indicators, Methodologies, and Concepts in late-FY94 and at the Bank-NGO meeting in May 1994. ENV also manages RPO-funded research into service level indicators which promises better performance monitoring at the project level.

ENV hosted a two week visit by noted indicator expert, Albert Adriaanse, from the Dutch Ministry of the Environment, in late-FY94. This promoted an integrated view of

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[1]For guidelines, see *World Bank Publications Policies and Procedures*, April 1994; particularly pages 41-3.

[2]Taken from ENV's FY94 Retrospective and *The Bank and the Environment*, Fiscal 1994.

[3]The unit comprised John O'Connor, Claudia Sadoff, and (beginning December 1993) Kirk Hamilton with support by Hawanty Permana.

[4]Team members attended the UNEP/UNSTAT Consultative Expert Group Meeting on Environmental Statistics (Geneva, November 1993); IUCN General Assembly (Buenos Aires, January 1994); National Accounts and the Environment Meeting (London, March 1994); IDRC Meeting on Chapter 40 of Agenda 21 (Ottowa, April 1994); UNDP workshop on refining the Human Development Index (New York, May 1994); and a meeting sponsored jointly by the Bank and CIAT on land quality indicators (Cali, June 1994). Numerous meetings in Washington and by telepone have been held on the subject with UNEP, UNDP, UNDPCSD, WRI, Earth Council, WWF, FAO, US Forestry Service, etc. Individual briefings for experts working on dozens of NGO and national efforts at indicators have taken place, with particularly strong ties to US and Dutch efforts.

indicators useful to developing as well as OECD countries, and a clearer sense of next steps. By end-FY94, work was coalescing around a 1-2 day indicator meeting to follow the Annual ESD Conference; at which the Bank would unveil the draft of a policy-oriented glossy publication based on indicator work, with special emphasis on Bank work but placing it in a broader, collaborative context of others' initiative, informatics, map-based indicators, etc.

ENVIRONMENTAL DATA AND INDICATORS. Environmental data and indicators of sustainability are needed to make sound policy and operational decisions about environmental and natural resource management. Yet even in developed countries data are often incomplete or site-specific, making accurate application to the country as a whole difficult. To fill such deficiencies, several Bank efforts have begun in close collaboration with national governments, other international agencies, academia, and NGOs.

- *Frameworks and guidelines*. The Bank is adapting the OECD core set of indicators for environmental performance reviews to the concerns of developing economies. An initial proposal, "Towards Environmentally Sustainable Development," was presented to the IUCN General Assembly meeting in January 1994 and was circulated extensively in the international community. An amended version of the framework is currently being finalized, based on comments received. Like the OECD, the Bank is using its framework both to compile best-available indicators in the short term and to build consensus about priorities for further work. The Bank's framework is designed with rapid assessments in mind. It is considered a complement to ongoing efforts by the Bank and others to promote environmental satellite accounts according to the new UN System of National Accounts and more-rigorous approaches to valuation.

- *Rapid assessments*. On many environmental issues, rapid assessment techniques and short-cut methods have been used to compile an initial set of nation indicators. It is expected that rough baseline figures can be compiled for most Bank borrowers during the next fiscal year. While the results will be too crude for many purposes, they should flag key problem areas, including major deficiencies in basic data collection. New indicators are in preparation for natural capital (with commercial and noncommercial aspects treated separately), deforestation, air and water quality, green per capita income, and an adjustment to measures of saving that includes environmental loss or gain. Where possible the Bank is relying on recent work by others, such as UNDRO's index of natural disasters.

- *Policy-orientation*. Frameworks and rapid assessments are useful for identifying problems, but policy formulation and implementation normally require an additional "bottom-up" approach to data and indicators. These depend on monitoring each ecosystem, which may be subnational or may cross national boundaries. For example, Bank work on land quality indicators will first develop indicators relevant for moist-tropical savannahs, intensively irrigated areas, and overgrazed pastoral zones. For successful project design and implementation, such subnational and regional efforts must be linked to national indicators. The Bank is exploring ways in which technical targets and policy-oriented goals can provide the links, building on techniques pioneered by the Dutch Ministry of Housing, Spatial Planning, and the Environment.

• *Collaboration and capacity building.* Initiatives are under way throughout the international community to help developing economies improve environmental data and indicators. The Bank assigns high priority to ensuring that its indicator work supports that of others, including multilateral, bilateral and research institutions, in order to assist Bank borrowers in planning a balanced approach to environmental monitoring and evaluation.

• *Dissemination.* There are risks in early publication of tentative indicators that may prove inaccurate. However, dissemination of preliminary findings is required since feedback is necessary to improve indicators quickly. The Bank is therefore considering a publication in fiscal 1995 that will contain "optimally inaccurate indicators" to show that available information can shed light on some key policy issues. Besides being produced in the usual Bank paper and PC diskette versions, this publication is expected to be made available over Internet with reader response procedures. Electronic versions will include extensive documentation and the detailed data underlying the indicators.

ECONOMIC VALUATION AND RESOURCE ACCOUNTING. As the Bank works to put into operation the concept of sustainable development, policymakers increasingly ask for help in placing monetary values on environmental impacts. Valuation is a systematic means of incorporating environmental externalities into development decisionmaking. The Bank has three priorities in its economic valuation work: (a) to apply the technique more widely at the project, sectoral, and national levels; (b) to further refine the methodology; and (c) to incorporate a broader range of biological, ecological, and sociological expertise into its methods and results.

1.78 The "state of the art" of valuation methodology is still somewhat primitive. Nevertheless, much can be done, and valuation techniques are increasingly being used as part of project development. These efforts are supported by a training program on valuation methodology for Bank staff and by the production and dissemination of case studies as environmental economics are applied to more and more lending operations.

During the past year applied work in this area has ranged from three economic studies of environmental issues in Chile to work in Eastern Europe on estimating the benefits of reducing sulphur in heavily forested areas. In Chile, the study (one of three mentioned above) applied the principles of environmental economics to evaluating the costs of urban pollution in Santiago, and examined the benefits and costs of reducing transport-related air pollution (largely suspended particulates) and water pollution (from domestic sewage). The sources of pollution were then linked with likely health effects, both sickness and premature death. The cost of reducing the sources of pollution were compared to the physical and monetary benefits of health. The resulting calculations can be evaluated in proposed policy changes and urban infrastructure investments. Plans are being made to use innovative approaches in certain cases---the use of contingent valuation studies to estimate demand for improved water and sanitation services or the use of the travel cost approach to estimate consumer surplus from safari tourism in East Africa. The measurement and economic valuation of the health impacts of pollution control investments are also receiving increased attention. In the past year work in these areas was carried out in Chile, Indonesia, and Mexico.

PERFORMANCE INDICATORS. Compiling sector-specific environmental performance indicators is part of the Bank's plan to improve tools for project performance monitoring and portfolio management information systems. During the year, the Environment Department took the lead in organizing this work directly and through the Thematic Team on Indicators, Methodologies, and Concepts (see above). ENV is proceeding on three tracks.

First, it has detailed and widely circulated a framework for indicators for twelve environmental issues (such as urban environmental quality, forestry, water, and soil) that are important for environmentally sustainable development. This framework was compiled from (a) existing data sources from, for example, the United Nations Food and Agriculture Organization (FAO), the Global Enviornment Monitoring System (GEMS), UNEP, and the World Conservation Monitoring Centre (WCMC); and (b) national level indicators of existing conditions (and subnational level indicators where available, such as in forestry); and (c) information on appropriate targets where there is already serious degradation. Recognizing that there is no internationally agreed framework for environmental indicators, the Bank is using as baseline the OECD Core Set of Indicators for Environmental Performance Reviews.[5]

Second, the Team is circulating this information to sector specialists and task managers of Bank projects. The intention is to get feedback on the relevance of the indicators for specific project sites and adjust the rough indicators to reality.

Finally, in a few areas where environmental issues cut deeply across conventional sectoral lines (for example, in pollution abatement and biodiversity), ENV is developing performance indicators. This work is now in a pilot phase, and while the task is long term and complex, the goal is to make environmental performance indicators routine in project monitoring, as economic and social indicators are. An initial set of national indicators has also been drafted by the GEF, with WRI advice, for biodiversity.[6]

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[5]See *OECD Core Set of Indicators for Environmental Policy Reviews, a synthesis report of the Group on the State of the Environment.* OECD/GD(93)179. Paris, 1993.

[6]See *Guidelines for Monitoring and Evaluation of GEF Biodiversity Projects.* The World Bank: December 1993.

Dissemination Vehicles

ENVDR's indicator team has produced a number of documents that have been circulated widely but informally, outside as well as within the Bank. An even greater number are in the pipeline and likely to become available during 1995. Depending on reactions to materials disseminated at a September 1994 experts' workshop, publication may be warranted as a formal departmental series, with the working title of Indicating Environmental Sustainability. Given outside interest in access to the empirical base for the series) comprising large arrays of tabulated data, map-based information, and supporting documentation), distribution channels presently used for the Bank's socio-economic indicators and related anlyses (e.g., *Trends in Developing Economies*) may need to be extended to environmental factors. Attention may also be required to Bank support in disseminating others' documentation that underpins Bank work.

I. Indicating Environmental Sustainability

1. *Accounting for the Environment*, John C. O'Connor; first draft, August 1993. The first draft was circulated widely in and outside; a redraft will be circulated September 1994. Appendices provide short descriptions of activities bearing on the team's work that are under way elsewhere. These are catalogues by topic and country (with some additional institutional initiatives listed). The main text charts the course for the team, from support to conventional efforts to improve basic data and set standards through to research and dissemination.

2. Environmental Indicators: Draft Training Note, Claudia Sadoff; first draft, October 1993. This is designed as a reference note for Bank staff taking introductory courses on environmental economics, etc.

3. *Towards Environmentally Sustainable Development: Monitoring Progress*; John C. O'Connor, first draft, January 1994. The first draft was presented to a workshop at the IUCN General Assembly in Buenos Aires, January 1994 and will be issued in the proceedings; it has been reprinted in *Information and Agenda 21*, a report by Canada's International Development Research Centre on an informal consultation on environment, development, and information (April 11-12, 1994, in Ottowa). A redraft is being prepared as the covering document for technical papers on forestry, water pollution, etc., to be distributed at the Meeting on Indicators and Informatics for ESD; September 22-3, 1994.

4. *Environmental Indicators: What Can They Tell US?*, Claudia Sadoff, February 1994. Distributed widely within and outside the Bank as Environment Dissemination Note Number 5, it provides a brief, general discussion of environmental indicators.

5. *Green Alternatives to GDP*, Kirk Hamilton, March 1994. Presented to the meeting of the London Group on National Accounts and the Environment, March 16-18, 1994, London. Examines policy uses for 'green' national accounting and the literature on this topic. Presents

a series of models of green accounting designed to highlight particular aspects of resource depletion and environmental degradation, then discusses issues of measurability and applicability.

6. *Genuine Saving and the Financing of Investment,* Kirk Hamilton and John O'Connor, May 1994. Widely circulated inside and outside the Bank. Describes the decomposition of the financing of investment in produced assets into net foreign borrowing, depreciation allowances, and depletion allowances. Argues that the measure of genuine saving is traditional net saving less the value of depletion of natural resources. Presents regional (and other aggregate) graphs of the path of per capita income as well as the components of the financing of investment, including genuine savings.

7. *Environmental Policy Performance Indicators*, John C. O'Connor; first draft, May 1994. The first draft was circulated within the Bank (via the Thematic Team on Indicators, Methodology, and Concepts) and beyond (notably through the Bank-NGO meeting in May 1994). It outlines a procedure that uses nation-level indicators for environmental issues (starting with forestry, biodiversity, water quality, and air pollution) to facilitate the dialogue between the Bank's central and operational units about priority areas for performance monitoring; and describes central supports for deepening work on performance indicators as priorities are agreed. A redraft will be circulated in Fall 1994, incorporating comments from operational units and further work in the center.

8. *Making Natural Resources Count,* Kirk Hamilton with assistance from John Dixon and Claudia Sadoff, May 1994. Distributed widely within and outside the Bank as Environment Dissemination Note no. 6, it discusses current issues in natural resource accounting, including valuation methods. It presents the theory and one example of measuring 'genuine' saving, accounting for the depletion of the environment; and describes alternative policy uses of natural resource accounts.

9. *Environmental Accounting for Decision-Making,* Kirk Hamilton, July 1994. Prepared for an OECD meeting on this topic in September 1994. Classifies the different broad approaches to environmental accounting. Presents an assessment of the potential uses for these varieties of accounts in decision-making. Reviews recent documents from OECD countries in order to tabulate the stated purposes of the green accounting programs of these countries, with particular reference to uses in decision-making.

10. *Monitoring Progress on Sustainable Development*, John C. O'Connor; August 1994. Prospectus for a meeting to take place September 22-3, 1994 as an Associated Event for the Bank's Second Annual ESD Conference.

11. *Rapid Assessment Methods: Filling the Data Gap*, Kirk Hamilton. Presented to the workshop "Accounting for Change-A network seminar on sustainable development indicators" at the New Economics Foundation, October 12-14, 1994, London.

Texts in Progress

12. *Knowledge Tools for ESD*, John C. O'Connor; first draft, August 1994. Given that monitoring and evaluation requires a variable blend of texts, visual aids (maps and charts), and tabulated date, how should it all be packaged for decision-makers? Without attempting a full answer, this paper gives a vision of what can be done in the near-term; essentially with existing technology; and with roughly the current budget envelope, in global terms and allowing for some redirection from duplicative efforts to "missing links."

13. *Monitoring Environmental Progress*, ENV team; first draft to be circulated at an associated event for the Bank's Second Annual ESD Conference, September 19-21, 1994; on Indicators & Informatics for ESD. Envisaged as a policy-oriented summary document, the first draft will explore each of perhaps a dozen key issues with a double-page text followed by two pages of maps, charts, etc. Supporting technical documents will be noted and provided on request.

14. *Global Approach to Environmental Analyses*, ENV team; first draft to be circulated in early 1995. This document is envisaged as the technical underpinning of empirical work given in the *Progress* report [12]. *GAEA* will initially bring together technical work already done (as described above) and those likely to emerge first as room documents for the September 1994 meeting on Indicators & Informatics. The timing and periodicity of *GAEA* as a Bank publication will depend on when these materials reach "critical mass" and how much interest there seems to be in them. Consideration is being given to electronic dissemination, possibly via Internet as well as PC diskettes. Technical documents in preparation, which may be available by September, include:

* Water Quality - September, 1994; Tariqul Khan (IECSE), Claudia Sadoff (formerly ENVDR), and ?. Documents sources and methods for broad measures of water quality, building on the chart for biological oxygen demand (BOD) in *WDR92* (page 46). It updates and refines *WDR92*; it shows results of similar procedures applied to faecal coliform, where the range of plausible estimates is shown to be markedly greater. Efforts are being made to include information on access to safe water, updating the relevant chart from *WDR92* (page 47).

* Pollution Monitoring & Evaluation - September 1994; John O'Connor & Philip Bogdonoff (ENVDR). Builds on the Water Quality study by documenting sources and methods for broad measures of air quality charted in *WDR92* (pages 51 and 54); identifying major weaknesses in such measures even at the scale of low-, middle-, and high-income economies; and indicating directions for improvement currently under study at the Bank. It will explain that the weaknesses, in particular a lack of spatial acuity, are hardly unique to air pollution but do tend to become overwhelming on this issue. It will expand on relevant text from [7], above.

* Forestry - September 1994; Kirsten Canby (ENVDR) & David Cassells (ENVLW). Provides the first publication of subnational data on tropical forests that underpin the FAO's Forest Assessment 1990, apart from dissemination through [7] above; together with latest

available national estimates for other countries; and discusses the problem of inter-temporal comparison given the decadal process of assessments currently used for international benchmarking.

* Metals, Minerals, & Energy - October 1994; John Kellenberg (ENVDR) & Grecia Matos (US BLM).

* Valuing Natural Resources & Habitat - [Fredrick van Bolhus, WRI, John O'Connor] Essentially an expansion of relevant text from [7], above.

* Climate Change & Global Warming - [KH & Charles Feinstein]

* Environmentally-Related Policy Tools - Builds on Economywide Policies Paper of ENVPE. Recent years have seen the adoption by a wide variety of developing and developed countries of significant policy changes affecting the environment, with a new emphasis on the efficiency gains made possible by harnessing market forces. Some of these changes fall under the heading of correcting existing distortions or righting policy failures; others are more explicitly aimed at protecting the environment and improving the management of natural resources. Chief among the former are schemes to eliminate subsidies on the use of energy, water, fertilizers and pesticides, reducing the consequent deleterious effects on the environment, but also important are the extension and entrenchment of property rights and exploitation rights for natural resources and the elimination of policies that encourage agriculture extensification (rather than intensification). Innovations have been seen in controlling access to common-property resources, such as fishery permit schemes. And encouraging new initiatives have been undertaken in the application of emission charges and marketable emission permits as the means to meet targets for environmental quality, the introduction of user charges for waste collection and disposal, and road charging schemes for reducing both congestion and pollution. Preliminary work will appear in the *Progress* report [12] discussion of taxes and subsidies but a well-articulated document is unlikely before 1995. (Possible sources of information: Bank country experts, OECD, CSERGE).

II. Making the Empirical Base More Accessible

Outside analysts are often at least as interested in having access to the basic information collected by the Bank as in obtaining its analysis and summary measures. This is true even where data sources and methods are relatively well known, like national accounting as summarized in Gross National Product (GNP), etc. The demand for access to underlying details is all the more understandable in the rapidly evolving field of environmental indicators. Mindful of this, the Bank is taking steps to match and in some ways exceed the disclosure guidelines that have been applied to social and economic indicators:

1. EI.STARS - A set of perhaps 100 ESD indicators will be made available using the Bank's popular PC diskette system, Socio-economic Time-series Access & Retrieval System (STARS). It will focus on nation-level indicators used in compiling the *Progress* report [12, above]. It will

include, in the form of annual time series where possible, measures of forest cover; national habitat; "green" variants on GNP and conventional measures of saving; first crude estimates of the wealth of nations; etc.

2. CD-ROM & Internet - Deliveries via higher-level technologies will accompany EI.STARS with a variety of environmental texts like *WDR92*, *The Bank and the Environment* (Fiscal 1994), the *Environmental Assessment Sourcebook*, *Environmental Data Sheets*, etc.

3. Bank Statistical Publications - Recent years have seen the addition of environmental indicators to the Bank's established statistical publications (*World Development Indicators*, *Atlas*, and *Social Indicators of Development*, in particular). This is expected to continue.

III. Related Documents

The Bank is but one of many units working on ESD indicators, whether narrowly or broadly defined. For example, the UN Statistical Division (UNSTAT) is the lead international agency if the narrow definition (basic data, statistics, and methodologies) is taken; the Bank has collaborated with UNSTAT on many aspects of this work. Or, for the broad concept of monitoring and evaluation (and probably for broad-guage ESD indicators), the UN Commission on Sustainable Development is the lead international agency. Each has established procedures, including inter-agency reporting process, and generates relevant documentation which is catalogued by the appropriate agency and need not be repeated. What is needed here, however, is acknowledgement of documents prepared by others, mostly by other Bank units, which either provided springboards for work by ENVDR's team, or met the team's standards for the kind of information it is committed to providing.

1. Assessing the Bank's Environmental Information, WRI study commissioned by ENVLW; August 1994. Based on interviews with Bank staff in various positions, consultants identified areas where the Bank's environmental monitoring and evaluation could be improved most efficiently with better attention to existing information sources. It also made recommendations about the leadership role the Bank might play in ensuring general improvements in work on ESD indicators and informatics, improving Bank access to information as a major by-product.

2. Land Quality Indicators (LQI) - Ann Hamblin, etc., study commissioned by AGR; first draft May 1994; second draft in preparation after June inter-agency workshop in Cali, Colombia. Provides a general discussion of LQIs and then offers detailed "menus" for three categories of land (tropical acid savannahs, intensively irrigated lands, and over-grazed pastoral settings).

3. Evaluating and Monitoring Biodiversity for GEF Projects - GEF, January 1994. Provides a concise review of the how's and why's of monitoring and evaluation, tailored to biodiversity but with more general relevance. The appendices on specific areas for indicator work are useful although still lacking in criteria for deciding which areas deserve highest prioritie, under which circumstances.

4. Industrial Pollution Projection System - David Wheeler, 1993.

5. Decision Support System for Pollution Control - Iona Sebastian, draft of 1994.

6. GEF-WRI draft paper on global shares of natural habitat.

7. Composite Indicators - IECSE's evaluation of highly aggregated indicators, where the principles for aggregation are pragmatic rather than conceptual.

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TOWARDS NEW FUNDAMENTALS

H. JACK RUITENBEEK

Canadian Environmental Advisory Council

INDICATORS OF ECOLOGICALLY SUSTAINABLE DEVELOPMENT

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Canadian

Environmental

Advisory

Council

Indicators of Ecologically Sustainable Development: Towards New Fundamentals

H. Jack Ruitenbeek

November 1991

Enquiries concerning the work of the Council and requests for Council publications should be addressed to:

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The Canadian Environmental Advisory Council

The Canadian Environmental Advisory Council (CEAC) is a body representing a cross-section of Canadians who are knowledgeable and concerned about the environment. It operates in a confidential advisory capacity to the Minister of the Environment. It provides the Minister with an alternative to the advice provided by the Department of the Environment and other federal agencies, and to the advice of specific interest groups. CEAC's public role, in terms of activities such as the publishing of reports, is therefore secondary to its primary function of advising the Minister of the Environment.

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Canadian Environmental Advisory Council
Conseil consultatif canadien de l'environnement

November 14, 1991

The Honourable Jean Charest
Minister of the Environment
Ottawa (Canada)
K1A 0H3

Dear Mr. Charest:

I am pleased to submit the third in a series of three reports by the Canadian Environmental Advisory Council on the subject of Indicators of Ecologically Sustainable Development. The report describes what are called "five new fundamentals" that should be reflected in the next generation of decision support indicators. The fundamentals are intended to be used to build upon existing approaches to reporting environmental information in a way which will increase the relevance of such information to senior decision-makers.

The Council's work on indicators has extended over a period of almost two years. It is clear from our investigations that designing indicators of ecologically sustainable development is a very challenging task, and it will take many years of concerted effort to develop a full set of policy-relevant indicators. Nevertheless, this is a very important task and we encourage you to continue to support and lead the work that is being done within Canada and internationally.

Please accept our best regards and our commitment to further service on your behalf.

Sincerely,

Robert Page
Chairman

Canada

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Acknowledgments

The writing of this paper has a rather unusual history. The first version consisted only of an abstract stating the "five fundamentals". The second version consisted of a "summary paper" that provided some elaboration of each of the fundamentals. This second version was subsequently expanded to provide more details on the derivation of the fundamentals, as well as examples of how they might be applied. Each of the versions came under substantial scrutiny, and the author is indebted to those who provided input and comments.

In particular, the author thanks Shirley Conover, Joseph Potvin, Ken Ogilvie, Tony Friend, Susan Holtz, and Stan Rowe, all of whom made substantial comments on the earlier versions. The reader is reminded, however, that any opinions and conclusions expressed herein are the responsibility of the author, who also takes full responsibility for any errors of commission or omission.

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Preface

The Canadian Environmental Advisory Council (CEAC) began work on the subject of sustainable development indicators following the July 1989 meeting of leaders of the G7 summit nations. At this meeting, Prime Minister Brian Mulroney proposed that indicators should be prepared that link economics and the environment, and assess the compatibility of economic development and the protection of the environment, leading to sustainable development. The proposal was endorsed, and a recommendation was made that the Organization for Economic Cooperation and Development examine how selected environmental indicators could be developed, in the context of its work on integrating environmental and economic decision-making.

During the second half of 1989 and early 1990, CEAC reviewed studies and literature on economic and environmental indicators. Two important conclusions were reached. First, the most immediate target audience was identified as the senior policy-makers and economic analysts playing key roles in government, corporate, and development agency planning and decision-making processes. Second, since this target group relies heavily on economic analysis and resulting indicators, CEAC needed to examine how economic analysis systems could be broadened to incorporate sustaining environmental resources and life-support systems. CEAC's premise was that these indicators would be used in policy- and decision-making at the highest levels of government and industry.

Since both economics and sustaining the environment were involved, the search for indicators generated discussions with leading economists and ecologists in Canada. In addition, CEAC met with staff at the United Nations and the World Bank. These investigations led CEAC to the conclusion that the development and effective use of indicators depend largely on the economic, ecological, and political paradigms subscribed to by decision-makers. Integrating economic and environmental decision-making is complicated not only by incomplete knowledge and information, but also by different theories and assumptions of economics and ecology, as well as constraints imposed by decision-making processes.

To examine the complex issues relevant to indicators of sustainable development, CEAC decided to host a two-day workshop. CEAC invited leading representatives of various schools of thought in economics and ecology together with senior Canadian policy- and decision-makers to explore the question: **How do the conceptual foundations of economics and ecological analysis shape the indicators that will motivate policy in the 1990s?**

To stimulate discussions at the workshop, three delineation studies were commissioned. The first two describe the major alternative schools of thought in economics and ecology, and comment on how these schools propose to deal with the new sustainable development policy agenda through concepts such as 'natural capital' and 'ecological integrity'. The authors outline some of the implications for preparing indicators of ecologically sustainable development. The third study examines decision-making processes and the further complications that they introduce into the design and choice of indicators. This third study also contains an appendix that evaluates several economic analysis systems for their ability to incorporate environmental factors.

In July, 1990, close to 40 experts and senior decision-makers assembled at a workshop hosted by CEAC in Ottawa. Conceptual debates centred around the three delineation studies, while more practical discussions were held on taxation, measurement, and investment. Following these discussions, the participants identified five areas of particular significance and focused discussions were held on: regenerative capacity; pricing and taxation; ethics; worst-case scenarios; and natural capital.

The July workshop was an intellectually rigorous event that stretched the parameters and perspectives on sustainable development to their limits. The discussions were recorded in an extensive set of workshop proceedings prepared for the participants. In addition, CEAC decided to publish three documents under the general title of *Indicators of Ecologically Sustainable Development*:

1. Economic, Ecological, and Decision Theories
2. Synthesized Workshop Proceedings
3. Towards New Fundamentals

The first document contains the three delineation studies prepared as background papers for the workshop. The second document synthesizes the workshop proceedings, bringing

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together the array of ideas and insights contributed by the participants. The third document is a distillation of the findings and sense of the workshop, as well as the work done by CEAC since July 1989 on indicators of ecologically sustainable development. It identifies five new fundamentals that should be reflected in the next generation of decision-support indicators. These fundamental principles significantly extend existing approaches to reporting environmental information, and they form part of the longer-term agenda for developing policy-relevant and operationally useful indicators.

CEAC's role in developing these indicators is first and foremost to advise the Canadian federal Minister of the Environment on the appropriate scope and direction of work in this area. While avoiding duplicating work on indicators being done by other groups, CEAC has benefited from the generous sharing of information by Environment Canada, Statistics Canada, and the National Round Table on the Environment and the Economy. The Council is not mandated to conduct ongoing research on a given subject. Hence, the three documents published represent a conceptual and, we hope, pragmatic contribution to the work being done by Canada and other nations on finding ways to integrate economic and environmental policy- and decision-making.

Author's Foreword

The Canadian Environmental Advisory Council (CEAC) has over the past year been responding to both international and domestic needs to develop indicators which link environment, economics and social equity to serve the purposes of a wide spectrum of decision-makers. Through looking at ecological issues, economic issues, and issues in decision-making itself, this paper identifies five new fundamentals which should be reflected in the next generation of decision support indicators. Indicators should:

a) reflect a ***broader scope*** — the economy and human behaviour within it should be acknowledged as a subset of the broader ecosystem which supports them;

b) reflect ***distributive elements*** which are important from a social equity viewpoint — incidence of both the costs and benefits of environmental degradation on various income and interest groups, for example, should be explicit;

c) have applications as a forward-looking ***projective tool*** rather than just a descriptive tool for monitoring current or past conditions;

d) reflect ***explicit linkages*** between human economic behaviour and the degree of vigour and productivity of the broader ecosystem; and,

e) recognize the ***inherent uncertainty*** in ecosystem behaviour and responses.

All of these fundamental principles represent significant extensions to existing approaches to reporting environmental information. Environmental indicators such as those included in the Environment Canada report provide a good base which, augmented by additional analyses, transforms them into indicators which do reflect the principles of sustainable development. One such augmentation might include, for example, an indicator which shows average water quality available to the poorest segments of a country's population.

In some cases, additional research and improvements to the current state of ecosystem science are required to generate such information. However, much of this information can be presented using currently available analytical techniques. A number of the tools of applied economics, for example, are well-suited to analysing problems dealing with distributive questions, behavioural projections, and uncertainty. The current challenge is in receiving more widespread political endorsement of the principles enumerated in this paper.

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1 Introduction

Background and Purpose of Paper

Over the past year, the Canadian Environmental Advisory Council (CEAC) has been responding to both international and domestic needs to develop indicators to assist decision-makers in working towards a society that embodies the principles of sustainable development. The need for such indicators was identified — among other initiatives — during the 1989 G7 summit, and Canada has continued to maintain a leading role in addressing this challenge.

In addition to recognizing the practical applications for which indicators of ecologically sustainable development (ESD) will be designed, CEAC has addressed the theoretical underpinnings of the economic, ecological, and analytical systems which might define ESD indicators. A number of independently authored papers were contracted by CEAC to survey approaches to some key issues in these areas. These, in association with other relevant background materials developed outside of CEAC, were used as a starting point for extensive discussions between economists, ecologists, and decision-makers in a participatory workshop held during the summer of 1990.

Ensuing discussions and documentation have provided a rich array of practical insights which are useful for defining and designing practical indicators and techniques for their interpretation. The workshop proceedings and its background papers provide an important objective record reflecting a wide diversity of well-informed opinion and experience.[1] The background papers surveyed issues relating to economic theories of resources and environment, ecological theories of ecological integrity, and decision theory, and described how different theoretical paradigms could lead to different approaches to designing indicators. While drawing material from and discussing these background papers, the workshop also explored the use of ESD indicators in selected applications in: (i) project appraisal for the financing of conservation investment, (ii) resource and environment provisions in taxation, and (iii) resource and environment adjustments in economic accounting. Intensive discussions of five core issues — regenerative capacity, ethics, pricing, natural capital, and worst-case scenarios — were also held during the workshop.

As the workshop was designed to explore and understand the differences among various schools of economic and ecological thought, a consensus was neither sought nor reached regarding the many individual technical issues. But some clear messages relating to the *principles* of indicator design did emerge as a result of the discussion. The purpose of this paper, therefore, is to describe these principles and how they emerged from the various individual key technical issues. Not all of the issues raised at the workshop are discussed in this paper; the specific issues dealt with are intended to provide a representative selection of those which clearly contribute to the principles.

While this paper is based on a synthesis and analysis of all of the material available to CEAC, it contributes to a broader context of international efforts to design meaningful ESD indicators. In particular, the principles can form a basis for augmenting environmental indicators such as those included in the Environment Canada report.

Key Issues and their Linkages

As illustrated in Figure 1, key technical issues were generally discussed from four different angles during the workshop. First, technical issues dealing with indicator *demand* broadly looked at the manner in which ESD indicators are used by different decision-makers. Second, issues reflecting indicator *supply* looked more closely at the practical constraints and theoretical premises for designing indicators: a key premise of this work is that different economic, ecological and political paradigms will generally generate different conclusions of what appropriate specific ESD indicators are. Third, various *analytical techniques* were addressed to assess whether different techniques have different information requirements, and to identify those techniques which might be most appropriate for making the technical possibilities of indicator "supply" somehow meet the actual "demand" for indicators. Finally, to underline the linkages

[1]The background papers are published in CEAC (1991), *Economic, Ecological, and Decision Theories: Indicators of Ecologically Sustainable Development*, CEAC: Ottawa. A synthesis of the workshop material is provided in Potvin, J.R. (1991), *Indicators of Ecologically Sustainable Development: Synthesized Workshop Proceedings*, CEAC: Ottawa.

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Figure 1.
KEY ISSUES IN ESD INDICATOR DESIGN

Indicator "Demand" Issues
How are indicators used?
Who uses indicators?
How much information is required?

Indicator "Supply" Issues
How is social equity captured?
How is ecological sustainability captured?
How is economic sustainability captured?
How are the linkages reflected?

Tools of the Trade
Are our analytical techniques adequate?
Can we reflect risk and uncertainty?

Indicators in Policy Design
What is the most critical policy focus?

between these issues and their ultimate applicability to policy decisions, some discussion was held relating to what the most critical *policy focus* should be in designing ESD indicators.

Five New Fundamentals

The specific technical issues are generally open to wide interpretation and a plurality of views. All of these views have, to varying degrees, sound justifications; yet divergence of opinion is not uncommon. Hence, at times there is little basis for agreeing that some types of information are better than others in capturing the essence of sustainable development. Some important lessons nonetheless arise from this divergence of opinion: lessons which have important implications for the broad approach to designing ESD indicators, even though they provide no explicit judgment on which underlying economic or ecological theory is most appropriate. These lessons are embodied in five "new fundamentals" for ESD indicator design, as summarized in Figure 2.

It is important to realize that these "new" fundamentals are not intended to replace any existing principles of ESD indicator design; there are, by and large, no existing principles to replace. The new fundamentals do, however, demand an augmentation to many of the current initiatives which are being undertaken to design indicators. In short, these fundamentals will generate a richer information set for decision-makers.

Overview of Paper Contents

This paper commences with a broad look at the principles of the "new fundamentals", focusing on some of their key elements and how they are relevant in a policy context. It then discusses how each of the main technical issues contributes to the conclusion that these principles are important and independent of the technical disagreement which can and does arise in specific indicator design. Next, the discussion examines these fundamentals in the context of some specific example indicators. From this, the paper concludes with a description of the next steps which might be taken in applying these fundamentals.

It should be noted that, throughout this paper, example indicators are sometimes provided to illustrate particular concepts. The specific indicators used, however, should be regarded as illustrative only; their use as an example does not represent an endorsement or suggestion that these specific indicators are the most appropriate from either a scientific or an economic perspective. The specific examples primarily illustrate how an existing indicator can be extended into *one potential set* of indicators which more completely reflects the five fundamentals. More research, in many cases, will be necessary to determine the *most appropriate set* of indicators.

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Figure 2.
FIVE NEW FUNDAMENTALS FOR ESD INDICATOR DESIGN

A *Broader Scope*
ESD indicator design must acknowledge that the economy and human behaviour are part of a broader ecosystem which supports them.

Distributive Elements
Social equity — in terms of the incidence of costs and benefits — must be an explicit component of ESD indicators.

Projective Applications
ESD indicators must be useful for forward-looking applications and not just descriptive of past or current conditions.

Explicit *Linkages*
Drawing connections between human economic behaviour and broader ecosystem health is a vital function of ESD indicators.

Inherent *Uncertainty*
Unquantifiable uncertainty in ecosystem behaviour and response requires that ESD indicators must explicitly communicate such uncertainty to decision-makers.

It is significant that two complementary perspectives seem to be implicit in developing the five fundamentals discussed in this paper. First, they are a manifestation of what can best be described as a more *global outlook* to achieving sustainable development. Holistic approaches to policy identification and decision-making — those which recognize the interdependence among different components of global systems — are becoming increasingly important and underlie the derivation of these fundamentals.

Second, and of key relevance to what is often a very technical area, the five fundamentals recognize that we are ultimately trying to provide *information* for ecologically sustainable development. Although the term "ESD indicator" is still used in this paper, the time is perhaps approaching when we will be better off to dispense with the sometimes restrictive connotations of the term "indicator" and replace it with the more appropriate term: "information".

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2 A First Look at the Fundamentals

Introduction

By concentrating on fundamental principles of indicator design rather than on specific indicators, it is intended that all indicator design efforts — irrespective of their theoretical basis — be directed towards capturing these principles. Substantial effort is being put towards indicator design in many disciplines; it will largely be incumbent on each discipline, and on each individual working in the field of indicator design, to reflect on how these fundamentals can best be applied within their particular areas.

Before showing how the five fundamentals are derived, it is appropriate to look at each one briefly: (i) to illustrate their policy relevance; and, (ii) to expand on some issues of definition which cut across all of the fundamentals. This will also allow the reader to see how the fundamentals arise as the different technical issues are discussed in subsequent chapters. Although some policy issues are addressed here, the policy framework will be revisited in greater detail in Chapter 6.

Answering the Key Policy Questions

From a policy perspective, the five key fundamentals are particularly relevant as policy-makers are currently faced with heightened demands to implement policies that are consistent with principles of ecologically sustainable development. When applied to indicator design, as shown in Figure 3, the five fundamentals are a natural extension of traditional approaches to typical questions of importance to those concerned with public policy formulation.

Fundamental 1: A Broader Scope

The first policy issue, that of *where* society and humankind stands in relation to the broader global ecosphere, has traditionally been largely ignored: policies focused on ensuring that humanity's immediate needs were met. It is increasingly obvious, as the availability of natural resources and environmental functions often constrains what can be done, that human behaviour is part of a broader ecosystem which supports humanity's needs. Indicators which are to be useful must therefore reflect this *broader scope*. A key corollary to this is that we acknowledge that humanity's long-term needs require the existence of healthy ecosystems, and that we start paying explicit attention to the well-being of these ecosystems.

Fundamental 2: Distributive Elements

The second policy issue, that of *who* is affected by conditions such as environmental degradation, has also traditionally not been addressed to the required degree of detail. Environmental degradation is typically reported in aggregates on the basis of regional information; a separate set of social equity indicators might be used to reflect social conditions in that region, but these equity indicators are typically not reported in the same framework as the environmental information. The second fundamental of indicator design thus demands that social equity concerns are reflected in all ESD indicators and that, appropriately, *distributive* information becomes an integral part of indicators. It is not uncommon for economic information to be presented in this way; Canadians learned in early 1991 from Statistics Canada, for example, that of the poorest fifth of the population, 16% owned gas barbecues, and that of the richest fifth of the population, 71% owned gas barbecues. We also know that not all Canadians have access to safe water. What is less obvious, however, is how access to safe water depends on income. Do the poor have less access? Is it getting worse? Such questions — of key policy interest during a time when social equity is one of three cornerstones of sustainable development cited by the Brundtland Commission — can only be answered if indicators explicitly reflect such distributional aspects.

Fundamental 3: Projective Applications

The third policy issue, that of *when* things will happen, has traditionally been dealt with by concentrating on existing or past conditions through "bottom-line" indicators. This has often been adequate when policies were largely concerned with *reacting* to existing conditions. But policy-makers are now often being pressed to implement *proactive* policies which are meant to prevent or produce specific effects at some future date. This requires that information made available to policy-makers will also be useful in a *projective* mode. The various types of "projective applications" are explored in further detail below.

Figure 3.
SOME KEY POLICY QUESTIONS:
DERIVATION OF THE FUNDAMENTALS

	Traditional Approach to Indicators	An Augmentation: New Fundamentals
Where are we in relation to the whole?	We concentrate on the immediate obvious needs of humanity.	We adopt a *broader scope* and acknowledge that humanity's longer-term needs require maintenance of the ecosphere.
Who is affected by events?	We concentrate on aggregated information; social equity concerns are captured by separate aggregates of information.	Social equity concerns are reflected in all indicators; *distributive* information becomes an integral part of indicators.
When will things happen?	We concentrate on describing existing or past conditions through "bottom-line" indicators.	We extend our descriptive approach to a projective mode.
What will happen if...?	Indicators generally concentrate on linkages between different types of economic activity.	We extend the indicators to capture the impacts of economic activity on broader ecosystem health.
How good is our information?	Descriptive indicators are assumed to be precise; imprecision is captured through quantifiable risk.	Projective indicators must reflect ecosystem uncertainty.

Fundamental 4: Explicit Linkages

The fourth policy issue deals with identifying and describing the various existing cause-effect relationships. The "*what if?*" question is being asked more frequently in a context where policy-makers are faced with a multiplicity of instruments. Traditional approaches to indicators have focused on linkages between various types of economic indicators: conjectured relationships between interest rates and employment, for example, assist policy-makers in knowing how restrictive monetary policy might exacerbate unemployment problems. Information relating to such linkages has been important to informed decisions regarding "tradeoffs" between sometimes conflicting goals. By the same token, a fundamental principle for designing ESD indicators should be that policy-makers be aware of the *explicit linkages* existing between economic activity and broader ecosystem health.

Fundamental 5: Inherent Uncertainty

Finally, the fifth policy issue, *how* good the information is, has traditionally been ignored when reporting indicators. Information is usually represented as being precise and, where imprecision exists, quantifiable ranges of risk might — albeit rarely — be presented. But an inherent aspect of ecosystem behaviour and response is that of unquantifiable uncertainty; this uncertainty will persist even as scientific understanding of complex systems improves. On a warm morning we are quite content to take a heavy coat to work if the radio announcer warns that there is a 20% chance of snow and that evening lows might be anywhere between 5 degrees above and 5 degrees below freezing. Yet in policy design it is not uncommon to hear decision-makers demand precise indicators before actions are taken. This demand for precision is, among other factors, a remnant of the traditional approach to representing indicators (and economic indicators in particular) as precise. This

traditional approach is not appropriate where complex ecosystems are concerned, and a final fundamental principle for designing ESD indicators must therefore be that they reflect this *inherent uncertainty*.

The Holistic View and Ecosystem Health

Many of the fundamentals have some reference to the broader ecosphere and its "health". We seek indicators which allow us to project how the ecosystem's health may be affected by our activity. We seek indicators which reflect the uncertainty of how healthy the ecosystem is. All of these cases represent an acceptance that we must adopt a *broader scope*: a more holistic scope which acknowledges that the economy and human behaviour within it are part of a broader ecosystem; a scope which recognizes that ecosystem health is a necessary precondition for the future health of humankind.

But at this stage, the natural sciences are still in their infancy in terms of their ability to describe ecosystem behaviour or responses. Further, there is little consensus of what terms such as "environmental integrity", "ecosystem maintenance", or "ecosystem health" mean at a technical level which can be described by specific indicators. However, analysts are increasingly aware of the fact that important dimensions of the problem can only be addressed through investigating the behaviour of the broad ecosystem rather than only small sub-components of such ecosystems. Complex systems — including ecosystems — tend to evolve and organize themselves continuously; their capacity to do so is important to their continued survival under a variety of stresses. To this end, we can start to think of "ecosystem health" as that which reflects the vigour and productivity of the broader ecosystem and, in particular, its ability to maintain its self-organizing capacity. While the scientific basis for the term "ecosystem health" is still hotly debated, its connotations as a corollary to human health are useful.

From the perspective of indicators, the corollary allows us to draw some relevant parallels. First, the road to understanding and measuring ecosystem health will be no less complex than the road humankind has travelled to understanding and measuring human physiology and health. Second, it allows us to take some of our measurement focus away from humanity and place it more on the ecosphere as a whole. Finally, it underlines that, from a diagnostic perspective, efforts must focus on indicators that potentially give some indication of the integrity of life support systems and broad ecosystem health. One such indicator might, for example, be the number of trophic levels one finds in a given ecosystem; declines in this number could provide critical early warning signs that a system's self-organizing capacity — and health — is declining.

Description, Projection, and Prediction: Changing Perspectives on Information

Another issue that is implicit in many of the fundamentals for ESD indicator design — and explicit in one of them — is that indicators must be useful in a projective mode. This also means that we should have information available to project distributional effects, linkages between human activity and ecosystem health, and ranges of potential ecosystem health corresponding to their inherent uncertainty. It is relevant, however, to pursue somewhat more formally what is understood by "indicators which are useful in a projective mode".

Figure 4 provides a summary of four different classes of information:

a) descriptive indicators;

b) indicators with projective applications;

c) projective indicators; and,

d) predictive indicators.

These information classes have different analytical requirements, different applications, and different interpretations in policy-making.

The simplest indicators are those which are purely descriptive of existing or past conditions. Many state of the environment indicators fall into this class, and they are often referred to simply as "bottom-line" indicators as they essentially represent some end-point description without any indication of what contributes to that particular end-point. They are useful in a *reactive policy* framework because changes in these indicators might signal when some reaction is warranted. As noted earlier, they are less useful when policy-making requires some sort of forward-looking *proactive* approach. But it is important to note that any forward-looking exercise will inevitably involve projections or predictions of these simple descriptive indicators, hence they are an important basis for any forward-looking work. In all cases of descriptive

Figure 4.
CHANGING PERSPECTIVES ON INFORMATION: DESCRIPTION, PROJECTION AND PREDICTION

Information Class	Application	Illustrative "Economic" Examples	Illustrative "Environmental" Examples
Descriptive Indicators	"Bottom-line" description of past or current conditions.	Energy Demand = 340,000 PJ Energy Price = $4/GJ	Energy Demand = 340,000 PJ Mean Global Temperature = 13°C
Indicators with Projective Applications	Analytical description of past conditions.	Elasticity of: Energy Demand to Price = –0.8	Elasticity of: Mean global temperature to energy use = 0.005 [Example only]
Projective Indicators	Projection of future conditions based on explicitly stated scenario.	"Energy Demand will fall 8% over long-term if a 10% end-use tax is applied."	"Global temperatures will be 0.1C° less than they would otherwise be if a 10% energy end-use tax is applied." [Example only]
Predictive Indicators	"Bottom-line" unconditional prediction of future conditions.	"Energy prices will increase 2% per year in real terms over the long term."	"The globe will warm by 1C° as a result of past greenhouse gas emissions." [Example only]

indicators, however, the information requires only collection of the data and limited straightforward analysis (through aggregation or normalization) to provide the required information.

At the other extreme, one can describe a class of "predictive indicators". These are usually represented as bottom-line predictions of what is expected to occur in the future; they are usually unconditional, represented as precise, and based on some type of scientific or socio-economic "law" or understanding of what is going on. The assertion that the sun will engulf the earth in about 5 billion years is one such prediction. Other examples in economic and environmental science are described in Figure 4: some economists believe, for example, that real price increases for energy are inevitable because of underlying economic "laws"; some climatologists will similarly assert that — based on their understanding of global systems — a rise in mean equilibrium global temperatures is inevitable given past emissions of greenhouse gases. In all of these cases, however, the predictive indicator presumes that past data have been gathered and analyzed extensively, and that some underlying "model" of the system applies which allows such predictions to be made.

In between these two extremes, shown in grey in the accompanying Figure 4, are the two classes of information which are referred to in this paper as the "projective mode". They require more analysis than the simple descriptive indicators, yet they do not necessarily involve the "black box" structures that are implicit in the predictive indicators. In a sense, these two classes of projective information provide decision-makers with the means to make their own projections. The simplest form of projective information involves "descriptive indicators with projective applications". These are frequently used in the economics discipline and relatively

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well-established techniques are available to analyze past data in a manner that is useful to a decision-maker who requires some forward-looking device. The example in Figure 4 illustrates that the own-price energy demand elasticity is approximately −0.8. This means simply that for every 1 percent increase in energy prices, the amount of energy demanded will decrease by 0.8 percent if other factors stay the same. This indicator is descriptive, because it relies entirely on an analysis and description of past behaviour, yet it is useful for forward-looking applications. A conditional projective indicator can be constructed, as shown, which illustrates — based on this elasticity — that a 10% tax on energy will decrease energy use by 8%. In the cases of this projective information, the information requires collection of the data, some detailed analysis (through statistical techniques), and the specification of explicit conditions or scenarios.

The position taken in this paper is that, although most traditional approaches to environmental information have focused on descriptive indicators, information that is useful in the projective mode must be collected and presented to an increasing degree. An illustrative example of this is shown in Figure 4. Descriptive information would give us only "bottom-line" indicators such as energy demand, energy prices, and mean temperatures. If we are concerned about global warming, we might want to know how energy pricing policies will affect global temperatures. This will require us to draw explicit linkages between our activity (energy use) and the condition (temperature) of the broader system. Suppose, for example, that atmospheric studies suggest that equilibrium temperatures will increase by 0.5% for every doubling in energy use; the implied "elasticity" would be 0.005. If we know the energy demand elasticity, we could project that global warming would be "slowed" by 0.1C° — if we were to put in place a 10% energy end-use tax.[2] This information would then provide one element of the total information set available to decision-makers. Other elements of the information set might still include, for example, the linkage of this temperature change to sea-level rise; the linkage between sea-level rise and net losses in output in coastal areas; the critical level of temperature change that ecosystems are likely to be able to withstand before their "health" is threatened; and some indication of the confidence levels associated with all of these.

Summary: Indicator States vs Information Slates

Traditional approaches to environmental information have generally focused on the descriptive "states" of individual indicators. In a broader policy-making context, such descriptive indicators will by themselves be inadequate, although they provide a good starting point for expanding the information which policy-makers will require. An expanded information "slate" provided by indicators which reflect the five fundamentals is more useful to decision-makers than is the "state" of any single indicator.

In some cases, generation of the larger information set will require additional research and improvements to the current state of ecosystem science. Much of this information, however, can be presented using currently available analytical techniques. It will be seen, for example, that the tools of applied economics are well-suited to analysing problems dealing with distributive questions, behavioural projections, and uncertainty. The current challenge will be in receiving more widespread political endorsement of the new fundamentals as a valid and useful part of any framework for collecting information relevant to decision-makers.

[2]The 10% tax would yield a decrease of 8% in energy use. This would yield a decrease of 0.005x8%=0.04% in equilibrium temperature. As the mean temperature is 13°C (or 286°K absolute) the decrease is 286x0.04%=0.11C°.

3 A Closer Look at Issues of Indicator Demand

Introduction

Although the most contentious issues addressed often deal with ecological theories, economic theories, or ethical prescripts of what type of indicators *should* be reported, the ultimate end-user of the information may not be aware of, or may not care about, such issues. From this perspective, it is appropriate — before looking at the ecological, economic, and ethical issues — to concentrate first on issues of indicator demand. Such demand issues have more to do with how indicators are used, rather than with how they can or should be constructed.

Indicators in Decision-Making

Many types of issues can be addressed when considering the use of indicators in decision-making, but we shall concentrate on three here:

a) how might *specific indicators* be used in individual decisions?

b) how do specific indicators relate to *other information* available to decision-makers?

c) how do indicators fit into the overall *decision-making environment*?

In answering the first question, the concept of an "Objective-Input-Constraint Trilogy" can be helpful. In this construct, specific indicators can be thought of as taking on one of three different roles in the decision process. As objectives, indicators would themselves represent some given target. As inputs, an indicator is relevant to the decision process but it is usually implicit that some trade-offs will be necessary between various input indicators. As constraints, indicators are important to the decision-maker as they provide some sort of boundary for action: transgression of the constraint might be physically impossible or, more commonly, might lead to consequences which are regarded as unacceptable.

Within such a framework, there can be significant debate over whether particular types of indicators should be regarded as constraints, objectives, or inputs. Irrespective of this debate, however, one important conclusion is that the way indicators are used can itself be dependent on what the information set is. For example, information sets which provide only "bottom-line" descriptive indicators tend to promote decision processes which regard these indicators as objectives or targets. In principle, for example, projected CO_2 concentrations might be an important input (or constraint) to determining how we should organize economic activity. In practice, however, if we concentrate only on measuring CO_2 concentrations, then the CO_2 level itself tends to become the objective when the actual objective should be regarded as something more general (such as sustainable development). An effective means to ensure that policies are not driven entirely by the "bottom-line" is to design information sets of ESD indicators that are potentially useful as *projective* tools in addition to their more traditional function as descriptive tools.

The second question, relating to the use of other information, is also open to considerable debate. One important aspect of this has to do with the "rationality" of a given decision process. The point of debate on whether decisions are "rational" is generally associated with two quite different dimensions: an intuitive dimension which means "sensible"; and, a formal dimension, common to the economics literature, which can be more or less construed as "consistent". In this context, consistent behaviour would — from an economist's perspective — be entirely rational, even though the behaviour might not seem at all sensible. Conversely, something might seem *irrational* under the formal economist's definition, yet still quite sensible intuitively. If I preferred apples to oranges, oranges to bananas, and bananas to apples, an economist might think I was irrational even though to me it is a perfectly sensible preference ordering.

Although debate on such issues will not be resolved easily, the debate has two general implications for indicator design. First, it highlights that the amount of information required — in addition to the specific indicators — will to some degree depend on whether decisions were made in a "single-objective" or "multiple-objective" context. Where multiple objectives, or a plurality of views, exist, more information about the trade-offs and linkages between various indicators is required. Second, decision processes themselves might become better understood if we had more information on the linkages between various factors. To illustrate this point, we can return back to the "apple-orange-banana" example. When this "inconsistent" pref-

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erence ordering was first observed, it was regarded by many as irrational: but when economists made further investigations they discovered that the preference ordering was both consistent and sensible if one measured, not items like apples, oranges, and bananas, but *characteristics* such as texture, colour, acidity, juiciness, and so on. When characteristics were ranked for each fruit, and when respondents were observed to select preferentially always that fruit which was dominant in more of the favoured characteristics, it became clear to researchers that they had been measuring the wrong thing all of the time: they should have been measuring *characteristics* instead of *items*. In short, by understanding the actual linkages and trade-off relationships which exist, it provides a basis for designing better future indicators.

The third question, that of the decision-making environment, relates to whether different indicators are required in different policy environments. Some argue that less information is required in market economies than in controlled economies, because the market will, to some degree, generate its own information requirements with no intervention. The opposing view is that market economies must have more information because they are involved in a wider range of activities, some of which are potentially quite destructive to the environment. While this debate will continue, one conclusion is that the types of indicators supplied might themselves influence the type of decision-making environment which arises. Descriptive indicators that are represented as targets or constraints might, for example, tend to promote regulatory approaches to policies. Indicators that provide information about *linkages* and trade-offs, and imply some flexibility in response, tend to promote decision-making environments that are less "command and control" based.

Indicator Communication

A concern which regularly surfaces relates to how much information is actually required. Is there such a thing as "too much" information? There are many dimensions to this, but at this stage the answer seems to be a qualified "yes". The types of reasons given for this are:

a) information costs money and at a certain point the cost of obtaining additional information is simply not worth the extra benefit which decision-makers might derive from that information;

b) having a little bit of data which are "crude and available now" is better than having a lot of data which are "precise but available later" in circumstances when time is of the essence;

c) an overload of detail does not help people who need to make general conclusions; and,

d) if not all types of information are being gathered, then it is possible that too much detail of one sort will lead to incorrect policy decisions. Indicators which report instantaneous trends might provide an incomplete picture of longer-term underlying behaviour; policies based only on these short-term trends will be fundamentally flawed.

By contrast, some take the position that simple indicators should be abandoned because only comprehensive sets of information can provide decision-makers with the type of information required to make proper decisions. Under this view, composite indicators are also not appropriate because they fail to reflect causal or behavioural linkages. Although support for all of these positions is likely to persist, it is clear that information must take into account the target audience: some audiences will require, and will be able to understand, more detailed information than others.

The second concern in indicator communication is thus the actual target audience. Indicators are used for a multiplicity of purposes by a wide array of users. Individual citizens organize their own consumption behaviour in response to indicators; scientists need technically detailed indicators to get a better handle on how systems behave; policy-makers need behavioural detail in indicators to determine what policy responses might be required to achieve particular objectives; decision-makers in corporations require information specific to their corporate sector or market region. In all such cases, however, an important piece of information involves the *incidence* of any particular event: regional authorities require regional disaggregation of indicators and individual business people will require information specific to their own industrial sector. The simple message is that, irrespective of what is being measured, some form of *distributive* disaggregation is an important component of any indicator.

Within the policy-oriented target audience, there is also a growing recognition that "stewardship" of the environment will become a potentially important responsibility. Stewardship implies that some management will be required; man-

agement will only be successful if information on behavioural linkages exists which is useful in *projective* applications.

A final issue in indicator communication relates to education. There are, in fact, two distinct dimensions to the role of education in indicator design. The obvious dimension, on which people normally concentrate, is that indicators are meant to educate the public, policy-makers, or some other target audience. A second, and perhaps more important dimension of ESD indicators, is that *education must be provided to describe what the indicators mean*. This can be done either through trying to provide long explanations of what the indicators mean, or by making the indicators themselves somehow tie to something with which people are familiar. A classic example has become indicators of "wind-chill" factor. Wind-chill describes the rate of heat loss from exposed flesh under various combinations of air temperature, wind speed, and wind direction. A technically correct measure in terms of $kJ/m^2/sec$ is likely to require a great deal of explanation; an equivalent temperature measure (e.g., 50° below zero) is technically less correct yet intuitively better; and an actual projected impact measure that incorporates typical cause-effect relationships ("exposed flesh will freeze in 30 seconds") is better yet as an indicator which is readily understandable without separate explanation.

Within the design of ESD indicators, this highlights the idea that for indicators to have some "self-explanatory" power, it helps to use concepts with which people are familiar. While the loss of one trophic level in Lake Erie might be important, it is also helpful if this could be connected to something like the concomitant decrease in sport fishing catch or the accompanying cost of water treatment. Failure to make such connections explicitly through education, or implicitly through indicators which are more intuitively self-explanatory, means that many indicators will be regarded simply as a scientific curiosity even though they might be very relevant indicators of ecosystem health.

Summary

The design of ESD indicators must be sensitive to how these indicators will be used and who will be using them. An investigation of the demand issues provides a strong case for introducing two of the fundamental principles: indicators should have *projective* applications; indicators should have *distributive* elements. In addition, it is clear that some description of the linkages between certain types of information would be helpful to decision-makers and to understanding the decision-making process itself.

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4 A Closer Look at Issues of Indicator Supply

Introduction

While the uses and audiences for ESD indicators are quite varied, our actions are ultimately bound by what can, in reality, be generated given any particular set of theoretical premises or practical constraints. Such theories can be regarded as supply issues to the extent that they depend on some ethical or practical reason which might limit the types of information that should or can be presented. One key lesson from investigating these supply issues is that different economic, ecological or political paradigms will generate different conclusions of what appropriate specific ESD indicators are. Some further generalizations for indicator design are made in this chapter, however, from investigating issues of social equity, ecological sustainability and economic sustainability. In summary, the chapter briefly addresses some issues which cross-over between these areas.

Social Equity and Ethics

The social equity and ethics dimension of indicators arises in numerous contexts. The first, and most notable, observation is that the ethical dimension can enter into indicators in two fashions: *what* indicators are specifically presented; and, *how* that presentation is interpreted. For example, we might have indicators which present information that dolphin populations are declining, or that the number of poor people without access to safe water is increasing. The presentation of this information captures the first element of the social ethics dimension. However, the second element, concerning how we interpret the information, is a quite different issue. Those with a broad world view might be outraged by the information, those with other priorities might be indifferent. Although it is not expected that everyone will take the "world view", the fact that more nations and individuals are taking this interest demands that the "what" dimension of social equity be presented more carefully. As implied by the previous chapter, however, the very fact that this type of information might be presented will at times force the interpretation issue: currently some of this information is not presented and it leaves people with the opportunity to live contentedly behind their "veil of ignorance".

Regardless of how we interpret it, the upshot is that more information is required about "what" is happening or will happen in the social equity dimension. From a practical perspective, there are basically two methods of dealing with indicators of social equity: a separate information set; or, an additional dimension of information that is reflected in all other indicators. The traditional approach has been to present a separate and distinct set of indicators of social equity through presenting indicators such as general poverty line statistics, or information on specific social groups within society. Presentation of this information has always been distinct from environmental information, although it is often tied into economic information. A new approach is called for. Because of the differential economic and physical impacts of environmental problems, a strong case can be made for explicitly showing the *distributive* elements of any such problems by social or economic group.

To distinguish more clearly between the various dimensions of these distributive elements, Figure 5 highlights three types of disaggregation. The first, with which most people are quite familiar, deals with the geographical or sectoral distribution of environmental problems. This is what the discussion in Chapter 3 relating to target audiences focused on: different public policy-makers or corporate decision-makers will often require this level of disaggregation to make decisions for their specific jurisdictions or economic sectors. This is also the dimension reflected in most international comparisons and, when previous studies have provided "disaggregated indicators", this is the type of disaggregation which has usually been supplied. An explicit social equity focus should also pay attention to the two other dimensions of this disaggregation: that relating to socio-economic status; and, that relating to intergenerational equity and the timing of the impacts. The former pays attention to the distribution of impacts according to nationalities (aboriginal nations), gender, age, education, or other facets. The latter requires that we pay attention to the timing of impacts and which generation will be responsible for bearing the consequences of our actions. For indicators, this requires that we have some *projective* abilities available. While there is considerable disagreement over what we should or should not leave future generations, we will still need to have the information about those consequences at hand to decide whether those consequences are or

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Figure 5.
SOCIAL EQUITY INFORMATION AND THE DISTRIBUTIVE DIMENSION OF INDICATORS

I: Disaggregation by Sector and Geographic Region

Consumption Sector: Residential, Commercial, Industrial, Government, ...
Production Sector: Energy, Forestry, Fisheries, ...
Political Jurisdiction: International, National, Provincial, Regional, Municipal, Rural/Urban ...

II: Disaggregation by Socio-economic Status

Age Cohort
Sex
Education Level
Income Group
Cultural Group

III: Disaggregation by Time of Impact

Current Generation in Current Time Period
Current Generation in Future Time Periods
Future Generations in Current Time Period
Future Generations in Future Time Periods

are not acceptable to us. Again, a clear distinction must be made between the "what" and the "how" questions introduced earlier.

Hence, social equity concerns require that the distributive elements must go beyond the regional or sectoral incidence described earlier; they must also show how different economic groups — the poorest and wealthiest, for example — are affected by given environmental problems. Concerns for minority interest groups or the economically disadvantaged have become more central to decision-making both domestically and internationally. As there has been a relative lag of reporting and analysis efforts in this area, it is appropriate for the social equity dimension to become a more dedicated focus for future ESD indicator design.

In summary, returning to the issue of "how" to interpret this type of distributional information, it would be presumptuous to assert that we know what is "good" or "bad". As one workshop participant observed, humans typically have trouble deciding what is "good" and "bad". The compromise which many adopt is a rejection of "absolutism" and an adoption of "relativism": the very adoption of such a compromise is, however, likely to increase the information requirements for comparative and *distributive* types of information.

Ecological Sustainability: Towards New Principles

In designing ESD indicators, the concept of ecological sustainability will force us to pay particular attention to introducing a "broader scope" and "inherent uncertainty" into the indicators which are presented. The following investigates some key issues which lead to these conclusions.

The natural sciences are, as noted earlier, still in their infancy in terms of their ability to describe ecosystem behaviour or responses. While the connotations associated with "environmental integrity" appear to be an appealing goal, there is little consensus of what it means at a technical level, and whether it is an appropriate target in any event. A typical connotation of "environmental integrity" among policy-makers has been that we must try to keep something — primary rainforest, for example — intact by ensuring that it is not subjected to any destructive stresses.

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Within ecosystem science, however, some would argue that any type of steady state situation is inherently unstable and that, in any event, ecosystems require some amount of external stress to ensure that their ability to adapt is not threatened. In this view, a "hands-off" approach is not necessarily required.

The idea of "environmental integrity" thus warrants some careful reconsideration. Various views propose that a better target would be to implement policies which promote ecosystem "maintenance", ecosystem "health", or — in some instances — ecosystem "development". While the views differ considerably, any of these positions requires that attention be paid not just to what is happening to people, but also to what is happening to ecosystems. As noted earlier, it is useful to regard the concept of ecosystem health as a close corollary to human health. Various indicators of ecosystem health might be appropriate — such as trophic levels, cycle lengths, or the populations of keystone species — and the actual selection of indicators will differ among ecological theories. Nonetheless, this does not detract from the idea that indicator design must reflect a *broader scope*.

This broader scope can take a number of directions. One avenue, however, is to start looking for appropriate diagnostic indicators of ecosystem health. These might have little obvious to do with human health. Examples of such indicators would include keystone species, charismatic species, or indicator species. Indicator species are especially useful if they can provide us with some sort of early warning sign that something is going wrong; canaries, which are more sensitive to trace concentrations of dangerous gases than are people, provided effective early warning systems when accompanying miners into mine shafts. A second potential avenue is to use the notion that humans themselves can be an indicator species, although it must be realized that human health impacts brought on by external stresses may be slow in manifesting themselves. While a decline in general human health — such as increased incidence of asthma attacks or radiation-related diseases in a given area — cannot be an effective *early* warning system for human health, it might be an indication that the broader ecosystem is also being subjected to intolerably high stresses. Using humans as an indicator species has the obvious advantage that we already have a vast network in place to gather information on human health: we simply need to start analysing it from a somewhat broader perspective.

What we do know about ecosystems, however, is that they do not behave with well-defined precision. Analysts are becoming increasingly aware that important dimensions of the "ecosystem health" problem can only be addressed through investigating the behaviour of the broad ecosystem rather than only small sub-components of such ecosystems. Unquantifiable uncertainty (as opposed to distinct quantifiable risk) is an inherent aspect of ecosystem behaviour. Indicator design must, where possible, reflect this inherent *uncertainty*; it is especially important that indicators do not appear to provide a greater degree of precision than they are, in fact, capable of providing.

Economic Sustainability: Towards New Principles

While different ecological theories will advocate different indicators of ecosystem health, different theories of how economies work — or of how economic measurement should be conducted — will result in different indicators of economic well-being. The general lessons from the economic sustainability debate, however, are that we will have to rely increasingly on describing the *linkages* between economic activity and the broader ecosystem, and that we must have some *projective* ability to do so. The following investigates some key issues which lead to these conclusions.

A particularly important lesson of economic sustainability is that conventional notions of economic "growth" are potentially misleading. Many indicators which traditionally provided measures of this growth are also inadequate for reflecting economic sustainability. Decisions based solely on aggregated GNP, for example, are flawed as this measure does not reflect the physical degradation of environmental capital and the monetary divestment of renewable resource inventories that occur in making up the GNP. Indicators of economic sustainability must, in this respect, be sensitive to the idea that the economy is, in fact, simply a subset of a larger ecosystem; indicators must reflect both the *linkages* between the economy and the ecosystem as well as the idea that the broader ecosystem is also of fundamental importance.

Appropriately, some reorientation of the concept of economic growth is warranted. Different approaches to this reorientation arise. One approach holds that we should concentrate on something quite different called "economic

development"; this requires paying attention to how overall quality of our economic well-being changes. This, it is asserted, might be done either with or without conventional economic growth. The approach requires that we extend indicators to measure quality of economic life, quality of the environment, quality of education and intellectual capital, quality of political and social freedom, and other factors not normally captured within conventional economic growth measures.

A second approach holds that we can still speak of conventional economic growth, but that we must start paying more attention to what the physical constraints are to that growth. There is considerable sympathy with the view that natural capital, in some form or another, is becoming the new constraint. Traditionally, human or man-made capital was often regarded as the constraint to economic growth. To establish whether the "natural capital constraint" idea is correct, we must have information on the specific linkages between human activity and the broader ecosystem which supports it, and might ultimately constrain it.

A somewhat related issue deals with whether humanity has actually been "living off" of natural capital to the detriment of the natural environment. While debate will continue on how to interpret the definition and valuation of natural capital, the issue will again be resolved only by explaining the linkages more clearly.

Describing the economy-environment linkages has led to many different approaches to monetizing the environment. There is continuing debate over whether such hypothetical monetization is appropriate and, if it is, which techniques should be used. Regardless of the techniques, most of the monetization approaches have one thing in common: they are trying to provide a better description of the linkages which exist between the economy and the environment. One example also illustrates how the role of projective information is becoming more important. There are ongoing efforts to reform the way that the System of National Accounts is handled and presented; one reform involves adjusting national income statistics to reflect the costs of environmental damage. A question being addressed is whether the appropriate costing figure should be "restorative costs" or "preventive costs". While there are numerous ecological and economic aspects to the debate about which measure is more appropriate, an important point is that both will require some projective ability. In one case we are estimating costs to restore something to some projected future state; in the other case we are projecting expenses to ensure that some future state will be maintained. Concentrating just on past or current information will not in itself provide us with the necessary insights we are seeking.

Summary

It is notable that the three themes examined above also reflect the cornerstones of what the Brundtland Commission in 1987 characterized as "sustainable development". The bulk of international attention, however, has been directed towards the environmental and economic aspects of these three: social equity aspects have often run a distant third in terms of the amount of attention they have received. In addition, indicator development has initially focused on economic behaviour indicators and descriptive "bottom-line" environmental indicators. One of the reasons that economic indicators have received such a large and dedicated following is precisely because, unlike many environmental and social equity indicators, they reflect some elements of system *behaviour* which allow decision-makers to project their direction. Such *projective* possibilities are only available to a limited degree with "environmental" indicators, and virtually no effort has been made to integrate social equity concerns into either economic or environmental indicators. It would thus seem that some priority should be placed on moving the "environmental" indicators into the same realm as economic indicators: a realm in which projective applications and descriptions of linkages is the norm. Similarly, "social equity" indicators have even further to go to catch up: a good first step will be to start integrating distributive information about social equity explicitly into all ESD indicators.

The three themes also provide an interesting perspective on the *scale* issue. The recognition that human activity is a subset of the broader ecosystem is one manifestation of the idea of scale; ecosystem scientists tell us that ecosystems might behave differently at different scales. But this is a concept with which we should already be all too well familiar. Corollaries can be found in the the equity dimension: some regard that the use of minimal force in defence is acceptable; the use of overt force in isolated incidents is not generally supported but often overlooked nonetheless; the use of overt force on a continuous or massive basis is regarded

as critically unacceptable. Similarly, in economics, post-Depression governments discovered that deficit financing was an effective way to pull the economy out of a slump: it was effective because the government sector was relatively small compared to the economy as a whole. As the public sector grew, and as public debt grew, deficit financing became a less effective vehicle. In some countries today, where the scale of the debt and the scale of the public sector is very large, trying to spend one's way out of a recession on inappropriate investments could lead to complete degradation of the system. To conclude, all systems — economic, political, or ecological — display behaviour which is scale dependent. When we accept this, we will realize that it is also important to know how systems behave at different scales, what the critical scales are, and what happens once systems approach those critical scales.

In summary, an investigation of the supply issues provides a strong case for introducing the following fundamental principles: indicators should reflect a *broader scope* which places increased importance on ecosystem health; indicators should reflect *explicit linkages* between economic behaviour and ecosystem health; indicators should recognize the *inherent uncertainty* in ecosystems. Strong support is also provided for the *projective* and *distributive* requirements of ESD indicator design.

5 A Closer Look at the Analytical Tools

Introduction

The previous chapters described how some technical issues of indicator "demand" and "supply" can lead to the need for some new principles of ESD indicator design. A key conclusion was that indicators that are purely descriptive of past or current circumstances provide incomplete information. These descriptive indicators are incomplete because they do not reflect any underlying behavioural linkages, they provide no time dimension which might be used in projective applications, they seldom reflect distributional concerns of a social equity nature, and the dimension of inherent ecosystem uncertainty is typically not given. But it is recognized that all information will, eventually, be based on or derived from some form of descriptive indicator. It is therefore clear that adoption of the new fundamentals for designing ESD indicators requires the application of some form of analysis.

While subsequent chapters will illustrate more specifically how certain techniques can be applied to present this information, this chapter will provide a brief overview of some selected issues dealing with analytical tools. Background work to the workshop provided a review of potentially useful analytical techniques.[3] This chapter will thus simply reiterate some of the key conclusions, and then address some new areas which were identified at subsequent workshop discussions.

Different Analytical Approaches: Some Observations

Numerous analytical tools are available for dealing with both economic monetary information and purely physical information. Technical models can describe technical linkages between various activities' output and input requirements. Economic models can describe these linkages in monetized terms, or connect monetary parameters to physical parameters. Modelling techniques using both descriptive and projective techniques are used routinely within the behavioural sciences.

In short, the behavioural sciences — economics among them — have progressed well beyond the descriptive stage and have developed substantial analytical means for projecting the impacts of policy initiatives on human activity and welfare. Further, tools and conventions to deal with distributional questions are well-developed in this discipline, and data are often organized in ways which can accommodate both distributional and projective analyses. Finally, an ecological tradition of modelling the demographics of a small number of inter-related species has been effectively adopted by natural resource economists to assist in management decisions relating to specific populations. It would appear, therefore, that much of the required "infrastructure" to generate the types of data referred to in this paper is in place in the behavioural sciences. However, there is a lack of consistent means for integrating ecological information into this framework.

Some approaches appear more promising than others. The most frequently cited, and called for by decision-makers, is the need to determine how ecosystems might constrain human activities. This requires that constraints be built into existing modelling frameworks such that the economy is forced to operate within this constraint. It is recognized that, within any such "model", the constraint is in fact an artificial simulation of what is in fact an uncertain parameter. It is therefore also important to make such constraints flexible so that uncertainty in ecosystems can be explicitly accommodated within policy analysis.

A second area of concentration is in more explicit modelling of linkages. Complex linkage models of economies already exist using a wide variety of approaches. In addition, the use of "effects" modelling in the biological and natural sciences is becoming more common. The purpose of effects modelling is to illustrate the isolated impact of some parameter on a broader system. Some partial integration of the economic and ecological modelling techniques — at least at the boundaries of each of the modelling systems and, where possible, at more than one point on the boundaries — is both feasible and desirable.

A third area, which also has some limited potential, deals with the parallels between economic general equilibrium models and an emerging

[3]See Ruitenbeek (1991), "The Role of Indicators in the Decision Process" in *Economic, Ecological, and Decision Theories: Indicators of Ecologically Sustainable Development*, CEAC: Ottawa.

view within some theories of ecosystem science that we must try to describe and model the entire system rather than small parts of it. Analogues to this approach can also be found within economic modelling. Experience with the economic models has been that modelling in just one variable can be effective in a short-term projective mode, but largely ineffective in a long-term projective mode. Modelling in a small number of key variables of economic performance has in some instances been able to project economic system behaviour reasonably accurately. The primary potential problem for the ecological sciences is that they may not have the historical data available on ecosystems that economists have available on economies. The historical information set available to economists does, however, offer potential proxies for ecosystem "health". Review of the information set, and analysis of the data within it, is warranted to determine if some adequate proxies can be found. As noted in the previous chapter, one potential candidate is human health. Through tracing this back, techniques (such as multivariate analysis) can be used to try to establish linkages between economic activity and broader ecosystem health.

Some Appropriate Techniques for Addressing the New Fundamentals

Quite remarkably, the type of indicator which has received the least attention to date, yet which is the simplest to create with the analytical tools available, involves information relating to the *distributive* dimensions of social equity. Both disaggregated and composite indicators have been used extensively within economics to try to report measures of income and asset distribution. The usual approach to the disaggregated information is to report indicators for separate income quintiles or deciles. Simpler means report information just for specific groups below certain income cut-off levels. The more frequent use of economic household survey data (typically sampling 50,000 or more households) and experimental surveys based on analyses of income tax returns, has provided information sets rich with disaggregated information.

The provision of distributive information, as well as that involving linkages between economic activity and ecosystem health, is greatly facilitated by geographical coding of information. The actual practice of "geo-coding" economic information is already quite common because the same type of information is required for decision-makers wishing information on particular jurisdictions. In addition, GIS systems are becoming more routine for presenting environmental information. What is less common, however, are the necessary links which would allow one to tie these two sets of information together. One good example of such links being established is the Statistics Canada publication *Human Activity in the Environment.*

In addition, the use of composite poverty and inequality indices has a long history in economic science although the most commonly used — the "GINI Coefficient" of inequality — has fallen into disuse. While part of the demise of this particular composite indicator has to do with some unusual (and often thought undesirable) characteristics it displays when income shifts within the middle income ranges, it can be more generally commented that composite inequality indices are now used primarily for specific policy questions; they are not usually presented or understood by the general public or by most decision-makers. When they are targeted to decision-makers, they are usually presented in both a disaggregated and a composite format.

Techniques for establishing both projective indicators and explicit linkages will, to a large degree, need to rely on multivariate analysis of historical or cross-sectional information. The basic idea is that one attempts to obtain enough data points to have a statistically significant sample such that one can distinguish between random "noise" in the data and the influence of independent factors. For example, one might try to "explain" urban pollution levels in terms of variables such as outside temperature, windspeed, number of automobiles, price of gasoline, average incomes, and some proxy for rush-hour congestion. If historical measures are available for one or more cities, then there is opportunity to isolate the effects of just, for example, gasoline prices or rush-hour congestion. A coefficient which describes only the *isolated* or *partial* linkage between one factor and another is generally termed an impact elasticity. An elasticity of −1 between gas prices and pollution, for example, would indicate that increasing gas prices by 10% would decrease pollution by 10% if all of the other things were kept constant. Similarly, investigation of the "rush-hour" variable might suggest whether policies to try to stagger rush-hour traffic might decrease pollution.

One extension of multivariate analysis to describing linkages involves a set of tools called

"limited dependent variable" techniques. These are becoming more common in economic analysis as economists are being forced to deal with fewer quantitative data and more qualitative data. The basic idea is similar to standard multivariate analysis, except that the dependent variable — the one you are trying to explain — takes on the value of only two or three distinct states. The use of this technique was pioneered for purchasing decisions: I either buy a car or I do not buy a car; I either drive a car or I take the bus or I walk; and so on. More recently, it has been used to model impacts of human activities on various ecosystems: I either hunt or I do not hunt; I either chop down trees or I buy kerosene. As a next extension, such techniques might be applicable to modelling (after the fact) when ecosystems have apparently moved from one state to another.

Although the tools of risk analysis are also relatively well developed, many of the formal mechanisms for dealing with quantifiable risk are not applicable in the context of inherently unquantifiable ecosystem uncertainty. Uncertainty is best reflected through scenario analysis that embodies explicit potential outcomes in terms of economic and ecosystem behaviour. The use of ranges of *critical values* is a particularly relevant and tractable method for presenting ESD indicators. Such methods are consistent with the idea that ecosystems exhibit inherent uncertainty, while also presenting relevant information to decision-makers regarding how close we are to certain limiting factors. In addition, they provide important planning information for "worst-case scenarios"; such scenarios are often cited as being *one* important input into the overall decision process. Key requirements for establishing critical sensitivity analyses, however, are that natural scientists must assist in defining a range of "critical levels" for an ecosystem, *and* give some idea of what happens at that critical level.

Summary

The previous chapters illustrated that information will, in principle, extend beyond simple measurement and reporting into realms that require further analysis and interpretation of the raw measurements. Indicators that are useful in projective applications, or those that reflect explicit linkages between the economy and ecosystem health, for example, will rely on analytical techniques which themselves have different information needs.

Analytical techniques involving economic analysis of behavioural, distributive and projective information are among the most common and well-developed techniques. Many of these can be, and have been, adapted for uses which accommodate technical information of the type which might be generated within the natural sciences. A significant first step — in many such exercises — will involve introducing ranges of physical ecosystem constraints within the analytical frameworks. The advantage to such an approach is that it is consistent with the idea that the economy is a subset of a broader ecosystem; it also has, at this stage, the most modest level of information demands on the natural sciences, and will lead eventually to a better understanding and development of indicators that reflect the economy-ecosystem linkages.

In summary, the analytical tools for dealing with both technical and economic information are well developed for providing information that is consistent with the five new fundamentals. The primary challenge is to increase the level of interdisciplinary work that occurs between the social and natural sciences to ensure that these tools are used to their full potential.

6 The Role of Public Policy in Ecosystem Health

Introduction

A review of some of the technical issues of ESD indicator design has resulted in the enumeration of five new fundamentals. Additionally, to underline the linkages between these issues and their ultimate applicability to policy decisions, it is useful to consider how indicators based on these fundamentals reflect a new focus for public policy. While public policy has traditionally been concerned with human health and welfare, it is also now finding a new role in addressing ecosystem health. This chapter explores some of the key factors that have contributed to this new role, highlighting how ESD indicators will provide important information in each step of the process of designing appropriate policies. A general example of a set of indicators is provided to illustrate how the five fundamentals contribute to a framework that is useful to this new role for public policy; the following chapter will look at a more specific set of indicators with numerical examples.

The New Public Policy Focus

The new role of public policy is most easily shown in Figure 6. While the traditional focus of public policy has been on short-term human health and welfare, the new focus also recognizes that public policy can play an important role in addressing ecosystem health. The new focus has evolved for a number of reasons, but it is useful to look at two of them at this juncture.

Considerable discussion arose during the workshop relating to whether humanity is or should be "anthropocentric" or "ecocentric". While the actual semantics of these terms is open to wide interpretation, essentially two quite different substantive positions exist. The first position — which might be characterized as the "forward-looking anthropocentric view" — holds that humanity's own long-term welfare depends on the continued vigour and productivity of the broader ecosystem. Under this view, public policy must address ecosystem health because failure to do so would undermine humanity's own long-term survival. The second holds that ecosystems, the ecosphere, and all natural things have — for moral reasons — some intrinsic value and an inherent right to exist and that humanity must, when organizing its own activities, respect these rights. Under this view, public policy must essentially address ecosystem health as a worthwhile end in and of itself.

Although the ethical bases for these two views are quite different, and not necessarily mutually exclusive, both views lead to the conclusion that public policy must start paying attention to ecosystem health. As shown in Figure 6, our traditional short-term focus has caused neglect of the broader ecosystem to the potential detriment of long-term human health. Although we can still maintain a longer-term anthropocentric attitude, this requires that the orientation of our immediate policies adopts a *broader scope*. Concomitantly, ESD indicators — along the lines of each of the steps identified below — must provide information that is consistent with such an orientation.

Stages of Indicators: Tracing the Connections

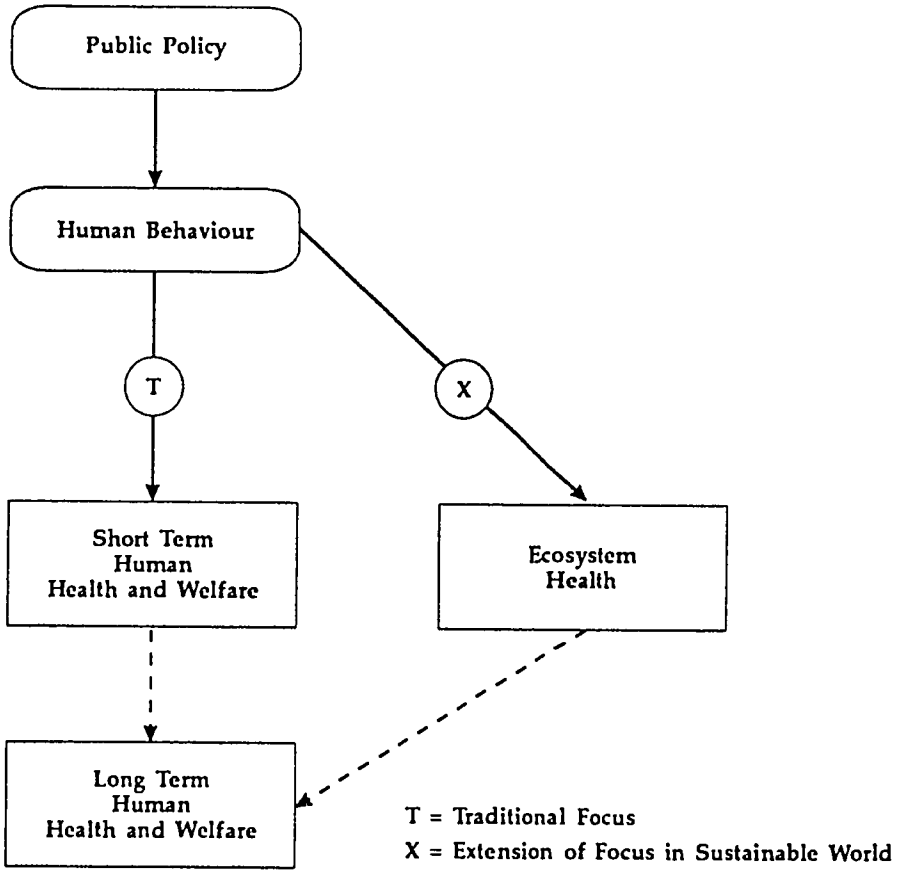
Public Policy and Human Behaviour

The first step in the process is to describe how human behaviour responds to public policy. There are numerous instruments of public policy — such as education policy, migration policy, and economic policy to name a few — and human behaviour in general responds to these policy instruments. Higher taxes on energy cause people to use less energy; open migration policies increase labour mobility. Even the *absence* of explicit public policy intervention presumably has some influence over how people behave either individually or collectively. In any event, in a policy context, it is important to have information that shows how human behaviour responds to public policy initiatives.

Human Behaviour and Short-term Ecosystem Stress

The second step in the process is to describe the impacts of human behaviour on the broader ecosystem. Traditionally this step would focus on how human behaviour influences human well-being through, for example, impacts on available leisure time or on some index of the standard of living. The new focus, however, requires that we trace the linkage between human activities and potential stresses on the ecosystem. Developing information relevant to this step will require

Figure 6.
THE NEW PUBLIC POLICY FOCUS



increased inter-disciplinary work between social scientists and ecosystem scientists.

Ecosystem Stress and Long-term Ecological Sustainability

The third step involves identifying the linkages between general ecosystem health and the various stresses to which the ecosystem is subjected. This step is probably the most difficult to incorporate into typical information frameworks as it essentially falls entirely within a realm of the natural sciences that has not traditionally provided such input to decision-makers. Moreover, the current state of the science, as discussed earlier, does not allow tidy simple answers to be provided about this particular linkage. Some degree of external stress is, for example, likely to contribute positively to ecosystem health, while too much stress will presumably degrade ecosystem health. Also, the degree of the impact of any stress is probably related to the scale of the cumulative build-up of past stresses: a small incremental stress when a system is near some critical threshold is liable to have greater consequences to ecosystem health than would a much larger stress when the system was far from this threshold. In short, "scale" plays a potentially important role as an important factor to determining ultimate impacts on ecosystem health. Providing information to address this third step resides almost entirely within the mandate of the natural sciences.

Long-term Sustainability and Current Policies: Closing the Loop

The final step requires drawing connections between ecosystem health and future long-term human health and welfare. This step again

will draw on the combined expertise of social and natural scientists. It is interesting to note, however, that this step is necessary only if one leans towards the school of thought favouring the "forward-looking anthropocentric view". Those content with addressing ecosystem health as a policy end in its own right would not need this additional information.

The Analytical Requirements

Both the information and the analytical tools required to address this extended policy focus are quite different from those required under the traditional focus. In the context of Figure 6, the traditional focus required two types of information for policy formulation: knowledge of how policies affect human behaviour; and descriptive indicators of humanity's own short-term well-being. The analytical requirements of the new policy focus present a substantial, though not insurmountable, challenge. The following section demonstrates how a set of indicators — based on a framework reflecting the five new fundamentals — could be constructed to address this new policy focus.

A Simple General Example: Near-term Policies and Long-term Impacts

It is important that the new fundamentals be applied on the basis of augmenting the current information set of ESD indicators that are available. While the precise manner in which this is done will differ from one application to the next, the simple example shown in Figure 7 illustrates how new indicators might be developed as an augmentation of existing information. In this example, a simple "bottom-line" descriptive indicator of environmental resource quality is used as a starting point. Through applying both further measurement *and* analysis, the indicators can be expanded to give decision-makers a more complete set of decision support information. Using this set it would be possible for a policy-maker to judge, for example, whether current immigration policies will unduly threaten longer-term ecosystem health. To illustrate some of the practical aspects of designing this information set, each part of this augmented information slate will be examined in turn.

As a starting point, it is useful to distinguish between the "reference indicator" that is often used in traditional policy problems, and an indicator that reflects a *broader scope*. This broader scope can be reflected in one of two ways: (a) through disaggregating the reference indicator to the level of specific ecosystems; or, (b) through providing information that is a diagnostic indicator for the system rather than something that is necessarily important to human health. Figure 7 takes the latter approach: it illustrates that the reference indicator might be some water quality characteristic — such as the concentration of nitrate/nitrite in water — which is important to human health; an indicator of broader scope that might be more relevant as a diagnostic indicator of ecosystem health, however, might be the number of trophic levels.

Incorporating *distributive* elements within an indicator can also have many different dimensions. Figure 7 illustrates one possible disaggregation of the reference indicator that provides policy-makers with information about the consumption of water quality by income class. The use of income "quintiles" is a fairly common analytical technique for presenting distributional data on the basis of income distribution. The basic idea is that the population is divided into five groups — each comprising 20% of the population — such that the poorest are in the lowest quintile and the richest are in the highest quintile.[4] If such indicators revealed that the plight of the less advantaged economically was also getting disproportionately worse "environmentally", cause might be found for targeting policies to selected income groups. It should be noted that "income" is not always the most appropriate or readily available basis for providing such distributive information; a method that is sometimes more analytically tractable involves using some form of asset base to describe the disaggregation (such as "renters" vs "owners"). In developing countries, land tenure positions are often a more revealing — and more readily available — method of disaggregation.[5]

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[4]In Canada in 1989, for example, any household with an income of under $17,000 was in the bottom quintile; any household with an income greater than $64,000 was in the highest income quintile.

[5]In a recent report — World Bank (1990), *Towards an Environmental Strategy for Nigeria* — the effects of environmental degradation (including desertification, deforestation, water contamination, air pollution, and other problems) were estimated explicitly for five "economic groups". The "richest" were defined as those who normally own property, land and have formal sector (wage) income; the "poorest" included those who owned no property, had no access (transient or rented) to land, and purchased most of their food requirements.

Figure 7.
GENERAL AUGMENTATION OF A SAMPLE INDICATOR — WATER QUALITY

Reference Point	Water Quality Characteristic Important to Human Health (Q_h)
Broader Scope	Water Quality Characteristic Important to Ecosystem Health (Q_e)
Explicit *Distributive* Elements	Average Water Quality Consumed by Lowest and Highest Income Quintile (y) of Population ($Q_{h;y=1}$; $Q_{h;y=5}$)
Applications as a *Projective* Tool	Impact Elasticity between Population (P) and Water Quality $\varepsilon = \frac{\%\Delta Q_h}{\%\Delta P}$
Reflect Explicit *Linkages*	Projected Impact Elasticity of Current Population Changes on Future Ecosystem Productivity $\varepsilon = \frac{\%\Delta Q_{e;t=2010}}{\%\Delta P_{t=1990}}$
Reflect Inherent *Uncertainty*	Range of Probable Critical Levels of Water Quality Characteristic (Q_e) $\frac{\text{Projected Range } \{Q_{e;low}:Q_{e;high}\}}{\text{Projected Critical Range } \{Q^*_{e;low}:Q^*_{e;high}\}}$

An example of an indicator that could be used in a *projective* mode involves calculation of an elasticity between water quality and population. Specifically, it is the ratio of the percentage change in a water quality characteristic to the percentage change in population, based on an analysis of historical information. In this case the elasticity is a useful projective tool because the magnitude of the elasticity illustrates what would likely happen to water quality should population change. An elasticity of zero, for example, would indicate that population level does not affect water quality.

The most difficult indicator to devise is often one that *explicitly links* current human activities to future ecosystem health or productivity. The use of some form of elasticity would again be one appropriate means for conveying this information. The use of an elasticity is generally more powerful than a simple ratio because the analysis of an elasticity requires that *other factors remain unchanged*. The methods used thus require an adequately controlled experiment or, where historical data are available, enough data so that the incremental effects of just a single factor (such as population level) can be isolated. Such procedures are relatively common in economic analysis and are becoming more common in ecosystem science. "Fates and effects" and "effects monitoring" studies are now often undertaken by ecological scientists. Rigorous investigation can, in such cases, isolate the effects of selected pollutants and provide useful information to decision-makers. The moratorium on oil exploration on Georges Bank was significantly influenced by fates and effects modelling that combined laboratory-based results of research on the most sensitive life history stages of fishes, oceanographic observations, and behaviour of oil at sea to describe the link between oil spills and the well-being of commercially important fisheries; these results allowed "projections" to be made of future ecosystem productivity in the event of oil contamination. The case of sulphur emissions, acid rain, and forest productivity — discussed in the following chapter — provides additional examples of how ecosystem productivity might be tied to human activity.

Indicators reflecting *uncertainty* must be able to capture different aspects of what we do and do not know. One aspect of the uncertainty is the potential errors in the measured data, and this uncertainty can be further compounded by the actual technique that is used for projecting values. Figure 7 therefore shows that there is some projected *range* of water quality, perhaps in response to a certain change in population level. More significant, however, is describing the uncertainty inherent in what we know about the critical levels of ecosystem health. Here a range is again presented; this might be regarded as the range over which ecosystem health starts to become threatened. The range might reflect simply differences in scientific opinion, or genuine differences in observed behaviour from other research. In defining any such indicators, however, it is important to distinguish between: (a) uncertainty in the description or projection; and, (b) uncertainty in the critical level. In addition, if possible, it is important to specify what type of degradation might occur at the critical level.

In summary, Figure 7 has shown that, with a broader scope, characteristics of importance to ecosystem health — but not necessarily to immediate human health — will receive increased attention. Also, selecting indicators that are useful as projective tools will require increased use of measures that reflect stresses and responses within a single indicator. One common example of this would involve the use of "impact elasticities" that describe the behavioural response to a given stress. Such elasticities are descriptive to the extent that they can be calculated based on historical information, yet they provide decision-makers with information that has key projective applications. These projective applications are critically important in the current situation where overall ecosystem vigour and productivity is becoming a policy focus.

7 Applying the Fundamentals

Introduction

Earlier chapters suggest that the next generation of support indicators should in principle reflect five new fundamentals of indicator design. In many cases, these would form an augmentation of existing approaches to indicator reporting. In some instances, indicators and information currently reported *already* reflect some of these principles. The crux of the matter is, however, that *all* indicator design should be done in a manner that consistently reflects these fundamentals.

While the previous chapter raised some general issues on augmenting indicators, this chapter illustrates in somewhat more detail — through a specific example — how the fundamentals can be applied. It commences with a brief assessment of some commonly used reference indicators in the area of sulphur emissions. This is followed by an example of an augmentation of these indicators and some comments relating to potential areas of improvement and difficulty.

An example of the use of indicators relating to sulphur emissions has been prepared. Selection of this as an example is purely opportunistic; significant research has been undertaken in this field in support of the various acid rain reduction programmes that have been pursued in Canada and elsewhere. The OECD has prepared preliminary estimates of various indicators relating to sulphur emissions. Environment Canada's State of the Environment Report (1986) provides summaries of indicators for sulphur emissions and deposition that do reflect to varying degrees the principles of indicator design espoused here. Also, such indicators are of key relevance to the energy sector in Canada; energy sector issues are the first being addressed by the National Round Table on the Environment and the Economy (NRTEE). Finally, the 1990 Long Range Transport of Air Pollutants (LRTAP) Assessment Report, published in Canada in early 1991, provides a significant record of the state-of-the-art knowledge of sulphur emissions and their effects.

The reader is reminded, however, that the specific indicators used here are illustrative of how the fundamentals could be applied and do not represent an endorsement or suggestion that these specific indicators are the most appropriate from either a scientific or an economic perspective. More research will in many cases be necessary to determine the most appropriate indicators. The example is intended to show, however, that a *set* of indicators that reflects these five fundamentals will — taken as a whole — provide information useful to decision-makers; information in this set is not otherwise obvious from the simple "reference" indicator.

Assessing Indicators

There has been considerable international effort dedicated to the area of "criteria" for indicator design. To some degree, the five fundamentals can be thought of as "joint criteria" which can be applied to any *information set*. In general, not every indicator in any information set needs to reflect each fundamental, but the information set taken as a whole should satisfy the fundamentals as a whole. From this perspective, it is not entirely appropriate to perform an assessment of any single indicator; a single indicator is not likely to reflect all of the five fundamentals.

As a starting point, consider a set of indicators relating to sulphur emissions. As previously noted, this area has received a great deal of international attention because of efforts to reduce acid rain. With regard to indicators, the energy sector has always been a field that has provided vast amounts of historical data that have been collected using increasingly consistent conventions and techniques. The fact that most emissions come from readily identifiable point sources presents an obvious policy target. Given this proliferation of potentially useful and relevant information, it is interesting to assess some of the basic "reference indicators" that are being used.

The basic reference point for most indicators dealing with sulphur emissions is an absolute measure of emission levels:

- annual SO_x emissions (tonnes/year [t/yr]).

In addition, the OECD[6] presents, within the same information set, the following information:

- SO_x per capita (tonnes/year/person [t/yr/p])
- SO_x per dollar of output (tonnes/$ Gross Domestic Product [t/$GDP])

[6]OECD (1991), *Environmental Indicators: A Preliminary Set*, OECD: Paris.

Figure 8.
UNAUGMENTED REFERENCE INDICATORS — SULPHUR EMISSIONS

late 1980s

	Canada	U.S.A.	U.K.
SO_x emissions ('000 t/yr)	3,800	21,000	3,700
SO_x per capita (t/yr)	146	84	63
SO_x per dollar of output (t/$GDP)	9.7	4.7	7.0
SO_x per unit energy use (t/PJ)	500	310	440

The information set recommended in a background document for the NRTEE[7] also suggests inclusion of the following indicator:

- SO_x per unit energy use (tonnes/gigajoule [t/GJ])

If we suppose that these indicators — presented in a time series which shows rates of change — comprise the entire information set, we can ask "how well does this set reflect the five fundamentals?" For reference purposes, selected values of these indicators are shown in Figure 8.

First, the set does not reflect the idea that we must *broaden* the scope of our analysis to show our impacts on individual ecosystems or the condition of the ecosystem as a whole. Specifically, some measure of sulphate deposition would be more revealing in this regard.

Second, the set does not highlight *distributional* aspects except to the extent that it provides international comparisons. It should be noted, however, that the intent of these sets of indicators is often not to show any distributional aspect; Marbek (1990) asserts that a separate set of social equity indicators should be developed for this purpose, but should not be meshed with sectoral indicators such as these.

Third, *projective* applications are presented to some degree for the simple reason that ratios are presented. The ratio of "SO_x/$GDP" might be construed, for example, as an indicator that if gross output goes up by some amount then SO_x emissions might also go up by some amount in proportion to this ratio. The weakness is, however, that the simple linear ratio shows only *averages* when policy-makers are often more concerned with what will happen at the *margin*. The presentation of time series information by the OECD gets around this to some degree, but the problem then still remains of the connection between SO_x and GDP if all things are constant. It may turn out that there is absolutely no connection between them.

Fourth, the set does not inform decision-makers of the *linkages* between sulphur emissions and ecosystem productivity or health. One reason for this is that all of the measures in the set are either absolute measures, or comparative measures, of different forms of human activity. Sulphur emissions, energy use, and gross economic output are all measures of current human activity and it is not obvious to decision-makers how these will affect the health of the ecosystem and, in turn, future human health.

Finally, the information provided in the set does not reflect any dimensions of the *uncertainty* involved either in the measurement of emissions or in the confidence of what are critical levels of emissions.

Specific Augmentation of a Sample Indicator

Although the set of indicators investigated above does not by itself address all of the fundamentals, it is possible to report others such that the "augmented set" does — to a greater degree — address them. One possible augmentation is

[7]Marbek Resource Consultants (1990), *Rationale and a Preliminary Family of National Indicators for Sustainable Energy Production and Use*. NRTEE: Ottawa.

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shown in Figures 9a and 9b. While there is a substantial amount of information contained in these tables, it is worth highlighting some of the features of the expanded indicator set.

The idea of a *broader scope* is captured in two ways: first, through reporting the impacts on selected ecosystems or areas that are important to human activity (such as forests); second, through describing the impacts in terms of an indicator that is more diagnostic of ecosystem stress or health. The use of sulphate deposition as an indicator does not move "all of the way" to a diagnostic indicator of ecosystem health, but it is somewhat more relevant to ecosystem stress than are simply sulphur emissions. In addition, an indicator is shown of the total area at risk to some "critical level of sulphur deposition".

Distributive information on who is affected by sulphate deposition is currently not readily available. In principle, however, it would be possible to show what proportions of the population are at risk due to high levels of sulphate deposition. In Canada, for example, economic administrative data can be coded geographically to areas as small as individual postal zones. Matching of this information with geographically-based deposition information would provide indicators that reflect distributive concerns.

Projective modes are, as noted earlier, partially reflected in the reference set of indicators. The simple linear indicator that Canada emits 500 tonnes of SO_2 for every petajoule of energy consumed is not, however, an accurate basis for projecting Canada's future emissions were energy consumption to change. A more useful indicator, as shown, would be an energy or income elasticity that describes how sulphur emissions respond to changes in energy use or income *in isolation.* At this time no such elasticities have been estimated, although statistical techniques are available to do such analyses.

An indicator that attempts to draw an *explicit linkage* between human activity and ecosystem productivity is also shown in Figure 9b. Data are available for both emission levels and forestry yield; the ratio of these two is provided as an index for discussion purposes. The information provided by the index is, however, incomplete for the same reason that the simple "SO_x/GJ" indicator described earlier is incomplete: it does not allow one to isolate the linkage. A somewhat better indicator — yet still incomplete from the perspective of making a causal connection — would be to observe changes in this index over time: an increase would mean that yields are increasing or emissions are declining. Technically, an *ideal* indicator of the linkage would again be an elasticity between forest yield and sulphur emissions. Such an indicator would represent the *isolated* effect of a change in emissions on forest yield. Ecological "fates and effects" studies have been used in some circumstances to demonstrate the existence of some of the links in the cause-effect chain.

As noted earlier, possible sources of uncertainty are (a) measurement error; (b) analytical uncertainties; and, (c) inherent uncertainties in the ecosystems based on our current scientific understanding. While in principle we might want to present all three in some format, Figure 9b does not dwell on measurement or analytical uncertainty. In the case of sulphur deposition, the inherent uncertainty in the ecosystem is probably more significant than the others. Estimates for critical levels of sulphate deposition for forests are as low as 20 kg/ha/yr and as high as 40 kg/ha/yr. For water resources, critical levels might be as low as 10 kg/ha/yr for those with low buffering capacities. The set of indicators presented in Figure 9b reflects this uncertainty. For example, a risk index is calculated that is simply a ratio of average sulphate deposition to "critical" sulphate deposition. The ranges of the indicator illustrate that in the Atlantic provinces the average deposition might — given our current understanding of criticality — have exceeded the critical levels; by contrast, in Ontario, the average deposition level has not exceeded the critical level. While it is not expected that this information will fulfil the total requirements of decision-makers, it does represent a useful composite indicator of whether further action and more detailed information is required while also communicating the potential uncertainty in the estimates.

Implications for Indicators: Areas for Improvement and Areas of Difficulty

The previous example has demonstrated some of the potential approaches to augmenting indicators. The operative policy question is whether the set of augmented indicators (such as that in Figure 9b) would be a more useful set of information than just the set of reference indicators (such as that in Figure 8).

Figure 9a.

SPECIFIC AUGMENTATION OF A SAMPLE INDICATOR — SULPHUR EMISSIONS[1]

Reference Point	General Principle or Basis	Rationale	General Examples
Reference Indicator	Standard state of environment indicator useful for descriptive purposes; focused on short-term human requirements	Sulphur emissions can provide a useful descriptive indicator of the stresses we are placing on the environment.	Common usage: tonnes SO_x/year NRTEE[2] proposed indicator: tonnes SO_x/GJ of energy used
Fundamental 1: *Broader Scope*	ESD indicator design must acknowledge that the economy and human behaviour are part of a broader ecosystem which supports them.	We should select an indicator that will tell us how selected ecosystems are being affected by sulphur emissions.	Total sulphate deposition: tonnes SO_4/year Average sulphate deposition in important areas of ecosystem: kg SO_4/ha/year[3]
Fundamental 2: Explicit *Distributive* Elements	Social equity – in terms of the incidence of costs and benefits – must be an explicit component of ESD indicators.	We should select an indicator that will tell us how various income and interest groups are being affected by sulphur emissions.	Average sulphate deposition on Indian lands or marginal farm lands: kg SO_4/ha/year
Fundamental 3: Applications as a *Projective* Tool	ESD indicators must be useful for forward-looking applications and not just descriptive of past or current conditions.	We can rely on descriptive historical relationships that also provide information about potential future trends.	Potentially useful NRTEE indicator: tonnes SO_x/GJ of energy used Alternately, estimate impact elasticity which does not assume direct linearity: $\%\Delta SO_4/\%\Delta GDP$
Fundamental 4: Reflect Explicit *Linkages*	Drawing connections between human economic behaviour and broader ecosystem health is a vital function of ESD indicators.	Requires information on the linkages between human caused stresses and ecosystem productivity.	Joint reporting of sulphur emissions (t SO_x/year) and growth rates of forest (m^3/year), with potential change in composite indicator of ratios: Δm^3 forest growth / t SO_x emissions
Fundamental 5: Reflect Inherent *Uncertainty*	Unquantifiable uncertainty in ecosystem behaviour and response requires that ESD indicators must explicitly communicate such uncertainty to decision-makers.	Requires us to express both the potential ranges in current measurement as well as the potential levels of criticality in ecosystem modification.	Joint reporting of range of actual deposition levels (t SO_4/ha/yr) with potential range of levels critical to ecosystem health (t SO_4/ha/yr). Composite indicator of range of attained percentage.

[1]Prepared by H.J. Ruitenbeek for the Canadian Environmental Advisory Council, 1991. The indicators used here are illustrative of how the fundamentals could be applied and do not represent an endorsement or suggestion that these specific indicators are the most appropriate from either a scientific or an economic perspective. More research will in many cases be necessary to determine the most appropriate indicators.
[2]From discussion paper by Marbek (1990) circulated by National Round Table on the Environment and the Economy (NRTEE).
[3]Environment Canada's State of the Environment Report (1986), for example, shows forest areas affected by different levels of sulphate deposition.

Figure 9b.

SPECIFIC AUGMENTATION OF A SAMPLE INDICATOR — SULPHUR EMISSIONS[1]

Reference Point	Specific Examples of Data	Comments on Source and Derivation
Reference Indicator	Country: / SO_2 ('000 t/year) / t SO_2/PJ Canada 3,760 500 U.S.A. 21,100 310 China 12,920 550 U.K. 3,750 440	Emission estimates are based on data for the mid-1980s as summarized in *WRI World Resources 1990-1991*. Intensity estimates are derived from these and IEA energy consumption data. [Note that 1 PJ = 1,000,000 GJ.]
Broader Scope	Area in Eastern Canada: / kg SO_4/ha/yr / Area at Risk Wheat Growing Areas 42.9 99.6% Corn Growing Areas 43.6 100.0% Forests 22.7 41.2% Water 23.5 46.8%	Estimates are based on deposition in early 1980s and are calculated from data provided in Environment Canada SOE Report. Area at risk represents proportion subject to deposition in excess of 20 kg/ha/year of sulphate deposition. For water resources, areas with very high buffering capacities are excluded from areas at risk, even if deposition exceeds the 20 kg/ha/year level; areas with low buffering capacities are regarded at risk if deposition exceeds 10 kg/ha/year.
Explicit *Distributive* Elements	Economic Interest Group: / kg SO_4/ha/yr / Population at Risk Populations on Native Lands not available not available Farms with income less than: $500,000/year income not available not available $100,000/year income not available not available	Calculation of these indicators would be based on similar information to that above, except that it also requires an analysis of spatially organized economic data. All data are available in Canada, yet require some supplementary analysis before indicators can be represented.
Applications as a *Projective* Tool	Simple linear indicator: Canada = 500 t SO_2/PJ Energy Consumed Non-linear indicators based on cross-section or historical time-series analysis: Energy Elasticity = $\frac{\%\Delta SO_2 \text{ Emissions}}{\%\Delta \text{ Energy Consumption}}$ = not available Income Elasticity = $\frac{\%\Delta SO_2 \text{ Emissions}}{\%\Delta GDP}$ = not available	These indicators are useful to projective applications as there is an implicit behavioural linkage between key human activities. Such information provides a basis for both further intuitive and formal analysis of what might happen if certain things occur in the economy (such as income going up). The simple linear indicator (based here on the reference indicator above) is often used as an index of intensity; and is a simple example of an indicator with potential projective applications. A more rigourous approach is to use non-linear impact indicators ("holding other factors constant") that can still be expressed as a single "impact elasticity".
Reflect Explicit *Linkages*	Forested Regions in Eastern Canada: / Ontario / Quebec / Atlantic Annual Emissions of SO_x (million t) 1.0 0.6 0.4 Forestry Annual Yield (million m^3) 44.6 81.5 24.2 Index of Yield/Emissions (Base) 45 135 60 Index (Next Period) not available Δ Index not available	Annual emissions based on 1990 estimates. Annual yields based on Environment Canada SOE Report estimate of yield from forests in area of sulphate deposition greater than 10 kg/ha/yr. Index calculated as simple ratio.
Reflect Inherent *Uncertainty*	For forests at risk in: / Ontario / Quebec / Atlantic Average sulphate deposition (kg/ha/yr): 19.7 21.0 27.6 Critical sulphate deposition (kg/ha/yr): 20–40 20–40 20–40 Risk Index (%) 49–98 52–105 69–138	Estimates are based on deposition in early 1980s and are calculated from data provided in Environment Canada SOE Report. Critical levels reflect best available scientific estimates of maximum deposition that areas could withstand before ecosystem vigour and productivity declines. Risk Index is simple ratio of actual levels and critical levels.

[1]Prepared by H.J. Ruitenbeek for the Canadian Environmental Advisory Council, 1991. The indicators used here are illustrative of how the fundamentals could be applied and do not represent an endorsement or suggestion that these specific indicators are the most appropriate from either a scientific or an economic perspective. More research will in many cases be necessary to determine the most appropriate indicators.

The analytical and scientific challenge of providing such augmented information is not insurmountable. As discussed, it is quite feasible to incorporate a broader scope, distributive elements, and projective abilities in the information we present. It is more of a challenge to specify critical values or constraints to activities, although even this is possible if such estimates explicitly reflect their uncertainty. Probably the most difficult challenge will be to provide explicit linkages between human activities and ecosystem productivity. Even this, however, is becoming increasingly feasible in the wake of ecological "effects" research on particularly important or sensitive areas.

But it must be recognized that the basic approach of "augmentation" has both advantages and disadvantages. The primary advantage, and the reason it is being used here, is that it allows analysts and decision-makers to formulate indicators that are natural extensions of indicators with which they are already somewhat familiar. This facilitates analysis, presentation, understanding, and eventual adoption of the expanded information set in the decision process.

There are also, however, two potentially serious disadvantages to the augmentation process. First, it assumes that the set of starting point reference indicators we are using is already relatively complete. By contrast, it is conceivable that there are indicators that are potentially important but which would not naturally fall out of any particular augmentation procedure. One example of such an indicator, suggested during the indicator workshop, is the net primary product of terrestrial photosynthesis used or preempted by human activity; this was estimated to be about 40%. This measure may be taken as a rough index of how big the human sub-system is relative to the total system. It is unlikely that such information would be arrived at through a simple augmentation of existing reference points. The second disadvantage to augmenting a reference indicator is that any weakness in the scientific basis for the reference indicator may not necessarily be eliminated in the augmentation process. The example of sulphur emissions and sulphate deposition, described above, illustrates this point. It is believed, however, that neither of these disadvantages outweigh the advantages of using an approach which augments existing indicators. The first problem — incompleteness of the information set — simply requires us to be open to other types of information. The second problem — persistence of a potentially weak scientific basis — underlines the need to include both explicit linkages and measures of uncertainty within the information set.

8 Next Steps

Introduction

To reiterate a statement made by one of the indicator workshop participants, let us propose that enough is known about ecosystem dynamics for economists to get started on making it an intrinsic element of economic policy, and, for ecologists to start making the conduct of human activity an intrinsic element of ecosystem science. In response to this challenge, it is appropriate that the "five new fundamentals" proposed in this paper become part of any accepted framework for ESD indicator design.

While it is expected that most readers will be able to identify specific steps and actions that are appropriate within their own discipline or sphere of influence, this chapter identifies some key areas that are believed to be particularly important to assist in future indicator design. Appropriately, some priority work areas are identified, and a generic three-part strategy is suggested for augmenting existing information sets.

Some Priority Work Areas

It is acknowledged that there still remains substantial disagreement over many of the technical issues in indicator design. Rather than seeking to resolve this disagreement before indicators are put forward, however, it is clear that the very generation, interpretation, and continued refinement of indicators will eventually contribute to the resolution of these disagreements. It is equally clear that new disagreements will emerge as our information set becomes richer and our knowledge improves. Nonetheless, some immediate work is in order to support the indicator development efforts.

The work priorities can be summarized as follows:

a) within the economics discipline, start to code information geographically such that it can be linked easily to geographically-based information from the natural sciences. This is likely to require a fairly high degree of resolution if, for example, distributive impacts of ecological problems are to be measured. The alternative to this "geo-coding" procedure is to code all of the environmental data using economic conventions. As the end goal is to present only *selected* environmental information for selected economic groups, it would not be efficient to do this for all environmental data.

b) within the economics discipline, start to build "flexible constraints" into analytical procedures which reflect potential critical limits of the broader ecosystem. The existence of "constraints" reflects the idea that we live within the broader ecosystem but, analytically, they must be flexible such that projective analyses can reflect some uncertainty in their levels.

c) within the economics discipline, commence historical analyses of linkages between human activities and potentially relevant indicators of ecosystem health. While this might appear at first glance to be a job for the natural sciences, economists have a certain comparative advantage in this area because the analysis will involve applying analytical techniques commonly used within the economics discipline to time series or cross-sections of economic and "ecological" information. One potential avenue of research is to follow up on the idea that humans are themselves potential "indicator species" of ecosystem health. Human health characteristics — for which historical data can be quite good — might therefore provide some links to broader ecosystem health.

d) within the natural sciences, develop ranges of potential critical limits for key ecosystems. The ranges can and should explicitly reflect the uncertainty in ecosystem behaviour and scientific understanding of that behaviour. These critical limits should be developed in consultation with the economics discipline to ensure that the information is (i) understood and (ii) something that can be accommodated within analytical structures typically used in policy analysis. For example, consider three indicators such as "sulphur emissions", "sulphate deposition on water areas", and "trophic levels". The first is the easiest to accommodate within economic models because it is a direct result of human activity, but it is a poor indicator of ecosystem health. The latter is, conversely, probably the best indicator of ecosystem health, but it is not readily built into economic models. In this case, sulphate deposition — or some variant of it — appears to be a tractable compromise.

e) within the natural sciences, select and report indicators that provide policy-makers with an idea of how "healthy" various ecosystems are. It is recognized that there will be disagreement within the discipline over what the appropriate measures are, but at this stage the goal of the exercise must still be to familiarize policy analysts and decision-makers with this *type* of information. The use of indicators relating to keystone species, charismatic species, or indicator species would provide a good start to communicating this information, but explanations of *why* these particular species are relevant to ecosystem health is an important component of the process.

f) within the natural sciences, improve the scientific understanding of ecosystem dynamics with a view to describing the linkages between ecosystem stresses that might be caused by human activity, and overall ecosystem health. In particular, this work could be oriented towards eventually being able to specify some appropriate "early warning signs" for ecosystem distress.

Through all of these activities, it is clear that continued interdisciplinary work is important. Realistically, however, each discipline will continue to have comparative advantages in some areas. Further, the magnitude of the research programme that needs to be undertaken dictates that economists will continue to do some types of work while ecosystem scientists will continue to do other types of work.

Implementing the Fundamentals: A Three Part Strategy

While the preceding section described some of the supportive longer-term research and analytical work which would be necessary to develop better ESD indicators, an immediate priority must also be to commence programmes which ensure that the fundamentals are, to whatever degree possible, reflected in the indicators that decision-makers will be using. The precise manner in which *programmes* of indicator design are implemented will differ considerably among institutions or organizations. In general, however, any implementation strategy will consist of three parallel initiatives, as shown in Figure 10.

First, a basic programme which supports the development of "bottom-line" descriptive indicators will remain as one of the three focal points. In general, this can continue to build on sectoral work that is currently being conducted within Canada and other countries. There will, however, be some reorientation required of programmes that currently regard "social equity" indicators separately in their own "sector". The general position taken in this paper is that

Figure 10.
A Three Part
Implementation Strategy

I: Basic Programme

Continue development of descriptive "bottom-line" indicators.

II: Extension Programme

Augment descriptive indicators with enhanced indicators that:

- show policy and behaviour impacts and linkages;
- reflect distributional elements; and,
- reflect uncertainty.

III: Complementary Programme

Augment technical work to define indicators that project how close we are or will be to ecosystem "constraints".

Select and increase reporting of ecosystem health diagnostic indicators.

attempts should be made to integrate the social equity dimension into all sectoral indicators.

Second, an "extension" programme will be required within each sectoral effort to develop indicators that show: the impacts and linkages involved with economic behaviour; the distribution of costs and benefits in a manner that reflects social equity concerns; and, some dimension of uncertainty. The uncertainty dimension can be as simple as expressing potential "error ranges" with the reporting of indicators, or as complex as comparing projected values in relation to ranges of critical values.

The third "complementary" programme involves increased attention by the natural sciences to developing physical indicators that can be used as points of reference in the behavioural analysis undertaken within the social sciences. As a first — but not insignificant or simple — step, this will require focusing on potential physical constraints to economic activities. A second — more complex — step will be to increase the reporting of various types of diagnostic indicators for ecosystems so that policy analysts and decision-makers will become increasingly familiar with indicators of ecosystem health. As noted earlier, one means of promoting such a complementary programme in the natural sciences is to support ecosystem research at a substantial level.

Closing Remarks

The focus of this paper has been to discuss indicator design in a context that is sensitive ultimately to the needs of policy-makers. It is well recognized, however, that policy-makers are not the only users of this information. Corporations, scientists, and the general public all will contribute to the generation and interpretation of the information used by these policy-makers. But to the policy-makers we propose that information which reflects the five fundamentals enumerated in this paper will provide them with a better information set than will simple descriptive indicators.

Decisions should be based on information that reflects a broader scope, distributional concerns, projective elements, the explicit linkages between human activity and ecosystem health, and the inherent uncertainty in all of these. Decisions so made will lead to policy initiatives that will rise to and meet the challenge of formulating programmes consistent with ecologically sustainable development.

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Environmental Indicators for Latin America and the Caribbean: Toward Land-Use Sustainability

- Population
- Socioeconomic Development
- Food and Agriculture
- Energy
- Ecosystems and Land Use
- Forests and Rangelands
- Biological Diversity
- Freshwater and Coastal Resources
- Atmosphere and Climate
- Information and Participation
- International Treaties and Conventions
- Projections in Land Use

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I. Introduction

1. PURPOSE

Environmental indicators are needed to analyze and monitor development processes. However, development policies and strategies are elaborated and applied at different levels of society, and the effects and consequences of such policies are observed at different scales. Indicators must, therefore, be selected in relation to these characteristics and to the users' needs.

The goal of the present work is to prepare a set of indicators that might be utilized in the evaluation and design of environmental policies. Besides defining descriptive indicators that may help policy-makers quantitatively evaluate a given situation, normative indicators are needed to compare reference values and to show in what direction society must proceed. For this, we used a rational methodology for selecting retrospective and prospective environmental indicators in relation to key environment and development issues.

The model presented here is based on the elaboration of three groups of indicators at different levels and scales (countries and life-zones; regions; and localities). The first group is employed to observe the causes of environmental problems (Pressure on the Environment); the second group reflects the quality of the environment in relation to the effects of the human actions (State of the Environment); and the third refers to the measures and responses taken by society to ameliorate environmental damages (Response on the Environment). In addition, a fourth group of prospective indicators relates to the progress necessary to make land-use sustainable (Progress Toward Sustainability).

In all, some 44 Environmental Pressure Indicators, 47 Environmental State Indicators, 5 Environmental Response Indicators, and 12 Progress Toward Sustainability Indicators were selected. The indicators are presented in tables at a regional level for countries and life-zones, and in boxes at a subregional or local level for plots, basins, and ecosystems. A short analytical text accompanies each of the specific subjects, as well as the bibliographic references and data sources. Technical notes show the data sources, the choice and definition of some of the indicators, and the elaboration of data in cases where the information was calculated specifically for this work. At the same time, a series of data and indicators are presented to reveal trends. Finally, some figures illustrate the evolution of trends.

The first iteration of this work focuses on subregional and local levels, especially when analyzing peasant agricultural activities. This emphasis is due to the importance of peasant agriculture for Latin America and the Caribbean, in terms of both past and present problems, and of future opportunities. The subregional and local analyses are studies of partial cases. They illustrate the causes and solutions of the problems at different scales. However, they do not provide a complete vision of sustainability in land-use. Rather, the objective is to give examples of the type of information and indicators necessary to understand the development process and to elaborate actions and responses to related problems.

2. BACKGROUND

Latin America and the Caribbean comprise 32 countries that cover more than 20 million square kilometers. (See Map 2.1.) The areas of the region share many biophysical characteristics that are unique from a global perspective. A first-order look at the region shows large well-defined terrestrial units. Mexico represents the northern portion of the current Latin American territory. Central America bridges North and South America, with the Caribbean serving as an insular arch. If only topography and hydrography were considered, Mexico and Central America could be represented by mountains and volcanoes; the Caribbean by the sea; and South America by the huge fluvial plains and the Andes range (PNUMA, AECI, & MOPU, 1990). Adding climate (precipitation, biotemperature, and evaporation) and geography (latitude and topography) allows us to divide the region into life-zones aggregated according to current vegetation and land-use until 18 great environmental units or life-zones emerge. (See Map 2.1.) The life-zone system helps us envision the ecological and production-related features of each land-use type. We may, for example, recognize the tropical moist forests, characterized by a shifting agriculture, resource extraction, and livestock raising; the tropical lower montane moist forests, characterized by peasant agriculture based on coffee crops; the tropical dry forests, typified by livestock raising and intensive crops (sugar cane); and the subtropical savannas, with their extensive livestock raising and cereal cultivation (Winograd, 1989a).

Yet, not all the region's common features are natural resource endowments. Many shared environmental problems and unexploited opportunities exist—a consequence of the development models applied in the region. With 8.5 percent of the world population, the region includes 23 percent of potential arable lands, 12 percent of current croplands, and 17 percent of all pas-

tures. It also accounts for 23 percent of the planet's forests (46 percent of tropical forests) and 31 percent of internal renewable water resources. Although its fossil fuel reserves amount to only 3 percent, this region has 19 percent of the world hydroelectric potential (See Table 2.1.) (Gallopín et al., 1991a). That said, the region is losing its forests at a rate of 0.7 percent to 0.8 percent per year to unstable and barely productive agroecosystems (Winograd, 1991a; WRI, 1992). Croplands are under utilized because, although 85 percent of the region can yield 2.5 annual harvests of short-cycled crops, only 65 percent of the cultivated area is harvested (FAO, 1988). In Central America and the Andean countries, 40 to 60 percent of the croplands show erosion problems, and 70 percent of the productive arid lands have suffered desertification (Leonard, 1987; Redclift, 1989; UNEP, 1991). The average carrying capacity of permanent pastures is scarcely 0.6 animals/hectare, and meat production does not exceed 13 kilograms per pasture hectare (WRI, 1992).

However, although most of the countries of the region share a common language and culture, stemming from a similar colonial past, the socioeconomic and environmental heterogeneity does not allow an easy analysis of Latin America and the Caribbean as a simple unit. From an economic standpoint, we may divide the region into countries with low-income economies (Haiti and Nicaragua), with middle-income economies (Ecuador and Colombia), and with high-income economies (Mexico and Argentina). Taking into account the socioeconomic situation, we may subdivide the region into groups of countries with high human development index (Uruguay and Costa Rica), middle human development index (Brazil and Paraguay), and low human development index (Guatemala and Bolivia). In summary, there is no single way to analyze the region. From an environmental point of view, it seems necessary to point out differences in national endowments of natural resources and their importance to economic development. In this sense, it is logical to divide the region into countries that do and do not export oil or into those countries that do or do not have great agricultural potential.

Nevertheless, to analyze and monitor development, land-use and natural resource management, we need to classify the region from a wider perspective—one that takes social and economic differences into account also. From this viewpoint, subregions (Central America, Caribbean, Southern Cone, or Andean countries) can be considered as political units of increasing integration in which development policies and strategies are elaborated at a wider level. In turn, nations can be seen as administrative units in which political decisions leading to development are taken. Life-zones are areas with common ecological and productive characteristics in which development actions and policies are performed. Finally, basins and ecosystems are where the causes and consequences of certain development policies are played out over the short term.

Socioeconomic and environmental conditions in Latin America right now make urgent changes in development models essential. These changes do not admit conventional solutions, and they must also go beyond the rhetoric on sustainable development to make real differences in real people's lives. Even as current development models are modified, the processes leading to development should be accelerated through dramatic changes in development, land-use, and natural resource policies. Applying sustainable development models poses new demands on those who formulate them. They must carefully quantify and follow the evolution of the process, the change and progress so as to elaborate the necessary actions and responses, More generally, they must recognize the causes and consequences of environmental problems and the impacts on different components of the development process.

The interest in and need for sustainable development, together with increasing consciousness of the threats menacing the environment and of the exhaustion or poor management of natural resources, have led countries, international institutions, policy-makers, and nongovernmental organizations to re-examine the means they use to evaluate and safeguard the environment, natural resource-use, and development itself (Rodenburg, 1992). In this process of defining actions and strategies and analyzing costs and benefits, environmental indicators are indispensable tools (OECD, 1991).

3. INDICATORS AND SUSTAINABILITY: CONCEPTUAL FRAMEWORK

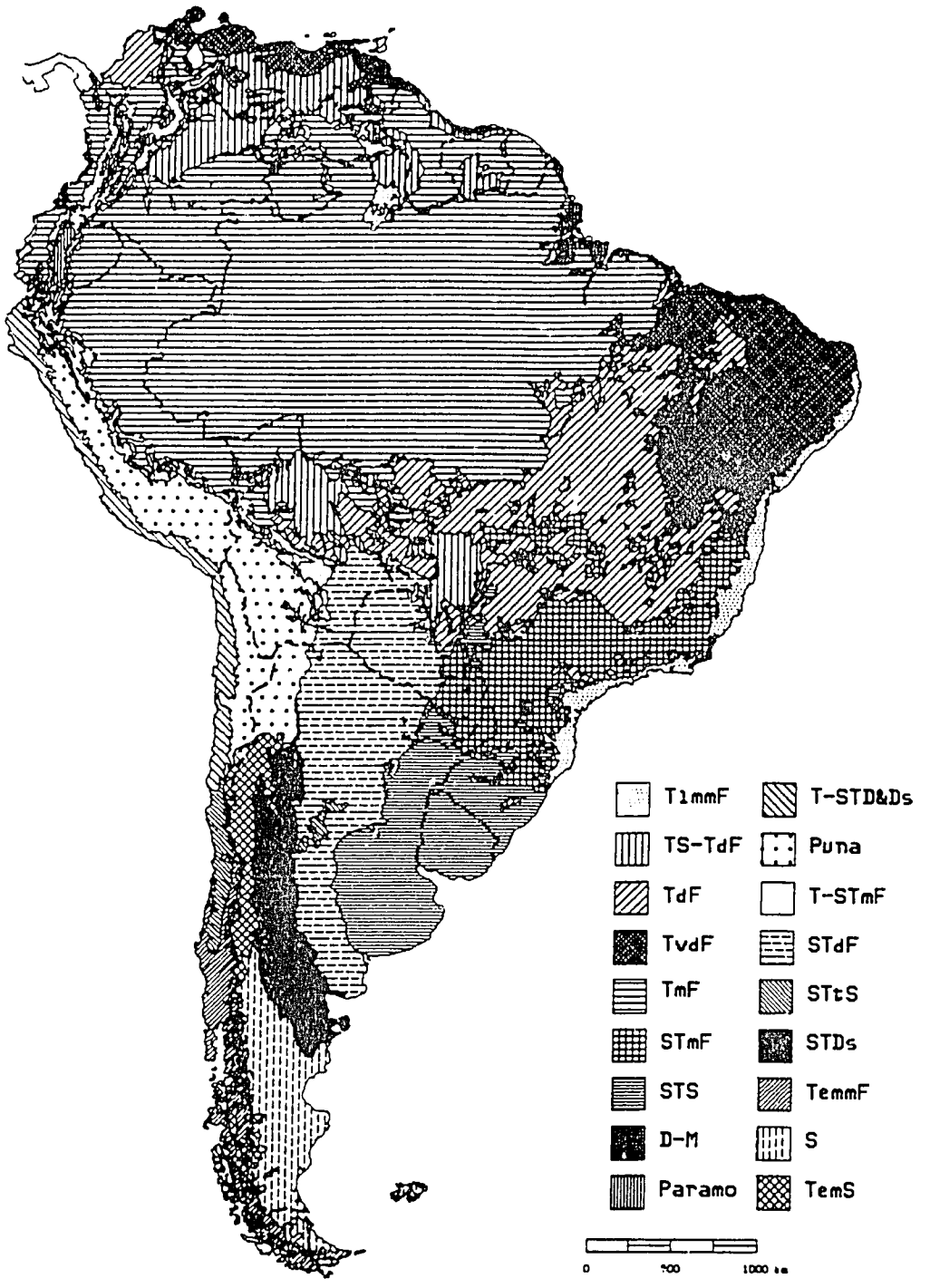
In the search for sustainable development models, tools that will allow the analysis of the evolution of the process are needed. Key among them are indicators that reflect stated development objectives and users' needs. To construct environmental indicators, researchers must define a conceptual framework to help them decide what to monitor and how. The indicators that emerge from this process must answer the needs for analysis at various levels and scales and at various stages of the development or ecological process. They must apply to separate components of the development or ecological process and be consistent with a stated definition of sustainable development.

Depending on which level analyzed (i.e., plot, basin, ecosystem or productive activity), different factors will emerge (economic, social, technological, or environmental) that influence sustainability, and therefore the necessary indicators to monitor the process. Similarly,

Table 2.1 Natural Resources in Latin America, the Caribbean, and the World

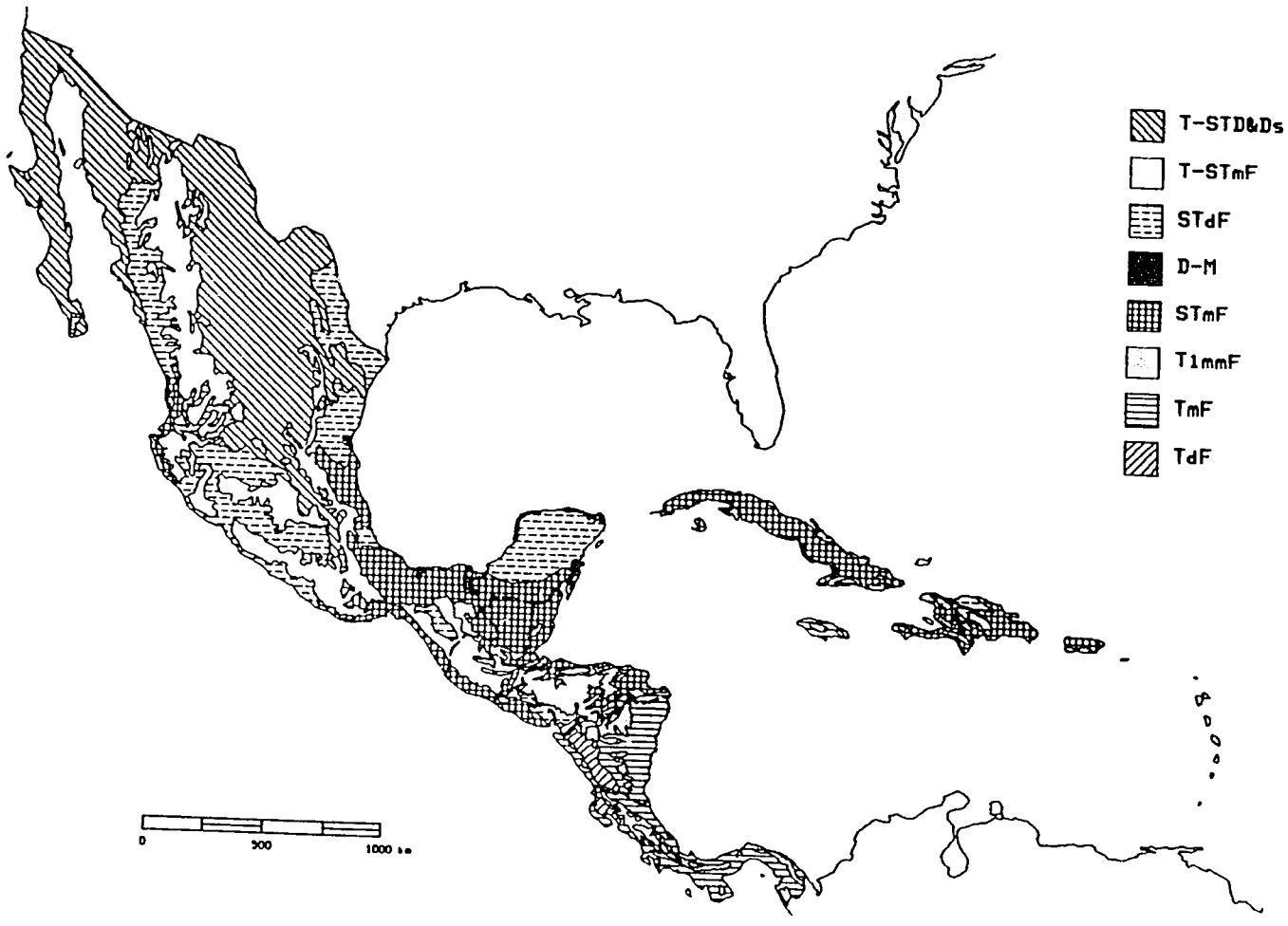
		Year	Latin America & the Caribbean Total	Latin America & the Caribbean % of World	World Total
Population	Inhabitants (millions)	1970	283	7.7	3,693
		1990	441	[illegible]	5,292
		2030	753	[illegible]	8,869
Food and Agriculture	Cropland (millions of ha)	1970	145	10.2	1,411
		1989	179	12.1	1,476
	Cropland per capita (ha)	1970	0.5	----	0.4
		1989	0.4	----	0.3
	Production of cereals (millions of T)	1970	71	5.4	1,204
		1990	100	5	1,972
	Production of Roots and Tubers (millions of T)	1970	49	8.8	561
		1990	48	8.4	574
	Production of Drugs (thousands of T)				
	Marihuana	1990	20.1	85	23.6
	Coca Leaf	1990	226	100	0
Energy	Fuelwood and Charcoal Production (millions of m3)	1970	185	15.6	1,186
		1990	289	16.1	1,796
	Installed Hydropower Capacity (gigawatts)	1970	18,718	6.4	290,652
		1989	87,761	14.2	617,101
Ecosystems and Land-use	Forested Area (% of total land)	1970	51	----	32
		1989	47	----	27
	Permanent Pasture Area (% of total land)	1970	26	----	25
		1989	28	----	25
	Cropland Area (% of total land)	1970	7	----	10.7
		1989	8.8	----	11.3
Forests and Rangelands	Extent of Forests and Woodlands (millions of ha)	1970	1,048	25	4,183
		1990	956	27	3,565
	Extent of Permanent Pastures (millions of ha)	1970	530	16	3,321
		1989	579	17	3,320
	Average Annual Deforestation (millions of ha)	1970	5.4	47	11.4
		1990	6.8	54	12.6
	Average Annual Reforestation (millions of ha)	1980-1990	0.8	5.4	14.7
	Roundwood Production (millions of m3)	1970	233	9.5	2,464
		1990	403	11.7	3,450
	Livestock Population (millions of animal units)	1970	257	17.7	1,451
		1990	362	20.8	1,746
Biological Diversity	Extent of Protected Areas (millions of ha)	1990	114	17.6	651
	Protected Area (% of total land)	1990	5.6	----	5
	Number of Species of Higher Plants (thousands)	1990	85	38	224.5
	Number of Species of Higher Plants (thousands)	1990	5.5	24	23
	Number of Animal Species Extinct	1600-1990	57	12	484
Freshwater and Coasts	Total Annual Renewable Water Resources (Km3)	1990	5,379	13.2	40,673
	Annual Renewable Water Resources per capita (thousands of m3)	1990	26.7	----	7.7
Atmosphere and Climate	CO2 Emissions from Industrial Processes (millions of T of C)	1970	142.6	3.7	3,850
		1988	266.6	4.5	5,893
	CO2 Emissions from Land-Use Change (millions of T of C)	1980	690.1	38.7	1,782.6
		1988	700.6	35.7	1,963.2
	CO2 Emissions per capita (T of C)	1980	2.6	----	1.5
		1988	2.3	----	1.5

Figure 2.1 Political and Life-Zones Map for South America



Note: TlmmF = Tropical Lower Montane Moist Forests; TS-TdF = Tropical Savannas; TdF = Tropical Dry Forests; TvdF = Tropical Very Dry Forests; TmF = Tropical Moist Forests; STmF = Subtropical Moist Forests; STS = Subtropical Savannas; D-M = Deltas and Mangroves; STdF = Subtropical Dry Forests; STtS = Subtropical Thorn Steppe; STDs = Subtropical Desert Bush; TemmF = Temperate Moist Forests; S = Steppe; TemS =Temperate Savannas

Political and Life-Zones Map for Central America



Note: T-STD&Ds = Tropical and Subtropical Deserts and Desert Shrubs; T-STmF = Tropical and Subtropical Montane Forests; StdF = Subtropical Dry Forests; D-M = Deltas and Mangroves; STmF = Subtropical Moist Forests; TlmmF = Tropical Lower Montane Moist Forests; TmF = Tropical Moist Forests; TdF = Tropical Dry Forests

the scale at which sustainability is measured will influence the choice of indicators. For example, the best indicators for measuring the sustained use of wood as a resource at a forest plot level might be incremental volumetric measurements—basically, physical measurements based on biological knowledge of the resource used and on information about the technology employed to exploit it (Dixon and Fallon, 1991). If sustainability is analyzed at a higher level (ecosystem or basin)—important, since the sustainable management of an individual resource can be non-sustainable for the system—additional indicators are needed to understand the behavior and interactions of the other system components. Even if, for example, reforestation by exotic species (i.e., *Pinus sp.*) can be sustainable in terms of species productivity, erosion, pest infestations, biodiversity losses, and impacts on water cycles and soil acidification can make such reforestation efforts unsustainable, so these factors must be monitored and assessed in relation to other human activities in the zone. The right indicators will in this case help analysts evaluate the costs and benefits of the production of an individual resource in the context of overall ecosystem or basin deterioration. Similarly, the costs of mismanaging soils, watersheds, and biodiversity could be calculated. In any event, the concept of sustainability is even broader than such indicators of ecosystem performance and balance might suggest. Its objective is not only to sustain a physical reserve or ecosystem production, but also to steadily improve the quality of human life. Thus, indicators that will integrate not only physical and technological factors, but also the sustainability of the social and economic system are needed. (Dixon & Fallon, 1991). In short, indicators must help decision-makers evaluate the opportunities lost and the benefits obtained in relation to socio-economic, environmental, and political needs.

Along with level and scale, the stages of any process under analysis must be identified. What are the problems and consequences of the current policies? And how do these policies interact? What opportunities and limitations characterize alternative development models as they are applied? If indicators don't help answer these questions, development proposals will fail. In short, monitoring should provide a sense of the past as well as stimulate ideas about the future.

1.3.1 What is Sustainable Development?

Sustainable development has many definitions, each devised for a different purpose. To minimize confusion in the context of further work on environmental indicators, sustainable development should be defined in terms of certain general sustainability objectives for the Latin America and the Caribbean region.

Essentially, sustainable development is a process of change that will allow the satisfaction of human needs without compromising the very base of development—the environment. The objectives of this kind of development are to obtain (i) an equitable economy; (ii) a fair and participatory social system; (iii) a reoriented and efficient technology base; and (iv) the optimal use and conservation of the environment. More specifically, five conditions should be met.

(1) At the economic level, it should not impoverish one group while it enriches another. In a sustainable society, all social sectors share the benefits of development. A structure characterized by increasing inequality may become sustainable in a purely biophysical sense, but not in socio-economic terms (Gallopín et al., 1989b; Saunier, 1987).

(2) At the ecological level, it should neither degrade diversity and the ecosystem's biological productivity nor the ecological processes and essential vital systems (IUCN, UNEP, & WWF, 1991). It should maintain, recuperate, and restore natural resources in areas with comparatively great productive potential, as well as deteriorated marginal zones, through sound management.

(3) At the social, cultural, and political levels, solidarity, agreement, the participation of all sectors and individuals, and international cooperation are needed to obtain sustainability. Action and respect are required from all parties, not just within the community but at global and regional levels too. Most current societies are strongly integrated into capitalist markets. But if this increasingly global system does not support sustainable practices and objectives, an isolated community or country does run the short-term risk of being penalized economically by incurring greater costs or receiving lower benefits for goods and services (Gallopín et al., 1989b; Preston, 1990).

(4) At a technological level, the ability to respond to change should increase. In a world where production is being transformed by accelerating technological innovation and expansion, where new products and markets are cropping up and both interdependence and interconnection are increasing, sustainability cannot be measured strictly in terms of an increase in productivity or sectorial self-reliance that will guarantee the production of a certain product over the long-term (Gallopín et al., 1989b). Instead, technology should be more related to efficiency in using resources and to the possibility of conserving or expanding productive options.

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(5) Finally, a diversity of socio-economic, cultural, productive, and ecological systems must be considered a key to adaptability and not an impediment to development. Indeed, increasing homogeneity means decreasing cultural, social, and economic options—a trend at odds with sustainability.

1.3.2 What are Indicators?

In general, indicators are elaborated to help analysts simplify, quantify, analyze, and communicate information. By assisting analysts understand complex phenomena and to put them into context for various segments of society (Adriaanse, 1993), indicators help reduce the uncertainty level, allowing society to better define priorities and urgencies.

For the selection and development of environmental indicators a conceptual framework is needed to organize and integrate diverse and dispersed information. At base, this framework consists of three types of indicators. The first identifies the causes of environmental problems and relates them to human activities. The second assesses the quality of the environment as a result of human actions. The third gauges the success of measures taken to improve the environment—essentially, political actions and responses.

There is another type of indicators that should help forecast and anticipate unsustainable aspects of development, as well as measure progress towards sustainability. With these indicators, the objective is to present enough data to permit an analysis of how much room to maneuver various alternative development models will allow. But because these indicators are based on simulation data and land-use projections, they appear in a different section of this document.

Thus, these sets of indicators combined can help analysts diagnose a situation in relation to certain environmental thresholds, design implementable policies based on sustainable development objectives, and figure out which current policies should be reinforced or eliminated to prevent further environmental degradation.

1.3.3. How Were These Indicators Selected?

Given the diversity of situations in Latin America and the great differences in the availability of environmental information from country to country, identifying which are the most important and urgent vis-a-vis the environment and development, as well as choosing the indicators needed to monitor them, is no easy task. Any method for classifying problems and opportunities and for selecting indicators will inevitably be somewhat arbitrary. Still, a first approximation permits us to analyze the development process in terms of its dependence on the environment and natural resources.

The main studies on environment and development in Latin America (BID & PNUD, 1990; Gallopín, et al., 1991c; PNUMA, AECI, & MOPU, 1990; USAID & WRI, 1993; WRI, 1990b) identify ten principal environmental issues:

(1) erosion and the loss of soil fertility,
(2) desertification,
(3) deforestation and land utilization,
(4) forest exploitation and use,
(5) basin degradation,
(6) deterioration of marine and coastal resources,
(7) water and air pollution,
(8) loss of genetic resources and ecosystems,
(9) quality of life in human settlements, and
(10) rural migration and land tenancy.

Since these problems can be analyzed in terms of the degree of impact on natural systems, and the populations and economic activities affected, two cross-cutting issues must also be added to explain and analyze past, current, and future ecological conditions in Latin America in relation to development: land-use and urbanization.

Of course, land-use and urbanization affect natural resources and the environment, population, and economic activities in different ways. At present, though urbanization involves more than half of the region's population, its spatial impacts and effects on natural resources have been limited. In contrast, land-use affects all natural resources and is an issue in most of the region, even though it affects directly only a limited number of the population in rural areas.

Although land-use and urbanization are inextricably interrelated, it is worthwhile to separate them when elaborating and selecting indicators. Urban environmental problems (pollution, industrial activities, wastes, etc.) are related mainly to quality of life and health in cities (Linares et al., 1992). Land-use problems (deforestation, erosion and desertification, loss of ecosystems and species, etc.) reflect primarily the abuse of natural resources. Since land-use appears as the main issue in the region in terms of opportunities and alternatives for a sustainable development, it has been selected as the primary environmental indicator.

The model adopted for this project to obtain information on progress toward sustainability is a variant of the Pressure-State-Response model, initially proposed by Tony Friend, David Rapport, and others (Friend and Rapport, 1979; OECD, 1991; Adriaanse, 1993). (See Figure 3.1.) Different variables may be selected to measure how a system's sustainability is affected by land-use and natural resources management at the country and life-

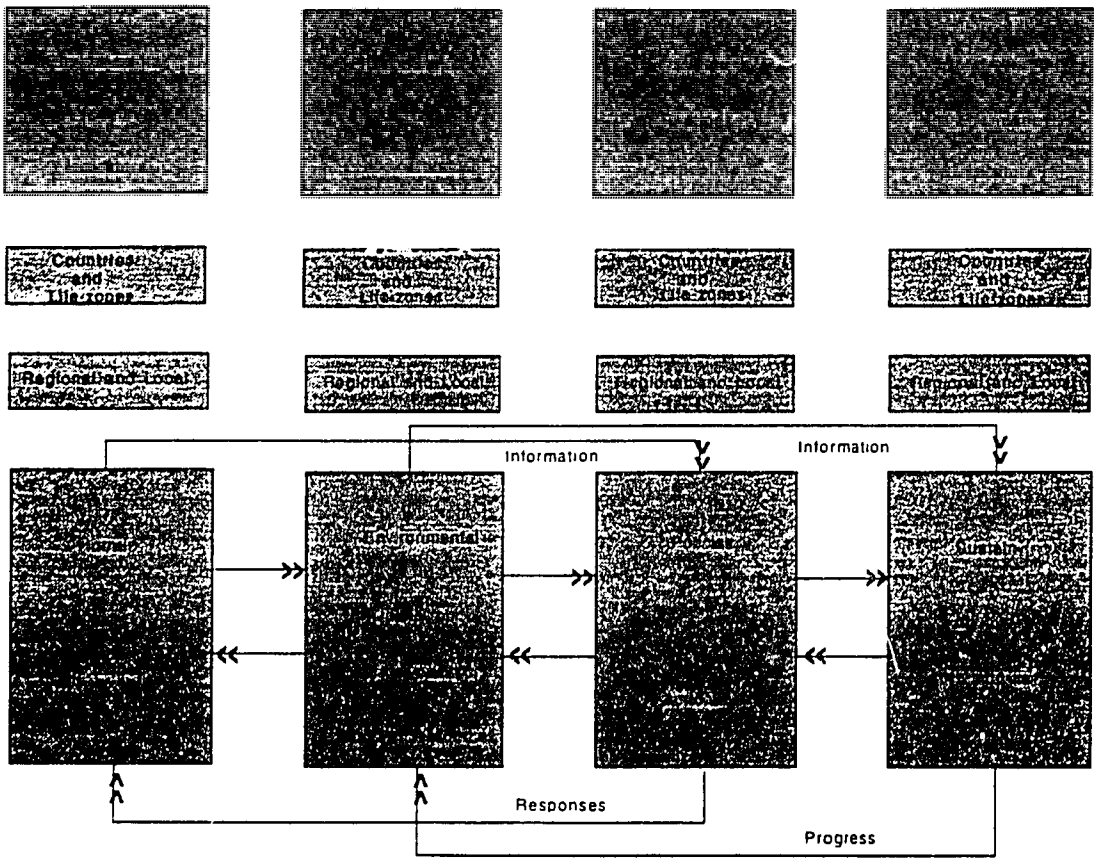
zones level, as well as at regional and local levels (de Camino and Muller, 1993; IIE, 1993). The variables associated with pressure on the environment are population, socioeconomic development, agriculture and food, and the use of energy resources. These pressures show up as impacts on ecosystems and land-use, forests and rangelands, freshwater and the coastal resources, and biological diversity, and as emissions stemming from human economic activities. As for societal responses, the variables are information, participation in policy-making, and global treaties and conventions. Because both problems and limitations, on the one hand and, on the other, opportunities and solutions to these problems arise as development models change, any projections stemming from this model must be viewed against more than one scenario for land-use and natural resource-use.

Within the framework of this model, indicators were selected on the basis of:

- the availability and quality of data;
- the geographical coverage;
- their relevance to the analysis;
- the possibility of relating the indicators to sustainability or non-sustainability;
- and personal judgments about how well they integrate the different levels and scales of analysis.

To elaborate the indicators, variables for each category of analysis were selected. These variables measure

Figure 3.1 Conceptual Framework for the Pressure-State-Response Model



Sources: Adriaanse, 1992 & 1993; Winograd, 1991

and describe the environmental and land-use situation and its evolution with respect to sustainability. (For example, for the Pressure on the Environment, Population, Socioeconomic Development, Food, Agriculture, and Energy were considered.) In turn, each variable is composed of different elements. (For the Population variable, for instance, the increment of population, the pressure of population on lands, and population distribution were used.) Each element has also some significant characteristics (or descriptors) related to sustainability. (For the population increment element, the measurement of the increment was used.) Finally, for each descriptor selected, one or many indicators must be defined to measure their effect on the system. (For the measurement of the increment of this effect, annual population change was selected as an indicator.) In addition, to understand the meaning of some indicators, statistical data on the future effect of the variables and elements on the system are also needed. (For instance, Projections of Population.) Tables 3.1., 3.2., and 3.3. show the variables selected, as well as the elements, descriptors, and indicators needed for each category in relation to development and the sustainability of land-use.

Table 3.1 Environmental Pressure Indicators

Variable	Element	Descriptor	Indicator	Additional Data
Population	Population Increment	Increment Measurement	Annual Population Change (R & L)	Population Projection (R)
	Pressure on the Lands	Relationship with Surface	Density (R & L)	Livestock Population (L)
	Population Distribution	Relationship between Urban & Rural	Percent Urban and Rural (R & L)	Deforestation & Desertification (L)
Socio-Economic Development	Production Increment	Increment Measurement	Annual Growth Rate (R)	Adjusted GDP (L)
	Production Increment	Relationship with Population	GNP per Capita (R)	Total GNP (R)
	Purchasing Power	Parity of Purchasing Power	GDP per Capita Real (R)	Annual Rate of Inflation (R)
	Employment	Employment Level	Percent of Unemployment (R)	
	External Debt	Relationship between External Debt & Exports	External Debt & Service as Percent of Exports (R)	Total External Debt (R)
	International Prices	Relationship between Export & Import Prices	Exchange Ratio (R)	Prices of Agricultural Products (R)
	Welfare	Human Development Level	Human Development Index (R)	
	Health Condition	Life Expectancy & Mortality	Life Expectancy at Birth & Infant Mortality Rate (R)	
	Nutrition Condition	Undernourishment & Calorie Supply	Percent of Children Undernourished & Calorie Supply (R)	
	Education Condition	Relationship between Male & Female Literacy	Percent of Adult Literacy (R)	
	Poverty	Relationship between Population & Poverty	Percent of Poverty Incidence (R)	
Food and Agriculture	Food Production	Increment Measurement	Change in Production & Yields (R)	
	Food Production	Increment Measurement	Index of Food Production (R)	
	Food Consumption	Change in Calorie Consumption	Per Capita Calories Available (R) & Percent Change of Calorie Intake (R)	Percent Change in Food Consumption (R)
	Agricultural Input	Increment of Input-Use	Annual Fertilizer & Pesticide Use (R)	
	Land Availability	Relationship between Cropland & Population	Cropland per Capita (R)	Irrigated Cropland (R)
	Land Distribution	Inequality of Distribution	Gini Coefficient (R)	
	Production Orientation	Relationship between Grain Production & Destination	Percent of Grain Fed to Livestock (R)	
	Soil Condition	Relationship with Hillside	Percent of Total & Cropland (R)	Population in Hillside (R)
	Hillside Soil Condition	Soil Limitations	Percent of Soils with Limitations (R)	
	Hillside Soil Condition	Soil Potential	Potential Cropland (R)	
	Production Potential	Relationship between Cropland, Population, & Input Level	Agricultural Land Needed (R)	
	Land Availability	Relationship between Cropland & Population	Potential Cropland per Capita (R)	Total Potential Cropland (R)
	Land Availability	Relationship between Actual & Potential Cropland	Land Expansion Potential (R)	
	Carrying Capacity	Relationship between Population & Input Level	Potential Population Supporting Capacity Ratio (R)	
	Production Orientation	Relationship between Drug Production & Employment	Drug Production (R & L)	Prices and Land-Use (L)
	Production Orientation	Changes in Food Consumption	Sources of Foods (L)	Hours Worked for Purchased Food (L)
Energy	Bioenergy Production	Relationship between Fuelwood Production & Population	Fuelwood and Charcoal Production per Capita (R)	
	Bioenergy Production	Relationship between Production & Requirements	Traditional Fuels as Percent of Total Requirements (R)	
	Production Potential	Bioenergy Production	Bioenergy Potential (R)	
	Hydroelectric Resources	Hydropower Capacity	Installed Hydropower Capacity (R)	
	Hydroelectric Production	Hydropower Capacity	Hydropower Generation as Percent of Capacity (R)	
	Hydroelectric Potential	Generation Potential	Exploitable Hydroelectric Potential (R)	
	Hydroelectric Production	Relationship between Generated & Surface	Kilowatts Generated per Hectare (L)	

Note Brackets indicate scale
R = Regional & L = Local

Table 3.2 Environmental State Indicators

Variable	Element	Descriptor	Indicator	Additional Data
Ecosystems and Land-Use	Change in Primary Production	Production Measurement	Natural & Actual Net Primary Production (R)	Surface Patterns (R & L)
	Change in Land-Use	Change of Measurement in Use Patterns	Percent of Change (R)	Surface Patterns (R & L)
	Production & Employment	Relationship between Employment & Surface	Employment per Hectare (L)	Employment per Activity (L)
	Land Production	Economic Production	Annual Production & Value (L)	Annual Deforestation (L)
	Impact of Land-Use	Emissions Measurement & Intensity of Use	Net Emissions (L), Species Used (L), & Year of Use (L)	Type of Use (L) & Size of Production Unit (L)
	Impact of Land-Use	Relationship between Urban & Rural Emissions	Eq. Persons Using Fossil Fuels in City (L)	
Forests and Rangelands	[illegible]estation	Forest Types		
	Forest Depletion	Deforestation in Closed & Open Forests	Closed & Open Forest Surface (R)	
	Forest Increase	Reforestation in Closed & Open Forests	Annual Deforestation (R)	
	Change in Forest Surface	Annual Deforestation	Annual Reforestation (R)	
	Change in Forest Surface	Relationship between Reforestation & Deforestation	Annual Deforestation Rate (R)	
	Forest Production	Relationship between Production & Population	Reforestation/Deforestation Ratio (R)	
	Forest Potential	Relationship between Timber Reserves & Population	Roundwood Production per Capita (R)	
	Forest Potential	Relationship between Production & Reserves	Timber Reserves per Capita and per Hectare (R)	
	Vegetation	Changes in Pasture Land	Production/Reserve Ratio (R)	
	Livestock Population	Measurement Increment	Percent of Change (R)	
	Carrying Capacity	Measurement Increment	Percent of Change in Livestock Population (R)	Permanent Pasture Surface (R)
	Pasture Production	Measurement Increment of Meat Production	Carrying Capacity Index (R)	Livestock Population (R)
	Economic Value	Relationship between Surface & Value of Exports	Percent of Change (R)	Percent of Change (R)
			Dollars per ha. of Principal Agricultural Products (L)	Meat Production (R)
Biological Diversity	Decrease of Species Number	Relationship between Total & Threatened Species	Percent of Animal Species Threatened (R)	
	Decrease of Species Number	Relationship between Total & Threatened Species	Percent of Threatened Plant Taxa (R)	Number of Species (R)
	Decrease of Species Number	Relationship between Threatened Species & Surface	Threatened Plant Taxa per 1,000 Km2 (R)	Number of Plant Taxa & % Endemic (R)
	Protected System	Relationship between Protected Surface & Total	Percent of Total Surface Protected (R)	
	Use of Biological Diversity	Relationship between Species Used & Total Species	Vegetation-Use Index (L)	Number of Sites & Protected Area (R)
	Extinction Risk	Relationship between Habitat Loss & Species	Species Risk Index (R)	
	Investment in Conservation	Relationship between Investment & Surface	Dollars per 1,000 ha. (R)	
	Economic Value	Economic Production	Value of Production (L)	Protection Financed by $US
	Economic Value	Investment Profitability	Net Present Value (L)	Production Yields (L)
				Production Cycle (L)
Freshwater and Coastal Resources	Coastal Resources	Relationship between Coastline and Coastal Resources	Relationship between Coastline, Mangroves, & Seagrass (R)	
	Protection of Coastal Resources	Protected Area	Number of Protected Coastal Areas (R)	
	Carrying Capacity	Increment of Population in Coastal Area	Population in Coastal Agglomeration (R)	
	Water Resources	Relationship between Water & Population	Renewable Water Resources per Capita (R)	Damages (R)
	Water Resources-Uses	Relationship between Total Resources & Population	Percent & per Capita Annual Withdrawals (R)	Total Renewable Water Resources (R)
	Distribution of Water-Uses	Relationship between Extraction & Activities	Percent of Sectoral Withdrawals (R)	Total Annual Withdrawals (R)
	Value of Coastal Resources	Relationship between Employment & Income	Employment & Income in Mangrove Forests (L)	
Atmosphere and Climate	Greenhouse Gas Emissions	Change in Greenhouse Emissions for Land-Use	Emissions CO2 Eq. Carbon Total & per Capita (R)	
	Greenhouse Gas Emissions	Increment of Greenhouse Emissions	Emissions CO2 Eq. Carbon Total per Capita & per PNB (R)	Emissions of CO2, CH4, & CFC (R)
	Greenhouse Gas Emissions	Relationship between Activities & Land-Use Changes	Emissions CO2 Eq. Carbon by Activity (R)	
	Greenhouse Gas Emissions	Relationship between Actual & Cumulative Emissions	Actual & Cumulative CO2 Emissions per Capita (R)	
	Climate	Natural Disasters	Population Affected & Economic Loss (R)	Type of Event (R)

Note: Brackets indicate scale
R = Regional & L = Local

Table 3.3 Environmental Response Indicators and Progress Toward Sustainability Indicators

Variable	Element	Descriptor	Indicator	Additional Data
Information and Participation	Environmental Information	Countries with Environmental Information	Number of Environmental Profiles & Assessments (R)	INFOTERRA Member (R)
	Society Participation	Participation in Environmental Policy	Number of NGO's by Activity Area (R)	
	Public Opinion	Importance of Environment	Public Perception of Environmental Problems (R)	
Treaties and Conventions	Environmental Policy	Participation in Treaties & Conventions	Signature & Ratification of International Treaties (R)	
	Sources for Financing Conservation	Debt for Nature Swaps	Funds Generated for Conservation (R)	
Projections in Land-Uses	Potential Land-Use	Relationship between Potential Land & Population	Potential Productive Land per Capita (R)	
	Land Needed	Relationship between Cropland Needed & Input Level	Agricultural Land Needed in 2030 (R)	Potential Cropland & Pasture Land (R)
	Actual & Potential Uses	Relationship between Actual & Potential Lands	Land-Use Index (R)	Input Level (P)
	Vegetation	Relationship between Loss & Gain of Forests	Deforestation Rate & Ref./Def. Ratio (R)	
	Land-Uses	Relationship between Land-Use & Population	Cropland & Forests per Capita (R)	Forest Surface (Def. & Ref.) (R)
	Land-Use Consequences	Greenhouse Gas Emissions	Net Additions per Capita & Total (R)	Cropland, Pastures, & Altered & Reforested Areas (R)
	Costs & Investment for Development	Relationship between Land Needed & Land-Use Costs	Mean Annual Investment (R)	
	Potential Land-Use	Relationship between Actual & Potential Uses with Costs	Rehabilitation Costs & Benefits (L)	Land Used and Land Use Costs (R)
	Mitigation Potential from Land-Use	Relationship between Potential Land-Use & Carbon Sequestration	Carbon Absorption by Reforestation & Agroforestry (R)	

Note: Brackets indicate scale
R = Regional y L = Local

Breakout Sessions
USAID Environmental Performance Workshop
March 30 and 31, 1995

Purpose: Breakout sessions have been designed as informal working meetings for participants to discuss their experiences from the field and Washington in measuring environmental performance. The sessions' purpose is to have participants translate these experiences into recommendations that can guide USAID in developing environmental performance indicators that describe the Agency's overall impact on the environment beyond the project or program levels. Participants will work toward gaining consensus on a common set of first-cut, Agencywide environmental indicators and on identifying the major issues that relate to their articulation and implementation. Some Agencywide performance indicators already used in health—fertility and infant mortality rates—offer good examples of such aggregate-level measurements.

Structure and Venue:
There will be four working groups:

1. Biodiversity conservation (Room F2304)
2. Energy, urban environment and global climate change (Room F2305)
3. NRM, Sustainable Ag, Forestry, Water, CZM (Room F2306)
4. Managing for Results (Auditorium)

Suggested Ground Rules:

- Facilitators and rapporteurs will be pre-assigned for session #1 and then be selected by breakout group members for the subsequent sessions.
- Participants are requested to select their working group on the basis of their area of expertise, and to remain active in that group throughout the two days.
- Breakout sessions will be fully participatory, self-managed, and highly flexible. Groups may divide into smaller focal areas (e.g., global climate change) if this facilitates the development of sector-specific indicators.
- Working groups may use the attached tables to guide their discussions or else develop their own approach for recording session discussions and conclusions for breakout and workshop proceedings.
- Rapporteurs should be prepared to provide a succinct, five-to-ten-minute summary of group discussions at the plenary meetings that follow each breakout session.

Format for Groups 1 - 3

Session #1

Objective: To review, discuss, and brain storm on the range of indicators that can be used to measure environmental performance at all levels (project, program, and strategy), and to identify issues that facilitate and hinder their use. Sharing information, experience, and the lessons learned about environmental performance measurements is the main goal of this first session.

Comments: At this initial group meeting, participants are encouraged to be expansive in their discussions, viewing the term "indicator" as only part of a broader dialogue on performance monitoring and evaluation (e.g., baseline data and targets are also important measurement components). In addition to developing a preliminary list of indicators, participants should review the indicators' characteristics (eg., quantitative versus qualitative, proxy verses direct measures, field-based versus theoretical, primary versus secondary data sources). Participants also should begin thinking about the feasibility of adopting the indicator in the short to medium term, taking into consideration issues such as the costs and data quality and availability. The workshop handbook includes a glossary of terms and reference materials (core environmental indicators developed by OECD and the Commission for Sustainable Development) to complement plenary presentations as inputs for breakout discussions.

Outputs: A preliminary list of first-cut indicators and related issues. Indicators may be grouped by hierarchial levels, as adopted by the Africa Bureau NRM Framework (e.g., biophysical, policy, and public education and awareness), or else categorized by whether they measure outputs, through intermediary results, all the way to impacts, or other schemes selected by the group.

Breakout Session #2

Objective: To complete discussions started in Breakout Session # 1, to develop criteria for selecting Agencywide environmental performance indicators, and to begin ranking indicators according to these criteria.

Comments: By the midpoint of this session, the group should have identified a wide array of performance indicators. It also should have begun developing criteria for selecting and ranking the indicators according to their relevance to the Agency's overall environmental strategy and the feasibility of adopting the indicators at the project, mission, and Agency levels. Factors to be examined may include the existence of workable measures, data availability, and a broad range of the field realities.

Output: Refined list of indicators and criteria to guide Agencywide indicator selection and priority ranking.

Breakout Session #3

Objective: To develop a core set of Agency performance indicators and a list of accompanying issues inherent to implementation and operalization.

Comment: Selection criteria developed in session #2 should be used to generate the first-cut core performance indicators for Agencywide impact determination. Revisiting activities from previous breakout sessions, plus more wide ranging discussion of how this information may be used is likely.

Outcome: First-cut core indicators and major issues.

Working Group _____
Facilitator _____
Rapporteur _____

Breakout Session #1
Sector _____

Preliminary Indicators at the project, program, & strategy level	Comments, Concerns, Pros & Cons

Working Group _____
Facilitator _____
Rapporteur _____

Breakout Session #1
Sector _____

Issues Related to Performance Indicator Relevance and Feasibility

Working Group _____
Facilitator _____
Rapporteur _____

Breakout Session #2
Sector _____

Criteria for Selecting and Ranking Agencywide Indicators

Working Group _____
Facilitator _____
Rapporteur _____

Breakout Session #3
Sector _____

First-Cut Agencywide Performance Indicators	Comments, Concerns, Pros & Cons

Working Group _____
Facilitator _____
Rapporteur _____

Breakout Session #3
Sector _____

Issues Related to Agencywide Indicators

Record FAOFood.Aid

ORGANIZATION, INSTITUTION, OR AGENCY:

Food and Agricultural Organization of the United Nations

OFFICE, BRANCH, OR DIVISION:

Economic and Social Policy Department
Statistics Division

STATISTICAL PROGRAM TITLE:

Food Aid Statistics

SUMMARY PROGRAM DESCRIPTION:

The Food and Agricultural Organization of the United Nations (FAO) is continuously monitoring food aid flows and developments. FAO publishes relevant up-to-date information on food aid flows, the food supply situation and crop prospects in developing countries of the world. These data are a pre-requisite to better planning of food aid and maximizing its effectiveness.

SUBJECT COVERAGE:

Coverage is provided on food aid flow by donors, recipients and commodities.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Shipments and receipts of food aid commodities are reported under two different categories: cereals (in tons of grain equivalent) and non-cereals (in tons). The value of food aid is reported in U.S. and local dollars.

STATISTICAL DATA TYPE:

Time Series - Time series statistics are provided for most of the variables reported. World totals are provided for basic statistics on food aid including: minimum target, Food Aid Convention commitments and shipments of cereals; proportion of cereal imports by low-income food-deficit countries covered by food aid; shipments of other foodstuffs; food aid through the World Food Program (WFP), including pledges to the regular biennial program, contributions of cereals and foodstuff to the International Emergency Food Reserve (IEFR), contributions to Protracted Refugee

Operations (PROs), total shipment through WFP, and total value of WFP emergency operations, IEFR and PROs; and food aid through Official Development Assistance (ODA) including value of food aid, share of food aid in total ODA, proportion of multilateral food aid and grants for food aid.

Statistics on development assistance and food aid cover food aid by members of the Development Assistance Committee (DAC) of the OECD (total value and value of multilateral and bilateral aid, grants and loans) and value and share of disbursement of food aid by DAC member countries.

Total world tonnage for shipments of total food by commodity (wheat, rice, coarse grains, vegetable oil, butteroil, edible fat, skimmed milk powder, other milk products, meat and meat products, fish and fish products, pulses, sugar, dried fruit, and other foodstuffs) and cereal food aid receipts by main categories of use [non-project aid, project aid (agricultural and rural development, nutrition improvement, Food Security Reserves, and other), and emergencies) are provided in times series.

Shipments of food aid by donor countries are reported for a series of years in tons for total cereals, wheat, rice, coarse grains, vegetable oil, butteroil, skimmed milk powder, and other milk products. Shipments of other foodstuffs (edible fat, meat, fish, pulses, sugar, dried fruit, and other foodstuffs) are reported for the last two years only.

Triangular transactions and local purchases in cereals by donors, place of origin and country of purchase are reported for several recent years.

Receipts of total cereals, wheat, rice, coarse grains, skimmed milk powder, other dairy products, vegetable oil, and butteroil are reported by recipients and major geographic region along with the share for low-income food-deficit developing countries and for the world.

Food aid flow for total cereals, skimmed milk powder and vegetable oils by donors and recipients is provided for the most recent year available.

Food aid transactions reported by the Consultative Subcommittee on Surplus Disposal include usual marketing requirements (UMR) of wheat and wheat flour, rice, coarse grain, vegetable oil, dairy products and other products (in tons) for recipient countries by donors for the most recent year available. Time series on total compliance rates for UMRs by commodity are also reported.

Statistics on food aid through WFP are reported as time series (e.g., resources, contributions to IEFR, total food aid shipments, development commitments approved by region, emergency operations approved by source and type of emergency) and as the most recent biennial data (e.g., pledges). WFP commitments for protracted and displaced person projects are reports by region for the most recent two years.

Statistics on food aid through other organizations include temporal statistics on the following: food and shipments through United Nations Relief and Works Agency for Palestine refugees by commodity; food aid purchases by and shipment through the United Nations Office of the High Commissioner for Refugees by commodity and by recipient; and food aid shipments through the International Committee on the Red Cross by commodity and recipient.

Donor food aid budget allocations during current and previous budget periods provide detail for donor countries on bilateral, multilateral, and total allocations in tons and local dollars.

Spatial Data - Statistics are reported as appropriate for donor and recipient countries, low-income food-deficit countries, least developed countries, and the world. All donor countries that have been providing food aid on a regular basis are listed individually. All others that have provided food aid at irregular intervals during the period under consideration are included in "others" category. Shipments for which the recipient country was not specified are included under "unspecified" except where information regarding the recipient country can be derived from other sources.

TIME PERIOD COVERED:

Food aid statistics for most series are provided from 1978 forward, although statistics for some series are provided from 1963 forward. Beginning in 19__, donor country data for cereal commodities are reported for the crop year (1 July - 30 June). Non-cereals and food aid shipments through multilateral organizations, both cereals and non-cereals, are reported on the calendar year basis.

DATA COLLECTION FREQUENCY:

Annual.

DATA COLLECTION METHODS:

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Data are supplied by donor countries and complemented by data provided by the FAO Consultative Sub-Committee on Surplus Disposal, the World Food Program, the International Wheat Commission, OECD, and other international organizations.

GEOGRAPHIC COVERAGE:

World-wide.

OTHER SPATIAL DATA CHARACTERISTICS:

Not applicable.

QUALITY ASSURANCE PROCEDURES USED:

Adherence to FAO reporting standards provides a degree of quality assurance. Notes on the tables in the Food Aid in Figures list the exceptions to these standards.

QUALITY OF DATA:

Coverage may be incomplete insofar as it may exclude some transactions by non-FAO Member Nations.

Donor country data may not correspond to actual receipts by beneficiaries during the given time period. Delays in transportation and imperfections in data recording systems may account for differences that may exist.

DATA OUTPUT FORMAT:

FAO offers food aid data on standard tapes for all time series (see description under Database below).

DATA OUTPUT FREQUENCY:

Annual.

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Inquiries about the technical contents of the Food Aid in Figures publication should be addressed to:

FAO
Via delle Terme di Caracalla
00100 Rome, Italy

CONTACT FOR PUBLIC INQUIRIES:

Requests for copies of the Food Aid in Figures publication should be sent to the FAO sales agent in member countries, or to:

Distribution and Sales Section
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

Information about standard tapes and order forms can be obtained from:

Computer Services Center
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

DATABASE(S):

Name of Database(s): FAO Food Aid Database

Acronym:

Identification Number (if applicable):

Contents: The database is maintained in FAO's AGROSTAT computerized system. It contains complete time series starting from 1970/71 for cereals and 1977 for non-cereals.

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Mr. Panos Konandreas
Senior Economist
Food Security and Food Aid Policies Group
Commodities and Trade Division
FAO
Rome

Forms/Software In Which Data Are Available: Data can be acquired on standard tape in machine-readable form.

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Hardware and Other Software Requirements:

Access Restrictions and Conditions:

Price Information: Standard tapes cost US$500 each or the equivalent pounds sterling or French francs. Prices are subject to revision.

Language(s): English, French and Spanish.

User Aids Available:

KEY PUBLICATIONS:

Food and Agricultural Organization of the United Nations, Food Aid in Figures (FAO, Rome, annual).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

KEYWORDS

Cereals
Food aid
Food deficit countries
Non-cereals

Record FAOFood.Balance

ORGANIZATION, INSTITUTION, OR AGENCY:

Food and Agricultural Organization of the United Nations

OFFICE, BRANCH, OR DIVISION:

Economic and Social Policy Department
Statistics Division

STATISTICAL PROGRAM TITLE:

Food Balance Statistics

SUMMARY PROGRAM DESCRIPTION:

Food balance sheets present a comprehensive picture of the pattern of a country's food supply during a specified reference period. They show country-level sources and utilization of primary food commodity groups and a number of processed commodity groups potentially available for human consumption. Annual food balances tabulated regularly over a period of years serve many useful purposes, incluing but not limited to: showing trends in the overall national food supply and import dependencies, disclosing changes that may have taken place, indicating the degree to which primary food resources are used to produce animal feeds, providing data for the projection of food demand, and revealing the extent to which the food supply of the country, as a whole, is adequate in relation to nutritional requirements.

The Food and Agricultural Organization of the United Nations (FAO) published the first food balance sheets in 1949 for 41 countries covering the period 1934-38 and 1947/48. A year later, it published a supplement giving 1949/50 data for 36 countries. Annual supplements were prepared until 1957 when FAO decided to publish three-year average food balance sheets with a five-year intervals between volumes instead. The number of countries covered in the early annual and initial three-year reports was between 29 and 41 countries. In 1977, beginning with the 1972-74 average food balance sheets and with the aid of the Interlinked Computerized Storage and Processing System of Food and Agricultural Commodity Data (ICS), FAO was able to provide coverage for at least 145 countries, all continents, summaries for economic classes and regions, and the world. By the 1979-81 issue, FAO had produced a standardized format which it continues to use.

Food balance sheets have been the main source of data used in the assessment and appraisal of the world food situation which FAO has made five times, starting with the pre-war period in its <u>First</u>

World Food Survey (1946) and followed by surveys for the early post-war period (published in 1952), the late 1950s (in 1963), the early 1970s (in 1977), and most recently (in 1985). Food balance sheets also provided a major source of information for the statistical base of FAO's Indicative World Plan for Agricultural Development, for which 1961-63 average food balance sheets were prepared for all the 64 developing countries in the study.

SUBJECT COVERAGE:

Food balance sheets cover food production, available supply, feed and manufacture, and per capita food supplies available for consumption in quantity, caloric value, and protein and fat content.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Data on country-level domestic food supply and utilization are reported in thousand metric tons or metric tons. Figures of per capita food supply are given in kilograms per year, grams per day, the caloric value in numbers of kilocalories per day, and the protein and fat contents in grams per day.

STATISTICAL DATA TYPE:

Time Series - Food balance sheets for individual countries provide the most recent three-year average for domestic supply (as production, imports, stock changes, exports, processed trade and total supply), domestic utilization (as feed, seed, food manufacture, other uses, waste and food), and per capita utilization (per year and per day) of major food groups with breakdown, where significant, for specific food commodities.

The commodity list is generally confined to primary commodities, except for sugar, oils and fats, and beverages. The list of commodities and their classification into major food groups for food-balance-sheet purposes is published with the food balance sheets. Major food groups include the following: total vegetable products; total animal products; cereals (excluding beer); starchy roots; sweeteners; pulses; tree nuts; oilcrops; vegetables; fruit (excluding wine); stimulants; spices; alcoholic beverages; meat; milk (excluding butter); eggs; fish and seafood; vegetable oils; animal fats; and miscellaneous.

Time series covering 10 consecutive three-year average periods provide data on per capita food supply by major food groups for individual countries, developed countries, developing countries,

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and the world.

Spatial Data - Food balance sheets and per capita supply are provided for 145 countries. Summaries of food supply are reported for developed countries, undeveloped countries, and the world. Country coverage, including classification as developed or developing, is identified in source documentation.

TIME PERIOD COVERED:

Food balance statistics cover a three-year-average period with a five-year interval between volumes. Food balance sheets are based on individual series of Supply/Utilization Accounts (SUAs) which are prepared on a calendar-year basis.

DATA COLLECTION FREQUENCY:

Annual.

DATA COLLECTION METHODS:

In constructing SUAs and the food balance sheets derived therefrom, FAO uses both official and unofficial data available in the Statistics Division and other units concerned in FAO. Missing data are estimated on the basis of surveys and other information as well as technical expertise available in FAO. Comments on previously prepared food balance sheets and suggestions for their improvement received from countries are taken into account in preparing new series.

GEOGRAPHIC COVERAGE:

World-wide.

OTHER SPATIAL DATA CHARACTERISTICS:

Not applicable.

QUALITY ASSURANCE PROCEDURES USED:

FAO uses a standardized format for food balance sheets which provides consistency within and among volumes. Data evaluation and consistency checks are undertaken within the framework of SUAS (see

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below). Internal consistency checks are inherent in the accounting technique of the food balance sheet itself. External consistency checks are based on supplemental information, such as the results of surveys conducted in various parts of the world and relevant technical, nutritional and economic expertise.

QUALITY OF DATA:

The accuracy of food balance sheets, which are in essence derived statistics, is dependent on the reliability of the underlying basic statistics of population, supply and utilization of foods and of their nutritive value. These vary a great deal between countries, both in terms of coverage as well as in accuracy. Estimates and/or adjustments are made to remedy gaps and inconsistencies in underlying data, particularly for developing countries. There are also many gaps in the statistics of utilization for non-food purposes, such as feed, seed and manufacture, as well as those for farm, commercial and even government stocks. In most cases, assumptions for food waste are based on expert opinion because there is little survey data and, when available, they are subject to significant margins of error.

DATA OUTPUT FORMAT:

Food supply and utilization data are published in FAO's periodical publication series entitled, Food Balance Sheets.

DATA OUTPUT FREQUENCY:

Periodic.

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Inquiries about the technical contents of the Food Balance Sheets publication should be addressed to:

Basic Data nit
Statistics Division
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

CONTACT FOR PUBLIC INQUIRIES:

Requests for copies of the Food Balance Sheets publication

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should be sent to the FAO sales agent in member countries, or to:

Distribution and Sales Section
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

DATABASE(S):

Name of Database(s):

Acronym:

Identification Number (if applicable):

Contents:

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Forms/Software In Which Data Are Available:

Hardware and Other Software Requirements:

Access Restrictions and Conditions:

Price Information:

Language(s): English, French and Spanish.

User Aids Available:

KEY PUBLICATIONS:

Food and Agricultural Organization of the United Nations, Food Balance Sheets (FAO, Rome, periodic).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

KEYWORDS

Food consumption
Food imports
Food exports

Needs

Data Output - Are tapes available; if so, need description of contents.

Database - Need FAO to fill in.

GEMS.AIR

ORGANIZATION, INSTITUTION, OR AGENCY:

United Nations Environment Programme in collaboration with the World Health Organization

OFFICE, BRANCH, OR DIVISION:

Global Environmental Monitoring System - Air

STATISTICAL PROGRAM TITLE:

Urban Air Quality

SUMMARY PROGRAM DESCRIPTION:

The United Nations Environment Programme (UNEP) and the World Health Organization (WHO) have been collaborating since 1974, through the Global Environmental Monitoring System (GEMS), on a worldwide network for monitoring air quality in urban areas. The network consists of thirty-five cities representing a range of climatic conditions and levels of urban development. Most cities have at least three monitoring stations for each city - one each in the city's industrial, commercial and residential areas. Evaluation of minimum, maximum and average levels of global urban air pollution are based on the monitoring data, and information covering a total of 50 countries taken from national reports, scientific literature and a questionnaire. The assessments have two main goals: to continue the ongoing process of producing periodic evaluations of global air pollution; and to keep developing and refining the techniques used for evaluating air pollution monitoring data, particularly to advance understanding of the risks air pollution poses to human health.

DATA SUBJECT COVERAGE:

Five air pollutants are monitored: sulfur dioxide (SO_2); suspended particulate matter (SPM); nitrogen dioxide (NO_2); carbon monoxide (CO); and lead.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Air quality levels are measured against WHO guidelines on

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recommended pollutants. Sulfur dioxide, nitrogen dioxide, carbon dioxide, and lead are measured in micrograms per cubic meter. Suspended particulate matter is measured in milligrams per cubic meter.

STATISTICAL DATA TYPE:

(1) Time Series: Time series data for available for all five variables. Representative data sets on sulfur dioxide and suspended particulate matter are available for 35 cities, many from 1973 forward. Time series data on nitrogen dioxide, carbon monoxide and lead, also from the early 1970s forward, are culled from national reports, open literature, and from questionnaire results.

(2) Spatial Data: Data are analyzed to determine levels and trends for each pollutant in the world's major cities. Assessments of global and regional air quality conditions and trends are also made using GEMS/AIR data.

TIME PERIOD COVERED:

For many stations, 1974 to present.

DATA COLLECTION FREQUENCY:

Sampling frequency varies according to sampling methodology from every minute to every 1-4 hours to daily.

DATA COLLECTION METHODS:

The data collection methods employed by countries within the network vary. Sulfur dioxide levels are monitored using the following methods: manual - flame photometric; gas bubbler - hydrogen peroxide; instrumental - amperometric ("Coulometric"); gas bubbler - pararosaniline; gas bubbler - conductometric; instrumental - conductometric; pulse flourescence; and gas bubbler - thorin. Suspended particulate matter levels are monitored using the following methods: high volume - gravimetric; soiling index/tape sampler - transmittance; light scatter - nephelometric; smoke shade - reflectance; membrane - gravimetric; and millipore filter - beta absorption.

GEOGRAPHIC COVERAGE:

The GEMS/AIR network involves 50 countries with representative data sets from 35 urban areas. The network includes both industrialized and developing countries.

OTHER SPATIAL DATA CHARACTERISTICS:

Not applicable.

QUALITY ASSURANCE PROCEDURES USED:

For sulfur dioxide and suspended particulate matter data, the GEMS/AIR network provides the following four standards: monitoring system design, training, methods comparisons and data validation. In the monitoring system design, guideline documents have been prepared which discuss the acceptable monitoring methods and suitable siting requirements. Training is provided when needed, especially in the operation and maintenance of the equipment.

Regarding data quality assurance, GEMS compares the actual reported data against specified criteria to judge results of the reported returns (i.e., detect various types of anomalies). GEMS conducts follow-up checks for possible errors and seeks subsequent verification by the reporting country. GEMS also has data completeness requirements to ensure that seasonal cycles are adequately represented before a yearly summary is constructed.

In addition, in 1979 an interlaboratory comparison study for the measurement of sulfur dioxide was carried out with 16 European laboratories and institutions.

QUALITY OF DATA:

GEMS/AIR data quality procedures for sulfur dioxide nd suspended particulate matter permit a more accurate and meaningful assessment of air pollutant results. Volume data are reported as cumulative frequency distributions, with information on minimum and maximum concentrations, arithmetic and geometric means, and standard deviations. Combined site-average for five-year periods are presented with the range of individual site annual averages.

Nitrogen dioxide, carbon dioxide and lead data are reported directly by individual countries or have been taken from published reports. The characteristics of these data include uncertainties as to the monitoring procedures, the siting requirements, representativeness of the site location and data and quality assurance practices. In addition, the very limited data available from which to judge world-wide levels makes inferences defendant

upon qualitative knowledge of similar conditions elsewhere where data may not be available.

DATA OUTPUT FORMAT:

Hardcopy.

DATA OUTPUT FREQUENCY:

Biennial.

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

GEMS/AIR
UNEP
P.O. Box 30552
Nairobi, Kenya

Telephone:
FAX: 2542 520281

CONTACT FOR PUBLIC INQUIRIES (IF DIFFERENT FROM PRINCIPAL CONTACT):

DATABASE(S):

Name of Database(s): GEMS/AIR Air Data Bank

Acronym:

Identification Number (if applicable):

Contents: GEMS/AIR data for sulfur dioxide and suspended particulate matter and nitrogen dioxide, carbon monoxide and lead data from national reports, open literature, and questionnaire survey.

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

G. Akland

U.S. Environmental Protection Agency
Research Triangle Park, North Carolina
U.S.A.

Telephone: (919) 541-3887

Forms/Software In Which Data Are Available:

Hardware and Other Software Requirements:

Access Restrictions and Conditions:

Price Information:

Language(s): English

User Aids Available:

KEY PUBLICATIONS:

United Nations Environment Programme, GEMS: Global Environment Monitoring System (UNEP, Nairobi, 1990).

--, Urban Air Pollution, UNEP/GEMS Environment Library No. 4 (UNEP, Nairobi, 1991).

-- and World Health Organization, Assessment of Urban Air Quality (UNEP/WHO, 1988).

World Health Organization, Air Quality in Selected Urban Areas, 1979-1980 (WHO, Geneva, 1983).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

KEYWORDS:

Air pollution
Air quality
  Ambient
  Urban
Carbon monoxide
Lead
Nitrogen dioxide
Sulfur dioxide
Suspended Particulate Matter

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Area(s) of Record Where More Information Is Particularly Needed:

Data collection method and frequency - Is the information reported herein timely and accurate.
Data output - Are digital files available?
Data output frequency ???
Contact for statistics ??
Contact for public inquiries ?
Database - Source needs to fill in.

TNS.LASP

ORGANIZATION, INSTITUTION, OR AGENCY:

The Nature Conservancy

OFFICE, BRANCH, OR DIVISION:

Latin America Science Program

STATISTICAL PROGRAM TITLE:

Conservation Data Centers

SUMMARY PROGRAM DESCRIPTION:

The Nature Conservancy was incorporated in 1951 for scientific and educational purposes. A nonprofit, tax exempt corporation, the Conservancy preserves plants, animals and natural communities that represent the diversity of life on earth by protecting the lands and waters they need to survive. It owns and manages more than 1,300 preserves throughout the United States, the largest private system of nature sanctuaries in the world. The Conservancy also has Latin American, Caribbean, and Pacific Programs that have helped protect millions of acres outside of the United States.

The Conservancy works by: (1) identifying lands that shelter the best examples of natural communities and species, and determining what is truly rare and where it exists; (2) protecting habitats and natural systems through acquisition by gift or purchase, and assisting government nd other conservation organizations in their land preservation efforts; and (3) managing preserves using staff and volunteer land stewards, and encouraging compatible use of the sanctuaries by researchers, students and the public.

In Latin America, the Conservancy has joined forces with over 30 organizations covering 17 countries to provide infrastructure, community development, professional training and long-term funding for legally protected but underfunded areas throughout the continent. To provide a readily accessible source of biological diversity information for use in conservation and development planning, the Conservancy has established a hemisphere-wide network of Conservation Data Centers (CDCs). A CDC is a continually updated inventory of the most significant biological and ecological features of the country or region in which it is located. This

Much of the data for CDCs is collected using Rapid Ecological Assessment (REA), an imagery based inventory method. REA integrates up-to-date imagery (remote satellite imagery and/or aerial photography) with field verification. It employs a stratified sampling technique using coarse filter information with finer levels of detail focused on critical areas. REAs are used to quickly characterize entire landscapes and to identify those habitats that are unique or of greatest ecological importance.

GEOGRAPHIC COVERAGE:

Latin America and Caribbean. There are currently 13 CDCs in Latin America and Caribbean countries: Bolivia, Colombia, Costa Rica, Ecuador, Guatemala, Jamaica, Mexico, Netherlands Antilles, Panama, Paraguay, Peru, Puerto Rico, and Venezuela.

OTHER SPATIAL DATA CHARACTERISTICS:

(1) Geographic Area of Coverage:

(2) Size, Scale, or Resolution of Geographic Unit:

(3) Cartographic Projection:

(4) Data Format: __ Map; __ Digital

(5) Description of Source Data:

(6) General Comments:

QUALITY ASSURANCE PROCEDURES USED:

QUALITY OF DATA:

DATA OUTPUT FORMAT:

80286 class processor can be used if the system is outfitted with LIM 4.0 EMS memory expansion board and preferably a math coprocessor. A minimum of 70 Mb harddisk space is recommended. The BCD System can be used with a monochrome or color monitor, and with a laser or dot-matrix printer. Mountain (or similar) type backup unit is strongly recommended for backing up large amounts of data. A minimum of two megabytes of RAM memory is required. If a computer with disk caching is to be used with the BCD, the disk caching should have the ability to be disabled. An IDE type hard disk with disk caching should not be used.

Software requirements include PC/MS DOS, Advanced Revelation database management system (version 2.0), and the BCD application package. PC Anywhere communication software is recommended. A memory management software package (386Max, QEMM) is required for PCs that are not using PC/DOS 5.0.

Access Restrictions and Conditions:

Price Information:

Language(s):

User Aids Available:

KEY PUBLICATIONS:

The Nature Conservancy (TNC), Latin America (pamphlet) (TNC, Arlington, VA, undated).

--, "The BCD System - The Next Generation of Heritage Computer Systems," Biodiversity Network News (TNC, Arlington, VA, Fall 1988).

The Latin America Science Program has produced several informative 1-page fact sheets about CDCs: Conservation Data Centers (October 1992); Rapid Ecological Assessment (February 1992); and Biological and Conservation Data System Technical Requirements (undated).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

Area(s) of Record Where More Information Is Particularly Needed:

Time period of study
Data collection frequency
Spatial characteristics of data
Quality assurance procedures
Quality of data
Data output - Are digital files available?
Data output frequency ???
Contact for public inquiries ?
Database - Source needs to fill in blanks

WB.SID

ORGANIZATION, INSTITUTION, OR AGENCY:

World Bank

OFFICE, BRANCH, OR DIVISION:

Socio-Economic Data Division

STATISTICAL PROGRAM TITLE:

Social Indicators of Development Statistics

SUMMARY PROGRAM DESCRIPTION:

Social Indicators of Development (SID) began as an internal World Bank effort to focus attention on poverty and related concerns of human development. It entered the public domain in the 1980s following widespread expression of interest in the statistics that had been compiled by the World Bank; i.e., summary data on health, education, nutrition, and other socially-related characteristics collected and disseminated by other international agencies (e.g., World Health Organization, United Nations Children's Fund, United Nations Educational, Scientific and Cultural Organization, etc), as well as other data contained within national reports received by the World Bank. The emphasis in SID is on detailed country-by-country review of social and economic indicators of human development and a broader international comparison of selected social and economic statistics.

DATA SUBJECT COVERAGE:

The statistics cover data on human resources and some natural endowments, as well as data on income and poverty and those elements of measured expenditures and production that are relevant in assessing social changes.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Social indicators are reported as absolute numbers, rates, proportion, and percentage of population, and in years (e.g., life expectancy). Land area is reported in square kilometers. Economic indicators are reported in U.S. dollars and percentage of GDP, income, population, and age group. Other units of measure include imports in metric tons, daily per capita food supply in calories and grams, energy consumption in kilograms of oil equivalent, road length in kilometers.

In addition to the temporal changes in country-level statistics referenced above, international comparisons are provided as sums or averages (usually population weighted) for reference groups defined by their geographic or regional classification and by their income group and the next higher income group (in GNP per capita). Exceptions are for high income and nonreporting nonmember economies.

(2) Spatial Data: National-level social and economic statistics are reported by country.

TIME PERIOD COVERED:

The indicators refer somewhat to different dates within three broad time spans: 25-30 years ago (centering on 1965); 15-20 years ago (centering on 1975); and most recent estimates.

DATA COLLECTION FREQUENCY:

DATA COLLECTION METHODS:

Many of the statistics compiled by the World Bank come from special agencies that have used questionnaires and surveys to collect country data. In some cases, particularly for population and related statistics, the World Bank staff revise these statistics with more recent information they have obtained from the country. Statistics are also generated through the work programs of sectoral divisions, or through special studies undertaken by the Bank staff, such as information on educational levels of the work force.

GEOGRAPHIC COVERAGE:

Data are provided for more than 170 countries reflecting a wide variety of social, political, economic, and cultural conditions. Summary statistics ar provided for major regions of the world, for country groups by income level, for nonreporting countries, and for the world.

OTHER SPATIAL DATA CHARACTERISTICS: Not applicable.

differences. Numbers should be used cautiously and only with reference to technical notes and definitions.

DATA OUTPUT FORMAT:

Hardcopy and electronic files.

DATA OUTPUT FREQUENCY:

Annual.

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Director
Socio-Economic Data Division
World Bank
1818 H Street, N.W.
Washington, DC 20433

CONTACT FOR PUBLIC INQUIRIES (IF DIFFERENT FROM PRINCIPAL CONTACT):

DATABASE(S):

Name of Database(s): Social Indicators of Development.

Acronym: SID.

Identification Number (if applicable):

Contents: SID is issued annually in diskettes containing time-series from 1965 to present, although many indicators are in fact available only for scattered dates.

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Publication Sales Unit
World Bank
1818 H Street, N.W.
Washington, DC 20433

Forms/Software In Which Data Are Available:

Area(s) of Record Where More Information Is Particularly Needed:

Time period covered - need date for most recent statistics.
Data collection frequency
Contact for public inquiries ?
Database - Source needs to fill in.

WCMC.WTMU

ORGANIZATION, INSTITUTION, OR AGENCY:

World Conservation Monitoring Centre

OFFICE, BRANCH, OR DIVISION:

Wildlife Trade Monitoring Unit

STATISTICAL PROGRAM TITLE:

Global Biodiversity -- Wildlife Trade

SUMMARY PROGRAM DESCRIPTION:

The Wildlife Trade Monitoring Unit (WTMU) of the World Conservation Monitoring Centre (WCMC) has five purposes: (1) monitor international trade in species covered by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); (2) monitor implementation of CITES and other national and international wildlife trade regulations; (3) monitor international trade in species not listed in CITES; (4) monitor domestic trade in wild plants and animals; and (5) monitor consumptive and non-consumptive utilization of wildlife within countries.

DATA SUBJECT COVERAGE:

WTMU maintains data on wildlife trade, production, farming, and utilization.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Statistics include numbers of live wild animals and plants traded; number and weight of products and derivatives of wild animals and plants traded; customs statistics; and wildlife dealers. Text files are maintained on individual species, coral reefs, and wildlife utilization such as crocodile farming and primate breeding.

STATISTICAL DATA TYPE:

(1) <u>Time Series</u>: Data can be used to show long-term trends

QUALITY ASSURANCE PROCEDURES USED:

QUALITY OF DATA:

DATA OUTPUT FORMAT:

DATA OUTPUT FREQUENCY:

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Jonathan Barzdo, Head
Wildlife Trade Monitoring Unit
World Conservation Monitoring Centre
219 (c) Huntington Road
Cambridge, CB3 ODL
United Kingdom

Telephone: 011-44-233-277-314
FAX: (223) 277136

CONTACT FOR PUBLIC INQUIRIES (IF DIFFERENT FROM PRINCIPAL CONTACT):

DATABASE(S):

WTMU maintains two major and several subsidiary databases.

I. Name of Database(s): Shipments of Wildlife Products

Acronym:

Identification Number (if applicable):

Contents: This database contains data on taxon of wildlife products, CITES appendix number, type of specimen, country of origin, purpose of transaction, quantity, and exporter's permit number.

Data Caveats or Limitations:

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KEY PUBLICATIONS:

World Conservation Monitoring Centre (WCMC), Report of a Feasibility Study for a Conservation Database on Tropical Timber Trade (WCMC, Cambridge, 1987).

--, Significant Trade in Wildlife: a Review of Selected Species in CITES, Appendix II (3 vols.) (WCMC, Cambridge, in press).

--, The Effects of Recent Legislative Changes on the Pattern of World's Trade in Raw Ivory (WCMC, Cambridge,).

--, The Green Turtle and Hawksbill: World Status, Exploitation and Trade (WCMC, Cambridge, in preparation).

--, Traffic Bulletin (WCMC, Cambridge, quarterly).

--, World Checklist of Threatened Mammals (WCMC, Cambridge, 1987).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

KEYWORDS:

CITES
Wildlife trade

WCMC.TPU

ORGANIZATION, INSTITUTION, OR AGENCY:

World Conservation Monitoring Centre

OFFICE, BRANCH, OR DIVISION:

Threatened Plants Unit

STATISTICAL PROGRAM TITLE:

Global Biodiversity -- Threatened Plants

SUMMARY PROGRAM DESCRIPTION:

The main objective of the Threatened Plants Unit (TPU) of the World Conservation Monitoring Centre (WCMC) is to gather, analyze, and disseminate conservation information on the world's threatened flora to the conservation and development communities. It accomplishes this objective by: (1) maintaining a database on threatened plants; (2) promoting the preparation of national Red Data Books and threatened plant lists; (3) providing information on threatened and endangered plant species in individual countries; and (4) providing support to international and national programs relating to plant conservation, particularly the IUCN-WWF Plants Conservation Program. The TPU works closely with the IUCN-WWF Plants Conservation Program, the IUCN Botanic Gardens Conservation Secretariat, and the Royal Botanic Gardens (Kew), among others.

DATA SUBJECT COVERAGE:

TPU maintains summary conservation data on threatened and endangered plant species.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Summary statistics for approximately 44,000 plant species include status at national, regional, and world levels; distribution data; endemism and data sources. TPU also maintains data on threatened plants in botanic gardens. In word processing text files, TPU maintains full data sheets for approximately 350 threatened plant species and site data, with descriptions of botanical sites of priority conservation concern.

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QUALITY ASSURANCE PROCEDURES USED:

QUALITY OF DATA:

DATA OUTPUT FORMAT:

DATA OUTPUT FREQUENCY:

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Christine Leon, Acting Head
Threatened Plant Unit
World Conservation Monitoring Centre
219 (c) Huntington Road
Cambridge, CB3 ODL
United Kingdom

Telephone: 011-44-233-277-314
FAX: (223) 277136

CONTACT FOR PUBLIC INQUIRIES (IF DIFFERENT FROM PRINCIPAL CONTACT):

DATABASE(S):

TPU maintains several databases relevant to threatened plants.

I. Name of Database(s): Plant Database

Acronym:

Identification Number (if applicable):

Contents: This database contains summary conservation data for approximately 44,000 plant species. Database fields include:

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Forms/Software In Which Data Are Available:

Hardware and Other Software Requirements:

Access Restrictions and Conditions:

Price Information:

Language(s):

User Aids Available:

IV. Name of Database(s): Plant Specialists Database

Acronym:

Identification Number (if applicable):

Contents: This database contains information on TPU's contact list of 1,000 plant specialists. Database fields include:

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Forms/Software In Which Data Are Available:

Hardware and Other Software Requirements:

Access Restrictions and Conditions:

Price Information:

Language(s):

User Aids Available:

TPU also maintains word processing files containing information on 350 threatened plant species, bibliographic data with over 12,000 plant conservation references, priority conservation site data, and country-level botanic and floristics information.

KEY PUBLICATIONS:

World Conservation Monitoring Centre (WCMC), Global Biodiversity: Status of the Earth's Living Resources

Area(s) of Record Where More Information Is Particularly Needed:

Source needs to fill in and/or modify:

Time Period
Data Collection Frequency
Spatial Characteristics of Data
Data Quality Assurance
Data Quality
Data Output
Data Output Frequency
Database
Key Publications
Additional Comments - Have any of these projects been completed?

G/WID-ENVIRONMENT HANDOUTS ON INDICATORS
(BY N.DIAMOND, IN DRAFT)

HANDOUT A (DRAFT)
EXAMPLES OF PEOPLE-LEVEL IMPACTS FOR ENVIRONMENTAL PROJECTS

HANDOUT B (DRAFT)
NRM AND URBAN ENVIRONMENT: POSSIBLE GENDER-DISAGGREGATED INDICATORS
(ADAPTED FROM AFR BUREAU "THE NRM INDICATOR CATALOGUE")

HANDOUT C (DRAFT)
URBAN MUNICIPAL MANAGEMENT, SHELTER & INFRASTRUCTURE:
POSSIBLE GENDER-DISAGGREGATED INDICATORS

HANDOUT D (DRAFT)
ENERGY & ENVIRONMENTAL TECHNOLOGIES:
POSSIBLE GENDER-DISAGGREGATED INDICATORS

HANDOUT E (DRAFT)
TEN KEY GENDER ISSUES - ENVIRONMENTAL PROJECT DESIGN, MONITORING & EVALUATION

DRAFT HANDOUT A (BY N. DIAMOND, G/WID ENV. ADVISOR)
EXAMPLES OF PEOPLE-LEVEL IMPACTS FOR ENVIRONMENTAL PROJECTS

HOUSEHOLD MEMBERS

* Changes in **income** for women/men.
* Changes in **health** for women/men.
* Changes in **employment** for women/men.
* Changes in **time/labor availability** for women/men.
* Changes in **access to productive resources** for women/men e.g. services, information, land, water, credit, equipment
* Changes in **access to/influence upon decision-making units** by women/men.
* Changes in **practices resulting from new skills** learned in training by women/men.
* Changes in the **condition/value of units of natural resources** controlled/managed/owned by women/men.
* Changes in the **condition/value of units of housing** owned by women/men.
* Changes in the **level of client satisfaction with services** by women/men.
* Changes in the **level of satisfaction with distribution of authority over use of resources** by women/men.
* Changes in **level of interest, willingness and capacity to cooperate** with relevant government agencies or private sector by women/men.
* Changes in **effectiveness, fairness and equity of enforcement** of laws and regulations for women/men.
* Changes in **distribution of policy incentives** for women/men.
* Changes in **distribution of policy disincentives** for women/men.

GROUP MEMBERS AND ORGANIZATION STAFF

* Changes in **employment status and hiring practices** for women/men.
* Changes in **access to productive resources** for women/men e.g. services, information, networks, training, equipment
* Changes in **access to/influence upon decision-making units** by women/men.
* Changes in **practices/policies resulting from new skills** learned in training by women/men.
* Changes in the **level of satisfaction with services** by women/men.
* Changes in the **level of satisfaction with distribution of authority over use of group or organization resources** by women/men.
* Changes in **level of interest, willingness and capacity to cooperate** with relevant government units, agencies or private sector by women/men.
* Changes in **effectiveness, fairness and equity of enforcement** of laws and regulations for women/men.

DRAFT HANDOUT B (BY N. DIAMOND, G/WID ENV. ADVISOR)
NRM AND URBAN ENVIRONMENT: POSSIBLE GENDER-DISAGGREGATED INDICATORS
(ADAPTED FROM AFR BUREAU "THE NRM INDICATOR CATALOGUE")

LEVEL V: INDIVIDUAL OR FAMILY WELL-BEING

1. Individual **(M/F)** or family **(define household unit)** income.

LEVEL IV: NATURAL RESOURCE BASE (GREEN, BLUE)

2. Percent of population **(Nuclear/Female-headed households)** with access to safe drinking water.
3. **(For M/F controlled lands/coastal resources)**
   Ratio and percentage change by land use type
   Length and adequacy of fallow period; % submarginal land cultivated
   Units of crop/resource produced; Units of inputs used
   Soil fertility measures
   % Natural vegetation cover, tree/shrub cover, fallow land
   % Coral reef in good condition
4. Measures of forest/plantation/reef extent, mgt. status, volume, value **(combined with gender analysis of tenure)**.
5. Annual offtake/harvests by local people and outsiders **(M/F)**.
6. Nature and extent of pressures (causes, underlying reasons, people's options), potential losers (of more effective biodiversity preservation) **(by M/F)**.

LEVEL III: PEOPLE ADOPTING PRACTICES

7. Number of people **(M/F)**/families experimenting with new practices.
8. Number of people **(M/F)**/families/organizations having adopted new practices.
9. Percentage of people **(M/F)** (out of total population in the area) adopting new practices.
10. **For land/resource controlled by men/women,** number of (unit of area) covered by new practices.
11. **For land/resource controlled by men/women,** surface area covered as a percent of total surface where a new practice can be applied.
12. Number of different practices adopted by local people **(M/F)**.
13. Combined positive effect on productivity and sustainability from adoption/implementation of different practices **(for M/F-controlled lands/resources)**.

LEVEL II: ENABLING CONDITIONS

14. % **local M/F** with control over x% of land over a period of time.
15. % change in the numbers of local **M/F** or change in their respective level of satisfaction with their authority over the use of natural resources available to them.
16. Change in specific capacity or authority of local **(M/F-dominated)** organizations (NGOs).
17. Local **M/F** level of interest/willingness/capacity to cooperate with govt. agencies to responsibly undertake independent NRM efforts.
18. Effectiveness/fairness/equity **(by M/F)** of law/regulation enforcement.
19. Number/% local **M/F** with access to financial, material, other incentives.
20. Number/% local **M/F** paying fees, permits & other disincentives.
1. Number/% local **M/F** purchasing inputs, participating in demonstrations.

DRAFT HANDOUT C (BY N. DIAMOND, G/WID ENV. ADVISOR)
URBAN MUNICIPAL MANAGEMENT, SHELTER & INFRASTRUCTURE:
POSSIBLE GENDER-DISAGGREGATED INDICATORS

MUNICIPAL MANAGEMENT ACTIVITIES

1. Number/% female:male municipal employees &/or NGO staff hired/promoted.
2. Number/% female:male municipal employees &/or NGO staff with improved access to productive resources.
3. Number/% female:male municipal employees &/or NGO staff with improved access to decision-making units.
4. Number/% female:male municipal employees &/or NGO staff changing practices &/or policies due to new skills learned in training.
5. Number/% female:male municipal employees &/or NGO staff with improved level of satisfaction with services.
6. Number/% female:male municipal employees &/or NGO staff with improved level of satisfaction about the distribution of authority over use of group or organization resources.
7. Number/% female:male municipal employees &/or NGO staff with improved level of interest, willingness and capacity to cooperate with relevant government units, agencies or private sector.
8. Number/% female:male municipal employees &/or NGO staff whose performance in influenced by the effectiveness, fairness & equity of enforcement of laws & regulations.

SHELTER ACTIVITIES

9. Number/% of women:men who receive information about loans.
10. Number/% of women:men who apply for loans (& % of those getting info).
11. Number/% of women:men receiving loans (& % of those applying).
12. Number/% of women:men in financial institutions who move into loan decision-making positions and/or are trained for these positions.
13. Number/% of firms owned by/employ/train women for home construction.
14. Number/% of women:men in home construction firms hired & promoted.
15. Number of community women:men and/or local women's group representatives:male-dominated groups involved in housing consultations.
16. Number/% of women:men obtaining housing-related skills from training.
17. Number/% of women:men used as trainers.
18. Number/% of women:men retaining the sale profits for new/upgraded homes.
19. Number/% of households (female-headed:nuclear) with loans spent on upgrades which improve household health.
20. Number/% of households (female-headed:nuclear) with loans spent on upgrades which improve female income generation.

INFRASTRUCTURE ACTIVITIES

21. Number/% of households receiving potable water (& time freed for other activities, other env. health benefits).
22. Number/% of households connected to sewer system (& reduction in diarrheal diseases, other env. health benefits).
23. Number of women or representatives of groups representing women's interests relative to the number of men or representatives from male-dominated groups who are involved in community consultation process for infrastructure decision-making.
24. Number/% of women in municipal institutions who move into infrastructure decision-making positions.

DRAFT HANDOUT D (BY N. DIAMOND, G/WID ENVIRONMENT ADVISOR)
ENERGY & ENVIRONMENTAL TECHNOLOGIES: POSSIBLE GENDER-DISAGGREGATED INDICATORS

ENERGY EFFICIENCY (EE) ACTIVITIES

1. Amount of fuel consumed by households during a given time period.
2. Amount of time or money spent by women/men on obtaining energy supplies.
3. Amount of time spent by women/men on family cooking or income-generating activities.
4. Length of workday for women/men.
5. Number/% of women adopting new fuel management and food preparation practices (e.g. drying and storing fuel, soaking beans, using pot lids).
6. Amount of energy used by women's energy-intensive enterprises (e.g. food/drink preparation&processing, cloth dying, pottery).
7. Number/% poor women adopting EE technologies.
8. Number/% poor women saving time/money by adopting EE technologies.
9. Number/% woman-owned enterprises adopting EE technologies.
10. Number/% female-headed households adopting EE technologies.
11. Number/% female-headed households saving time/money via EE technologies.
12. Number/% women (by class, type of org.) involved in EE policy dialogue.
13. Number/% female participants/trainers (by class, org.) in EE training.
14. Number/% female training graduates with improved access to EE policy decision-making units, changing practices &/or policies.
15. Distribution of benefits, by gender, class, communities and region, of EE technologies and policies.

RENEWABLE ENERGY (RE) ACTIVITIES

16. % of women/men consuming less non-RE fuels for household use.
17. % of women/men spending less on non-RE fuels for household use.
18. % of women/men engaged in home-based enterprises using RE fuels.
19. % of women/men visiting clinics for respiratory/eye problems.
20. % of woman-owned enterprises consuming\spending less on non-RE fuels.
21. % women (by class, organization) engaged in RE policy dialogue.
22. Number/% females (by class, org.) participants/trainers in RE training.
23. Number/% of women providing training in RE.
24. Number/% female training graduates with improved access to RE policy decision-making units, changing practices &/or policies.
25. Distribution of benefits, by gender, class, communities and region, of RE energy technologies and policies.

PRIVATE SECTOR ENERGY DEVELOPMENT ACTIVITIES

26. Percent change in government funds spent on health programs.
27. Percent change in unit costs of fuels used by poorest households.
28. Percent change in unit costs of fuels used by richest households.
29. Number/% of woman-owned private sector firms involved in energy sector.
30. Number/% of private sector/NGO women participating in energy training.
31. Number/% female training graduates with improved access to policy decision-making units, changing practices &/or policies.

ENERGY TECHNOLOGY INNOVATIONS (ETI) ACTIVITIES

32. Number/% of technologies introduced which serve women's end use demands.
33. Number/% of women-owned enterprises/NGOs adopting new technologies, operations & mgt. techniques or achieving economic savings from ETI.
34. Number/% of entrepeneur/NGO women participating in ETI training.

DRAFT HANDOUT E (BY N. DIAMOND, G/WID ENVIRONMENT ADVISOR)
EN KEY GENDER ISSUES-ENVIRONMENTAL PROJECT DESIGN, MONITORING & EVALUATION

1. **Which impacts on which people?**
   This question is the starting point for gender issues.

2. **What is a household? Which members participate & benefit?**
   Households (also known as compounds or homesteads) are not always simple units and can be composed of several individual households. You should carefully define the household unit (common definitions include blood relatives, mother-children units, people who live together, people who eat together, or people who pool some earnings). Since benefits or improvements which help one woman, one household member or one household unit will not necessarily benefit other household women, members or units, you will want to track changes in benefits, income, expenditures, etc. for both males and females in a household.

3. **Which community members participate & benefit?**
   Community-level indicators do not tell us much about which gender or which stakeholders within the community will benefit or pay costs associated with project activities. You can either drop down to household-level or gender-specific indicators or track the progress of women or other stakeholders in having greater say or representation in community-level decision-making units and activities.

4. **Which group, organization or agency members participate & benefit?**
   Social units or institutions are also composed of different stakeholders and often members of both sexes. Depending on the rules of the group for access to leadership and other group resources, it is not safe to assume that all members will benefit (or bear costs) equally when new resources or incentives become available. The best route is to track who has access to resources and incentives.

5. **Which location?**
   The selection criteria used for project locations within countries can be critical for making progress on gender issues and benefiting women. You may want to select some sites (provinces, cities, towns) in which women are known to be assuming greater leadership roles in government and civil society. Alternatively, there may be some sites in which you can choose to address problems particularly affecting women (e.g. income in high migration areas dominated by female-headed households, etc.).

6. **Which technology, infrastructure, services or mode of information dissemination?**

   Your selection criteria for technology & services should include crops and activities dominated by women, land parcels managed by women and innovations which address women's needs, priorities, resources and end use (e.g. fuelwood and food preparation management).

   Your selection criteria for infrastructure should include women's priorities which may place greater emphasis on family health & hygiene. Also, your choice about what to do first can be influenced by gender-differences in priorities, needs, etc.

Your strategy for information dissemination should include both women's and men's information channels, preferred language, etc. You may also want to track the relationship between who gets information vs. who takes actions (adopts a practices, applies for loan, seeks assistance)

For technology, services and mode of information dissemination, you need to think about how the timing and logistics (e.g. schedule and location of meetings, etc.) include/exclude particular households or groups of people.

7. Which type of technical assistance?

When assessing needs for technical assistance, be sure to notice how local women and men, female and male staff, female- and male-dominated organizations vary. Given differences in needs and style, the mix of capacity building, training and use of technical experts will vary.

8. Which type of training, trainers, trainees?

Training needs will vary for local women and men, female and male staff, female- and male-dominated organizations. For example, women's groups may require leadership training. Male-dominated institutions may need diversity training. The content of the training may differ but incorporation of relevant gender issues and use of male and female examples should be consistent. Women trainers and trainees should be sought out - some projects have used a strategy of requiring that female participants be named first and then a matching number of male participants are allowed to attend.

9. Which partners, colleagues and staff?

As part of a participatory process, we should be widening our net of partners and encouraging their participation in project and policy dialogue. In a general way, this concept means new partnerships with NGOs, institutions and staff with whom USAID has not had relationships with in the past. In a specific way, we need to reach out to more to female staff and colleagues, as well as NGOs, university departments and units within government agencies which have expertise in environment and gender.

10. Which policies, laws and strategies are targeted for reform?

Most policies/laws/strategies result in winners and losers. It is informative to track male/female involvement in decision-making, criteria (formal/informal) used to make decisions, males/females included and excluded by changes in policies/laws/strategies, differences in male-female priorities and conflict resolution.
Impacts on women and men include: access to resources, access to institutions, access to decision-making units, level of involvement with institutions, level of satisfaction with policy results, capacity and authority of groups representing women's interests, changes in incentives/disincentives, equity of law enforcement, etc.

OECD.EDC

ORGANIZATION, INSTITUTION, OR AGENCY.

Organization for Economic Cooperation and Development

OFFICE, BRANCH, OR DIVISION:

Group on the State of the Environment

STATISTICAL PROGRAM TITLE:

Environmental Statistics

SUMMARY PROGRAM DESCRIPTION:

The Organization for Economic Cooperation and Development (OECD), in carrying out its task of promoting economic development in member countries, is concerned with the qualitative and quantitative aspects of economic growth. The OECD's program of work relating to environmental matters emphasizes the importance of sustainable development. Member governments have agreed to ensure the development and coordination of objective, reliable and comparable environmental statistics and information at the international level. The statistics and information provided by member governments, supllemented by data from other sources, are used by OECD to produce environmental data compendiums, indicator reports and state of the environment reports.

DATA SUBJECT COVERAGE:

Statistics are organized according to a conceptual framework towards sustainability which relates to pressures on the environment, state of the environment and responses of economic and environmental agents to pressures on the environment.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Statistics are reported in metric units.

percent of territory and hectares per capita) and changes in major protected areas (number and size)]; forests (wooded area (square kilometers, km2 per capita and percent of total land area), forest cover (total km2 and percent of natural and planted softwood and hardwood), volume of standing wood, production of roundwood, fuelwood and charcoal (cubic meters), forest depletion and growth (cubic meters and intensity of use - harvest/annual growth), production of industrial roundwood, sawnwood & sleepers and wood based panels (cubic meters and % of world production) and production of wood pulp and paper & paperboard (tons and % of world production), trade in roundwood and forest industry products by product (value of imports and exports in US$) and by world region (% by type for OECD, developed countries, developing countries and the world), trade in tropical wood by region (value in US$, total per capita and % of imports), forest ownership (% of covered area) and burned area of forest (hectares) and related losses (value of loss in US$)]; wildlife [state of animals, birds, fish, reptiles, amphibians, invertebrates, vascular plants, mosses lichens, other fungi and algae (number of known species, number and % threatened and number and % declining), fish production (tons and value in US$), biosphere reserves and wetlands of international importance (number and area in km2), and major protected areas by type (number)]; solid waste [amounts of waste generated by source (tons), amounts of municipal waste (tons and % increase, kilograms and % increase per capita), composition of municipal waste (percentage of major types of waste), percentage of population served by municipal waste services, chemical and non-chemical industrial waste and hazardous and special waste (tons), amount of selected groups of industrial waste (tons), production, import, export, dumping at sea and incineration at sea of hazardous and special waste (tons and %), disposal of municipal waste by method (tons) and waste recycling and recovery rates (%)]; risks [major floods and related losses (type, number of deaths and property loss in US$), major natural disasters of geological origin (type, number of deaths, property loss in US$ and number of houses lost), major climatic and meteorological disasters (type, number of deaths and property loss in US$), accidental oil spills from tankers (number and quantity spilled), and selected accidents involving hazardous substances (number of deaths, injuries and persons evacuated)]; **RESPONSES** - public opinion [environment protection vs. growth tradeoff, percent very concerned about local environmental problems, percent very concerned about national environmental problems, percent very concerned about international environmental problems], pollution control expenditures [public and private expenditures (% of GDP and %), annual industry investment (index), research and development expenditures (constant US$ and % of total R&D budget appropriations)]; **GENERAL DATA** - population [total (number), density (population per km2)], area [total (km2)] and Gross domestic product [change in volume of GDP in purchasers' value (US$)].

QUALITY OF DATA:

Definitions and classifications used, difficulties of comparability and gaps in information are indicated whenever necessary in the introduction to the various sections of the OECD reports and in text and notes attached to tables.

DATA OUTPUT FORMAT:

Printed report and computer diskettes.

DATA OUTPUT FREQUENCY:

The OECD Environmental Data Compendium is published every two years, starting in 1985. Three editions of the State of the Environment report have been published (19 , 19 and 1991). A preliminary set of Environmental Indicators was published in 1991.

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Secretariat
Organization of Economic Cooperation and Development
2, rue Andre-Pascal
75775 Paris Cedex 16
Telephone: (33-1) 45.24.81.67

CONTACT FOR PUBLIC INQUIRIES (IF DIFFERENT FROM PRINCIPAL CONTACT):

DATABASE(S):

Name of Database(s):

Acronym:

Identification Number (if applicable):

Contents:

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KEYWORDS:

- Agriculture
  - , employment
  - , fertilizers
  - , irrigation
  - , land use
  - , mechanization
  - , pesticides
- Air
  - , emissions
  - , quality
- Earthquakes and other natural disasters of geologic origin
- Energy
  - , coal
  - , consumption
  - , electricity
  - , gas
  - , imports
  - , nuclear
  - , oil
  - , production
- Environmental opinion
- Fish
- Floods
- Forests
  - , burned area
  - , cover
  - , ownership
    - , production of forest industry products
  - , trade
  - , volume
- Hurricanes and cyclones
- Industry
  - , investments
  - , production
  - , tourist receipts
- Land
  - , national parks
  - , protected areas
  - , use
- National parks
- Population
  - , density
- Sewage
  - , population served by treatment plants
- Transportation
  - , energy consumption
  - , networks
  - , traffic volumes
  - , vehicles in use
- Waste
  - , hazardous
  - , industrial
  - , municipal solid
    - , composition
    - , disposal
    - , generation
    - , population served
    - , recycling
- Water
  - , inland
    - , oil spills
    - , pollution
    - , quality
    - , withdrawal
      - , surface
      - , ground
  - , lakes
- Wildlife
  - , amphibians
  - , birds
  - , freshwater fish
  - , invertebrates
  - , mammals
  - , plants
  - , reptiles

II. The OECD Core Set of Environmental Indicators

The OECD publishes a core set of environmental indicators which is primarily intended for use in environmental performance assessments in OECD countries. It nonetheless provides an example of a core indicator set based on a coherent conceptual framework which covers a range of environmental sectors. It has been used by the World Bank as the basis for a similar core set focusing on developing countries (see section I).

The framework which underpins the core set is the Pressure-State-Response model. This framework is based on the causal links between (a) pressures exerted on the environment by human activities, (b) changes in the quality and quantity of natural resources and the environment, and (c) responses to such changes in the form of economic, environmental, and sectoral policies.

Sector	Core Indicators
Climate Change & Ozone Layer Depletion	Greenhouse Gas Emissions
	Atmospheric Concentrations
	Energy Intensity
Eutrophication	Nitrogen from Fertilizers and Livestock
	River Quality: Biochemical Pollution
	Waste Water Treatment
Acidification	SOx Emissions
	NOx Emissions
	Acid precipitation
Toxic Contamination	Consumption of Pesticides
	River Quality: Toxic Metals
	Fuel Prices and Taxes
Urban Environmental Quality	Traffic Density
	Air Qualities in Cities: SO2
	Air Qualities in Cities: NO2
Biodiversity & Landscapes	Threatened Species
	Protected Areas
Waste	Waste Generation
	Municipal Waste

Waste (cont.)	Hazardous Waste
	Recycling Rates
Natural Resources	Use of Water Resources
	Use of Forest Resources
	Fish Catches
	Land Use
General Indicators	Economic Activity and Consumption
	Population
	Industrial Production
	Energy Supply
	Transport
	Pollution Control Expenditures

A detailed presentation of each indicator, as well as discussion of the Pressure-State Response-Framework is available in: Environmental Indicators: OECD Core Set (Code 97-94-19-3, ISBN 92-64-04263-6, 159 pages, $22), from:

OECD Publications and Information Center
2001 L Street, NW
Suite 700
Washington, DC 20036-4910
Phone (202) 785-6323
Fax (202) 785-0350

Record UN.Energy

ORGANIZATION, INSTITUTION, OR AGENCY:

United Nations

OFFICE, BRANCH, OR DIVISION:

Department of Economic and Social Development
Statistical Office

STATISTICAL PROGRAM TITLE:

Energy Statistics

SUMMARY PROGRAM DESCRIPTION:

The United Nations Statistical Office compiles a comprehensive collection of international energy statistics. The collection, which has been published annually since 1952, provides a global framework of comparable data on long-term trends in the supply of mainly commercial primary and secondary forms of energy.

DATA SUBJECT COVERAGE:

Statistics cover production, trade, and consumption of solid, liquid and gaseous fuels, electrical energy production, production of uranium, and energy resources and reserves. In addition, information is provided on: principal importers and exporters of coal, crude petroleum, and natural gas; capacity of petroleum refineries, natural gas liquids plants, and electricity generating plants by type; and new and renewable sources of energy (e.g., fuelwood, charcoal, bagasse, peat, geothermal, and hydrothermal energy sources).

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Energy statistics are reported in metric units by country and for the world. Comparisons of production, trade, consumption, and energy requirements for different primary fuel types are presented in common units (e.g., metric tons of coal equivalent, oil equivalent, and terajoules). Per capita energy consumption is provided as kilograms per capita and gigajoules per capita. Procedures for converting from original units to common units are discussed in the publication, Energy Statistics Yearbook.

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STATISTICAL DATA TYPE:

(1) Time Series: Annual compilations of energy statistics commenced under the title World Energy Supplies in Selected Years, 1926-1950 (published in 1952). The current publication, Energy Statistics Yearbook, contains four or six years of data for each time series. By referring to previous volumes of the publication, a time series can be established from 1950 to present. Monthly and quarterly data may be found in the Monthly Bulletin of Statistics.

(2) Spatial Data: Data are provided, where available, by country, region, continent, and the world.

TIME PERIOD COVERED: 1950 to present, based on the calendar year except as noted.

DATA COLLECTION FREQUENCY: Monthly.

DATA COLLECTION METHODS:

Data are compiled primarily from annual questionnaires distributed by the United Nations Statistical Office and supplemented by official national statistical publications. Where official data are not available or are inconsistent, estimates are made by the Statistical Office based on governmental, professional or commercial materials. Estimates include, but not limited to, extrapolated data based on partial year information, use of annual trends, trade data based on partner country reports, breakdowns of aggregated data as well as analysis of current energy events and activities.

The following specialized, governmental and intergovernmental agencies provided source materials: Comite professional du petrole (Paris); Food and Agriculture Organization of the United Nations (Roe); International Atomic Energy Agency (Vienna); International Energy Agency of the Organization of Economic Co-operation and Development (Paris); International Sugar Organization (London); Nuclear Energy Agency of the Organization of Economic Co-operation and Development (Paris); Organization of Arab Petroleum Exporting Countries (Kuwait); Organization of the Petroleum Exporting Countries (Vienna); Statistical Office of the European Economic Communities (Luxembourg); United States Department of Energy (Washington, DC); and World Energy Council (London).

GEOGRAPHIC COVERAGE: Worldwide.

DATABASE(S):

Name of Database(s):

Acronym:

Identification Number (if applicable):

Contents:

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Forms/Software In Which Data Are Available:

Hardware and Other Software Requirements:

Access Restrictions and Conditions:

Price Information:

Language(s): English and French.

User Aids Available:

KEY PUBLICATIONS:

United Nations. Energy Statistics Yearbook (annual). Statistical Papers, Series J. (New York: United Nations publications).

--. Monthly Bulletin of Statistics. Statistical Papers, Series Q. (New York: United Nations publications).

--. World Energy Supplies in Selected Years, 1929-1950. Statistical Papers, Series J, No. 1. (New York: United Nations publications, Sales No. 1952.XVII3).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

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Record FAOFish.Catch

ORGANIZATION, INSTITUTION, OR AGENCY:

Food and Agricultural Organization of the United Nations

OFFICE, BRANCH, OR DIVISION:

Fisheries Department

STATISTICAL PROGRAM TITLE:

Fishery Statistics - Catches and Landings

SUMMARY PROGRAM DESCRIPTION:

For nearly fifty years, the Food and Agricultural Organization of the United Nations (FAO) has provided annual statistics, on a world-wide basis, on nominal catches of fish, crustaceans, molluscs and other aquatic animals, residues and plants, taken for all purposes (commercial, industrial and subsistence) except recreational, by all types and classes of fishing units (fishermen, vessels, gear, etc.) operating both in inland fresh and brackish water areas, and in inshore, offshore and highseas fishing areas. Statistics for mariculture, aquaculture and other kinds of fish farming are also reported.

SUBJECT COVERAGE:

Coverage includes statistics on catches of freshwater, brackish water, and marine species of fish, crustaceans, molluscs and other aquatic animals and plants killed, caught, trapped, collected, bred, or cultivated for all commercial, industrial and subsistence purposes.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Nominal catches, or landings on a live weight basis, expressed in metric tons, except for whales, seals and crocodiles which are given in numbers and corals, pearls and sponges which are given in kilograms.

Nominal catches refers to the total live weight of fish retained at the time of capture (and excludes the total live weight of undersized, unsalable or otherwise undesirable whole dead and alive fish which are discarded at the time of capture or shortly afterwards). For cases where the catch, on board fishing vessels or factory ships are gutted, eviscerated, filleted, salted, dried,

etc. or reduced to meal, oil, etc., conversion by accurate yield rates (conversion factors) is used to establish the live weight equivalents (nominal catches) at the time of capture. In some national statistics, the following terms are in common use to refer to nominal catches: landings in round, fresh basis; landings in round, whole basis; and landings on an ex-water weight basis. The closely related concept "landings" refers to the quantities of catch on a landed weight basis (i.e., ex-vessel weight). In many fisheries, the landed quantities (landings) are identical to the quantities caught (nominal catch).

STATISTICAL DATA TYPE:

Time Series - Annual fishery catch statistics for the most recent series of calendar years and split-years are reported by species item or group, major fishing area, continent, and individual country or area. Aquatic animals and plants are broken down at either the species, genus or family levels into approximately 995 statistical categories called "species items." These 995 species items are arranged by FAO within 51 groups of species constituting the nine divisions of FAO 'International Standard Statistical Classification of Aquatic Animals and Plants' (ISSCAAP). In all tables, except one where selected species items of significant commercial importance are listed in order of catch size, the species items are arranged in order of their taxonomic codes with respect to ISSCAAP groups.

Spatial Data - Catch data by species and country are reported for twenty-seven (27) major fishing areas, internationally established for fishery statistical purposes. These areas consist of eight (8) major inland fishing areas, each covering the waters of one of the eight continents, and nineteen (19) major marine fishing areas covering the waters of the Atlantic, Indian and Pacific Oceans and the 'southern' oceans and their adjacent seas. Breakdown of catch statistics by subareas, divisions, subdivisions, etc. within these major fishing areas are not presented in the Yearbook. These details appear in various statistical bulletins issued regularly by various regional fishery organizations, councils, commissions, committees, etc.

TIME PERIOD COVERED:

Fishery statistics have been reported annually in the Yearbook of Fishery Statistics since 1948. Volumes of the Yearbook published in 1948-63 were variously titled, Production and Fishing Craft, International Trade, and Production. Volumes published in 1964 and subsequent years were titled Yearbook of Fishery Statistics -- Catches and Landings, 19__.

DATA COLLECTION FREQUENCY:

Annual, based on the calendar year (1 January - 31 December), with the exception of data on catches in the waters around Antarctica for which the split-year (1 July - 30 June) is used. Slit-year data are shown under the calendar year in which the split-year ends.

DATA COLLECTION METHODS:

National focal points for fishery statistics, in particular those countries fishing in more than one major fishing area, report their annual catches to various fishery commissions, as well as to FAO. To eliminate duplication in requests to these national offices, FAO cooperates with regional fishing bodies, particularly through the Coordinating Party on Atlantic Fishery Statistics (CWP), to standardize reporting forms, procedures, definitions, classifications and other related documentation. This system also helps to reduce discrepancies between the figures appearing in the Yearbook and those published in the bulletins issued by the commissions.

National data covers all quantities caught by fishing craft flying the flag of the reporting country and landed not only in the domestic harbors of the reporting country but also in foreign harbors. National catch excludes quantities caught by foreign fishing craft and landed in domestic ports.

Final data are submitted by many national offices; provisional figures are provided by others. Whenever national offices fail to report their annual catch statistics in time for publication, FAO, in the absence of other information, repeats the data previously reported by the country (R designated figures), and in the case where statistical information is available, FAO estimates the quantities to reflect more realistic catch data (F designated figures).

GEOGRAPHIC COVERAGE:

World-wide.

OTHER SPATIAL DATA CHARACTERISTICS:

Not applicable.

QUALITY ASSURANCE PROCEDURES USED:

Adherence to FAO reporting standards provides a degree of quality assurance. Notes in the Yearbook on individual countries or areas and for specific tables list the few national exceptions to these standards.

QUALITY OF DATA:

Although data are shown to the nearest ton, they are not necessarily of this degree of accuracy. Some countries do not precisely record their catches and submit estimates rounded off to the nearest hundred metric tons.

Several countries still report their catches by large groups of species. In these circumstances, the catch data presented by individual species items are likely to be underestimated.

DATA OUTPUT FORMAT:

Fishery catch data are reported annually in the Yearbook of Fishery Statistics. FAO also provides time series of fishery statistical data in machine readable form (standard tapes and floppy disks) for countries or areas, species groups, and major fishing areas for a period of years starting with 1970 up to the latest year published in the Yearbook.

DATA OUTPUT FREQUENCY:

Annual.

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Inquiries about the technical contents of the Yearbook publication and requests for standard tapes should be addressed to:

The Senior Fishery Statistician
Fishery Information, Data and Statistics Service
Fishery Department
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

CONTACT FOR PUBLIC INQUIRIES (IF DIFFERENT FROM PRINCIPAL CONTACT):

Requests for copies of the Yearbook publication should be sent

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to the FAO sales agent in member countries, or to:

Distribution and Sales Section
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

Requests for floppy disks should also be sent to the above address.

DATABASE(S):

Name of Database(s):

Acronym:

Identification Number (if applicable):

Contents:

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Forms/Software In Which Data Are Available: Data can be acquired on standard tape or in PC version on floppy disks of either 3.5 or 5.25 inches.

Hardware and Other Software Requirements:

Access Restrictions and Conditions:

Price Information: Standard tapes cost US$300 each or the equivalent in pounds. Floppy disks of either 3.5 or 5.25 inches cost US$120 per set or the equivalent in pounds sterling or French francs. Prices are subject to revision.

Language(s): English, French and Spanish.

User Aids Available:

KEY PUBLICATIONS:

Food and Agricultural Organization of the United Nations. Fishery Statistics - Catches and Landings. (FAO, Rome, annual).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

WHO.SAN

ORGANIZATION, INSTITUTION, OR AGENCY:

World Health Organization

OFFICE, BRANCH, OR DIVISION:

STATISTICAL PROGRAM TITLE:

Drinking Water and Sanitation Statistics

SUMMARY PROGRAM DESCRIPTION:

The World Health Organization (WHO) is a specialized agency of the United Nations with primary responsibility for international health matters and public health. Through this organization, which was established in 1948, the health professions of some 160 countries exchange their knowledge and experience with the aim of making possible the attainment by all citizens of the world by the year 2000 of a level of health that will permit them to lead a socially and economically productive life. By means of direct technical cooperation with its member countries, and by stimulating cooperation among them, WHO promotes the development of comprehensive health services, the prevention and control of diseases, the improvement of environmental conditions, the development of health manpower, the coordination and development of biomedical and health services research, and the planning and implementation of health programs.

DATA SUBJECT COVERAGE:

WHO compiles data on access to safe drinking water and availability of adequate sanitation facilities. Other WHO statistics relating to human health and the environment and health care services are listed under Additional Comments, Descriptions and Information (below).

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Drinking water and sanitation statistics are reported in terms of percentage of population with access to safe and adequate resources and facilities.

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DATA OUTPUT FORMAT:

Hardcopy and electronic files.

DATA OUTPUT FREQUENCY:

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Chief Statistician
Global Epidemiological Surveillance and Health Situation Assessment
World Health Organization
1211 Geneva 27
Switzerland

CONTACT FOR PUBLIC INQUIRIES (IF DIFFERENT FROM PRINCIPAL CONTACT):

DATABASE(S):

Name of Database(s): WHO Data Bank

Acronym:

Identification Number (if applicable):

Contents: Information stored in WHO data bank id usually summary data.

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Forms/Software In Which Data Are Available:

Hardware and Other Software Requirements: Data are provided on standard 1/2 inch wide, 9-track, magnetic tape with a density of 6250 bytes per inch in EBCDIC code. Upon request, tapes can be made available with a density of 800 or of 1600 bytes per inch. Additional information such as tape layout, record length, block size, and tape labels are provided in the documentation. Applicants are requested to provide blank tapes for the re-recording.

KEYWORDS:

Drinking water
, access to safe supply

Sanitation
, adequate facility, availability of

WCMC.SCMU

ORGANIZATION, INSTITUTION, OR AGENCY:

World Conservation Monitoring Centre

OFFICE, BRANCH, OR DIVISION:

Species Conservation Monitoring Unit

STATISTICAL PROGRAM TITLE:

Global Biodiversity -- Species Conservation

SUMMARY PROGRAM DESCRIPTION:

The main objective of the Species Conservation Monitoring Unit (SCMU) of the World Conservation Monitoring Centre (WCMC) is to gather, analyze, and disseminate conservation information on the world's fauna to the conservation and development communities. It accomplishes this objective by: (1) identifying and monitoring the status of animal species of conservation concern; (2) preparing and updating detailed, standardized accounts for threatened species; (3) providing information on threatened and endangered species in individual countries; and (4) providing support to international activities, programs, and conventions relating to animal species conservation. The SCMU works closely with the special interest groups of the IUCN Species Survival Commission.

DATA SUBJECT COVERAGE:

SCMU maintains data on individual animal species of conservation concern.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Statistics include 33 fields of information on the distribution and conservation status of individual animal species of concern, including: world population size and trend; captivity population size and status; exploitation; threats; location; and legal coverage.

STATISTICAL DATA TYPE:

QUALITY ASSURANCE PROCEDURES USED:

QUALITY OF DATA:

DATA OUTPUT FORMAT:

DATA OUTPUT FREQUENCY:

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Jane Thornback, Head
Species Conservation Monitoring Unit
World Conservation Monitoring Centre
219 (c) Huntington Road
Cambridge, CB3 ODL
United Kingdom

Telephone: 011-44-233-277-314
FAX: (223) 277136

CONTACT FOR PUBLIC INQUIRIES (IF DIFFERENT FROM PRINCIPAL CONTACT):

DATABASE(S):

Name of Database(s): Animal Database

Acronym:

Identification Number (if applicable):

Contents: This database contains 33 fields of information on the distribution and conservation status of individual animal species. These fields are:

Data Caveats or Limitations:

Area(s) of Record Where More Information Is Particularly Needed:

Source needs to fill in and/or modify:

Time Period
Data Collection Frequency
Spatial Characteristics of Data
Data Quality Assurance
Data Quality
Data Output
Data Output Frequency
Database
Key Publications

WCMC.PADU

ORGANIZATION, INSTITUTION, OR AGENCY:

World Conservation Monitoring Centre

OFFICE, BRANCH, OR DIVISION:

Protected Areas Data Unit

STATISTICAL PROGRAM TITLE:

Global Biodiversity -- Protected Areas

SUMMARY PROGRAM DESCRIPTION:

The World Conservation Monitoring Centre (WCMC), established in 1988, is managed as a joint-venture between The World Conservation Union (IUCN), the United Nations Environment Programme (UNEP), and World Wide Fund for Nature (WWF). Its mission is to provide information on the status, security, management and utilization of the world's biological diversity to support conservation and sustainable development. To implement this mission, WCMC maintains substantial databases on the status and distribution of plant and animal species of conservation and development interest; habitats of conservation concern, particularly tropical forests, coral reefs, and wetlands; the global network of national parks and protected areas; and the international trade in wildlife species and their derivative products. This record concerns the statistics of WCMC's Protected Areas Data Unit (PADU) which provides accurate, up-to-date information on the protected areas of the world.

DATA SUBJECT COVERAGE:

PADU maintains four kinds of information: (1) official lists of protected areas by country; (2) details on national protected area systems, including legislation and administration; (3) details on individual protected areas; and (4) maps of national protected area systems and individual sites. In developing this information, PADU works closely with the IUCN Commission on National Parks and Protected Ares (CNPPA) and other data units within WCMC.

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OTHER SPATIAL DATA CHARACTERISTICS:

(1) Geographic Area of Coverage:

(2) Size, Scale, or Resolution of Geographic Unit:

(3) Cartographic Projection:

(4) Data Format: __ Map; __ Digital

(5) Description of Source Data:

(6) General Comments:

QUALITY ASSURANCE PROCEDURES USED:

For making international comparisons, WCMC utilizes IUCN, CNPPA's classification system for protected areas. This system is based upon management objectives and has 10 different classes of protected areas: Scientific Reserve/Strict Nature Reserve; National Park; Natural Monument/Natural Landmark; Managed Nature Reserve/Wildlife Sanctuary; Protected Landscape or Seascape; Resource Reserve; Natural Biotic Area/Anthropological Reserve; Multiple-Use Management Area/Managed Resource Area; World Heritage Sites; and Biosphere Reserves.

WCMC uses standard procedures for data collection: (1) a review, on a country-by-country basis, of existing information documents and the compilation of new ones, as necessary; (2)circulation of country drafts for review by government authorities and experts at national and international levels; and (3) revision of draft materials to incorporate review comments.

QUALITY OF DATA:

DATA OUTPUT FORMAT:

DATA OUTPUT FREQUENCY:

KEY PUBLICATIONS:

World Conservation Monitoring Centre (WCMC), Global Biodiversity: Status of the Earth's Living Resources (Chapman & Hall, London, 1992).

World Conservation Union (IUCN), "Categories and criteria for protected areas. In: McNeely, J.A. and Miller, K.R. (eds.), National Parks, Conservation, and Development: The Role of Protected Areas in Sustaining Society (Smithsonian Institution Press, Washington, DC, 1984).

--, 1990 United Nations List of National Parks and Protected Areas (IUCN, Gland, Switzerland, 1990).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

PADU provides data support for the Biosphere Reserve Program, the World Heritage Program and the Ramsar (Wetlands) Convention.

KEYWORDS:

Biodiversity
Conservation
Parks
Protected Areas
Reserves

Record FAOTropFor.Assessment

ORGANIZATION, INSTITUTION, OR AGENCY:

Food and Agricultural Organization of the United Nations

OFFICE, BRANCH, OR DIVISION:

Forestry Department

STATISTICAL PROGRAM TITLE:

Tropical Forest Resources Assessment

SUMMARY PROGRAM DESCRIPTION:

Forest resource appraisals on a global scale are conducted by the Food and Agricultural Organization of the United Nations (FAO) under its mandate to provide current, objective and globally consistent information on the state of the world's tropical forests, recent trends of deforestation and forest degradation, and the underlying causes and effects. Assessments provide baseline data and source documentation, tested methodology, and forest classification standards that serve as a foundation for integrating continuing global and national level forest resources monitoring activities. Assessments serve also to coordinate activities and strengthen the facilities and capabilities of national institutions to monitor forest resources on a continuing basis.

SUBJECT COVERAGE:

FAO assesses tropical forest cover and change for different ecological zones by continent and at the global level. Coverage includes statistics on forest cover area, growing stock, utilization, management, and protection as well as analysis of land use changes (e.g., forest amelioration, afforestation, deforestation, and forest degradation). Ancillary data on land area, vegetation/ecology, population density, and socio-economic conditions are compiled as part of the assessment.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Forest cover and deforestation area is measured in hectares. Population density is presented as number of inhabitants per square kilometer. Statistics on forest management areas, forest plantations, and protected areas coverage are given in hectares.

STATISTICAL DATA TYPE:

Time Series - Statistical data on the state of tropical forests are baseline measurements based on existing survey data for the reference year 1990. Data on deforestation, land use changes, forest management, and forest plantations are time series for the period 1981 to 1990. Where forest cover data have different reference years, an adjustment function is used to bring them to the standard reference years.

Spatial Data - Two types of spatial data are compiled: cartographic data and remote sensing data. Spatial databases, which are obtained from various sources or generated by the project and organized under a Geographic Information System (GIS), include the following: vegetation map of the tropics; eco-floristic zones; ecological zones; LANDSAT 4,5 World Reference Grid; population density and annual population growth; potential global and forest biomass; administrative (political) boundary; mean annual precipitation and bio-temperature; topography; protected areas; and vegetation map from NOAA/AVHRR satellite imagery (for some regions).

Remote sensing data include LANDSAT MULTISPECTRAL SCANNER (MSS) images [of which 20% are THEMATIC MAPPER (TM)] and Indian Remote Sensing Satellite (IRS) satellite data.

TIME PERIOD COVERED.

Forest cover estimates are made for 1980 and 1990. Deforestation rate is given for the period 1981 to 1990. To estimate forest cover and land use change, satellite images from two different dates are used: one close to 1980 and one close to 1990, separated by at least 5 years, in the same season (preferably beginning of dry season). Developments in forest management and forest plantations cover the last decade (1981-90), and forest protection data are provided for 1990 with reference to growth in forest area networks since the 1960s.

DATA COLLECTION FREQUENCY:

Data are collected at ten-year intervals. An earlier tropical forest resource assessment was conducted in 1980. The present assessment for the reference year 1990 was initiated in March 1989.

DATA COLLECTION METHODS:

The assessment was carried out in two complementary phases: (1) compilation of existing national survey data; and (2) monitoring of tropical forest cover and its change using remote sensing in a global sample survey format.

National offices filled in standardized tables, according to FAO definitions and classification system for forest resource data collection, using existing survey data on forest area, growing stock, timber utilization and forest management. After being reviewed by FAO, the data was organized and stored in a database called "Forest Resources Information System (FORIS 1990) together with comments appearing in the country briefs.

Modelling was applied to bring all information to standard reference years. This was achieved by correlating forest cover and its change with ancillary variables. To get an idea of the shape of the function, time-series data at sub-national (province, district) were plotted against population density. A precise mathematical formulation of the adjustment function (deforestation model) was obtained through regression analysis based upon the time-series data contained in FORIS. Because the deforestation rate was found to vary with ecological zone for the same population density, the FORIS database was integrated with the spatial databases including vegetation and ecological zones, and spatial databases, in particular population and socio-economic indicators. A set of functions was computed corresponding to main ecological zones. The model was validated and applied to sub-national units for the reference years 1980 and 1990. The average national rate of deforestation was derived from sub-national results, the regional rate from the national rates, and the global rate from the regional rates.

Forest cover change assessment based on remote sensing was conducted using high resolution LANDSAT satellite data. A survey design was developed for annual sampling intensity of 10%, allowing coverage of the entire tropical zone in a ten year cycle. A two stage stratified random sample is carried out. First, the survey area is divided into subregion based on geography and then the sub-regions are divided into forest cover strata. The allocation of samples to the sub-region is made proportional to estimated deforestation. Within a sub-region, sampling units are selected with probability proportional to the land area of the sampling units.

Image interpretation follows standard procedures developed by FAO and employs standard and globally compatible land use classification, thus assuring conceptual, spatial and temporal consistency. It involves the help of a number of regional and national remote sensing institutions with interdependent interpretation; i.e., visual interpretation of images from both

years by the same interpreter (coming from the region and familiar with the location) at the same time. Data are recorded from dot grid using customized LOTUS 1-2-3 spreadsheet software. Selected samples are field verified in cooperation with National Forest Services and Remote Sensing Agencies. The methodology generates annual estimates of forest cover, temporal change maps, and land use class change matrices for each study location.

GEOGRAPHIC COVERAGE:

Africa, Latin America and the Caribbean region, and Asia and Pacific regions of the world.

OTHER SPATIAL DATA CHARACTERISTICS:

(1) Geographic Area of Coverage: Tropical zone with a total land area of nearly 5 billion hectares covering 40 countries in Africa, 32 countries of Latin America and the Caribbean, 15 countries in Asia (excluding Pacific). In 1990 approximately 1.7 billion hectares of the total tropical land area was actually covered with forest.

(2) Size, Scale, or Resolution of Geographic Unit: LANDSAT scenes covering approximately 3.4 million hectares serve as the sampling unit. The entire tropical zone encompasses 1200 sample units. 117 samples were selected for the first round of interpretation.

(3) Cartographic Projection:

(4) Data Format: Digital and cartographic (map) data.

(5) Description of Source Data: LANDSAT MSS.

(6) General Comments:

QUALITY ASSURANCE PROCEDURES USED:

Adherence to FAO data compilation, analysis and reporting standards provides a degree of quality assurance. To bring various national-level statistical data into a common framework of definition and classification, FAO prepared Guidelines for

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Assessment Based on Existing Survey Data which are intended to provide a global standard for compilation and reporting of all relevant statistical data in a consistent way.

For spatial data, FAO employed an adjustment function to bring data from different reference years to the standard reference years.

The highest level of consistency and precision in the assessment of forest cover change comes from employing the simple and robust remote sensing technique described under Data Collection Methods above. The design permits coming back to the same location after 10 years. These time series, in turn, will help improve and refine the deforestation model on a geographic and ecological basis.

QUALITY OF DATA:

The forest resources assessment is based on existing survey data from forest inventories which, in almost all cases, are designed to meet local information needs. The data cover many parameters of interest and span a wide period of time; however, compiling these data to present a national, regional or global picture is problematic, especially when there are variations in classification schemes, accuracy and survey dates. GIS and mathematical models were employed as tools for data analysis and integration.

The number of countries with forest cover information on two or more dates on a comparable basis is limited. In cases where multi-date inventories are available, the forest cover change observed is used to compute a "local fit" of the deforestation model parameters and thus producing more reliable results. For most of the countries, however, information is available at sub-national levels for only one date, mostly based on satellite remote sensing. Nonetheless, validation of the deforestation model showed a +/- 10.6% mean difference between observed and predicted changes in forest cover. In view of the fact that sub-national data were summed upward to provide "bigger pictures", the reliability of estimates is higher at each successive summation. It may also be noted that available information on other parameters such as status of forest management, plantations, biomass and forest harvesting is deficient. Likewise, information on forest species composition in protected areas is limited.

The first round of remote sensing interpretation covers 10% of the entire tropical zone and provides forest area estimates with 7% sampling error and estimated deforestation with 10% sampling error (at 95% probability).

DATA OUTPUT FORMAT:

Data are presented in tables, matrices and maps in the publications listed below.

DATA OUTPUT FREQUENCY:

Approximately every ten years.

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Inquiries about the technical contents of the assessment should be addressed to:

Forest Resources Assessment 1990 Project
Forestry Department
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

CONTACT FOR PUBLIC INQUIRIES:

Requests for copies of the publications listed below should be sent to the FAO sales agent in member countries, or to:

Distribution and Sales Section
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

DATABASE(S):

Name of Database(s): Three databases are referenced in the assessment: Forest Resources Information System, BIBLIO, and Geographic Information System.

Acronyms: FORIS 1990, BIBLIO, and GIS.

Identification Number (if applicable):

Contents: FORIS 1990 contains statistical data on forest area, growing stock, timber utilization and forest management compiled and reported to FAO in accordance with its Guidelines for Assessent Based on Existing Survey Data. FORIS 1990 is

supplemented by BIBLIO, a database program (written under dBASE IV) for storing bibliographic references for the forest resources and for retrieval under classification by country, author, year, publisher or additional keywords. The GIS databases include a vegetation map of the tropics; eco-floristic zones; ecological zones; LANDSAT 4,5 World Reference Grid; population density and annual population growth; potential global and forest biomass; administrative (political) boundary; mean annual precipitation and bio-temperature; topography; protected areas; and vegetation map from NOAA/AVHRR satellite imagery (for some regions). Remote sensing databases include images from LANDSAT MULTISPECTRAL SCANNER (MSS) and Indian Remote Sensing Satellite (IRS).

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Forms/Software In Which Data Are Available:

Hardware and Other Software Requirements:

Access Restrictions and Conditions:

Price Information:

Language(s): English.

User Aids Available:

KEY PUBLICATIONS:

Food and Agricultural Organization of the United Nations. The Forest Resources of the Tropical Zone by Main Ecological Regions. Prepared by the Forest Resources Assessment 1990 Project. (FAO, Rome, June 1992).

Pandey, D. Assessment of Tropical Forest Plantation Resource (Draft). A study undertaken at the Department of Forest Survey, Faculty of Forestry, Swedish University of Agricultural Science, in cooperation with the Forest Resources Assessment 1990 Project of the Food and Agricultural Organization of the United Nations and financed by the Swedish International Development Authority. (Swedish University of Agricultural Science, 1992).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

The Governments of Sweden, Finland, the Netherlands, Switzerland and france provided funding for the Forest Resources

Assessment 1990 Project through a multi-donor trust fund. Major in-kind contributions were made by the United States Department of Agriculture Forest Service, the Swedish University of Agricultural Sciences, and the World Conservation Monitoring Center, United Kingdom. Personnel assistance was given through the Associate Professional Officers scheme of the Governments of Germany, Sweden, United States, Belgium, and the Netherlands.

UNDP.HDR

ORGANIZATION, INSTITUTION, OR AGENCY:

United Nations

OFFICE, BRANCH, OR DIVISION:

Development Programme

STATISTICAL PROGRAM TITLE:

Human Development Statistics

SUMMARY PROGRAM DESCRIPTION:

The United Nations Development Programme (UNDP) has developed a system for measuring and monitoring the human dimension of development. The central underlying principle of this system is that while growth in national production (GDP) is absolutely necessary to meet all essential human objectives, what is important is how this growth translates -- or fails to translate -- into human development in various societies. Differing from conventional approaches to economic growth, human capital formation, human resource development, human welfare or basic human needs, UNDP views human development in terms of the process of widening people's choices and the level of their achieved well-being. UNDP's measurement of human development focuses on three essential elements of human life: longevity (e.g., life expectancy at birth), knowledge (e.g., literacy), and decent living standards (e.g., command over resources needed for a decent living). In constructing a human development index, UNDP uses a deprivation measure of these three essential elements; i.e., it measures the continuing shortfall from a desired value or target rather than what has been achieved.

DATA SUBJECT COVERAGE:

UNDP has constructed human development indexes for various indicators of human development (e.g., life expectancy, literacy, and living standards).

capita, real GDP per capita, GNP per capita of lowest 40% of households, income share of lowest 40%, ratio of highest 20% to lowest 20%, Gini coefficient, population below poverty line); urban crowding (urban population and annual growth rate, persons per habitable room, city per country with highest population density); military expenditure imbalances (military expenditure, ratio of military expenditure to health and education expenditure, arms imports, ratio of net ODA to military expenditures, armed forces as percentage of teachers); resource flows imbalances (official development assistance, interest payments on long-term debts, debt service, gross international reserves, ratio of exports to imports, terms of trade); demographic balance sheet (population and annual population growth, dependency ratio, contraceptive prevalence rate, fertility rate, crude birth rate, rude death rate); natural resources balance sheet (land area, arable land, population density, livestock per capita and annual increase, fuelwood production per capita and annual increase, annual deforestation, internal renewable water resources); and national income accounts (GNP, GDP, GNP per capita, annual GNP per capita growth rate, annual rate of inflation, overall budget surplus or deficit, gross domestic savings). For each of these indicators, countries are ranked according to low human development, medium human development, and high human development. Regional aggregates of human development indicators are also provided.

(2) Spatial Data: Human development indicator statistics are reported for the variables listed above for 130 countries with populations of more than a million people. HDI and associated statistics (life expectancy, adult literacy rate, daily calorie supply, population with access to health services and safe water, and GNP per capita) are reported for 32 countries with populations of fewer than a million people.

TIME PERIOD COVERED:

Most indicators over the mid to late 1980s; trend data are from 1960 forward.

DATA COLLECTION FREQUENCY:

DATA COLLECTION METHODS:

Existing data are taken from a variety of sources, including Food and Agricultural Organization of the United Nations, Habitat, Institute for Resource Development, International Center for Urban Studies, International Labor Organization, International Monetary

UNDP publishes the Human Development Report and provides digital data in LOTUS 1-2-3 worksheets.

DATA OUTPUT FREQUENCY:

Annual.

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Mahbub ul Haq
United Nations Development Program
1 UN Plaza
New York, New York 10017
USA

CONTACT FOR PUBLIC INQUIRIES (IF DIFFERENT FROM PRINCIPAL CONTACT):

DATABASE(S):

Name of Database(s): Human Development Report Statistics

Acronym:

Identification Number (if applicable):

Contents: 42 Lotus Worksheets containing the statistics compiled and presented in the Human Development Report publication.

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Forms/Software In Which Data Are Available: LOTUS 1-2-3.

Hardware and Other Software Requirements:

Access Restrictions and Conditions:

Price Information:

Language(s):

User Aids Available:

Area(s) of Record Where More Information Is Particularly Needed:

Data collection frequency
Contact for public inquiries ?
Database - Source needs to fill in.

GRID

ORGANIZATION, INSTITUTION, OR AGENCY:

United Nations Environment Programme

OFFICE, BRANCH, OR DIVISION:

Programme Activity Centre

STATISTICAL PROGRAM TITLE:

Global Resource Information Database

SUMMARY PROGRAM DESCRIPTION:

The Global Resource Information Database (GRID) was established within the framework of the United Nations Environment Programme's Global Environmental Monitoring System (GEMS) in 1985. Its mission is to provide timely and reliable georeferenced environmental information and access to a unique international data service to help address environmental issues at global, regional and national levels. Using environmental geographic information systems (GIS), GRID converts environmental data into integrated information usable by both national and international scientists and decision makers, thus helping to bridge the gap between scientific understanding of earth processes and sound management of the environment.

The long-term objectives of GRID are to: (1) enhance availability and open exchange of global and regional environmental geo-referenced data sets; (2) provide United Nations and intergovernmental bodies with access to improved environmental data management technologies; and (3) enable all countries in the world to make use of GRID-compatible technology for national environmental assessment and management.

DATA SUBJECT COVERAGE:

Global, regional and national data sets cover political and natural boundaries, elevation, soil, vegetation, wildlife, land use, climate and population.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

GRID data consists of measured values or classifications of environmental parameters with coordinate codes linking them to specific locations on the earth's surface. Spatial data from remote sensing images and maps are stored in vector (line and polygon) or raster (grid cells) mode; tabular data are also stored.

STATISTICAL DATA TYPE:

(1) Time Series: Some of GRID's spatial data sets and special assessments are based on time series data; for example, climatic change (change in humidity index, temperature and precipitation, 1930-59 to 1960-89), vegetation index (1985-88 monthly) and temperature (monthly mean).

(2) Spatial Data: Global spatial data sets encompass the following themes or parameters: atmosphere (cloudiness); atmospheric precipitation; evaporation and transpiration; rainfall; climatic change; humidity; terrestrial ecosystems; land use classification; soil degradation; tropical forests; vegetation; wildlife habitats; rivers; human population; social and cultural indicators; methane; earthquakes; elevation; and temperature. Spatial data themes and parameters for Africa are as follows: atmospheric precipitation; evaporation and transpiration; rainfall; solar radiation; winds; lithosphere; coastlines; islands; terrestrial ecosystems; soils; ,land use classification; soil degradation; desertification; biological diversity and protected areas; vegetation; wildlife habitats; lakes; subterranean water; river basins; coastal and island environments; human settlements; human population; agriculture; animal diseases; irrigation; railway transport; roads; vectors of human disease; wildlife population statistics; elevation; slope; temperature; military activity; animal husbandry; and cartography. Regional spatial data sets are available for West Africa, South America, Western Asia, Europe, and Oceania. National-level spatial data sets are available for 26 African countries, 23 countries in the Western Hemisphere (North and South America and the Caribbean), 22 Western Asia and Middle Eastern countries, 17 European and former Eastern Block countries, and six Oceanic (Pacific) countries.

TIME PERIOD COVERED:

Most data sets are from the mid 1980s to the early 1990s, although some go back to the late 1960s to mid-late 1970s.

DATA COLLECTION FREQUENCY:

All the data sets are constantly updated.

DATA COLLECTION METHODS:

Most of the GRID data are derived from satellite and other monitoring programs, though some have been produced in GRID pilot studies.

GEOGRAPHIC COVERAGE:

Global, regional and selected national.

OTHER SPATIAL DATA CHARACTERISTICS:

(1) Geographic Area of Coverage: Global, regional and selected national, heavily weighed towards Africa because UNEP, through GEMS, has a responsibility for developing a resource monitoring and assessment programme for the African continent.

(2) Size, Scale, or Resolution of Geographic Unit: Vector scales vary from 1:250,000 to 1:500,000 (useful for national and sub-national studies) to 1:1,000,000 to 1:8,000,000 (for global studies). Raster cells vary in scale from minutes to degrees and from meters to kilometers.

(3) Cartographic Projection:

(4) Data Format: _X_ Map; _X_ Digital

(5) Description of Source Data: Images, maps and tables derived from remote sensing and ground surveys.

(6) General Comments:

QUALITY ASSURANCE PROCEDURES USED:

QUALITY OF DATA:

DATA OUTPUT FORMAT:

Hardcopy (processed images and maps) and digital.

DATA OUTPUT FREQUENCY:

Upon request.

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Harvey Croze, Director
GRID-Program Activity Centre
UNEP/GRID-PAC
P.O. Box 30552
Nairobi, KENYA

Telephone: 254 2 230800 ext. 4155
FAX: 254 2 226491
Telex: 22068 UNEP-KE
e-mail: hcroze@nasamail.nasa.gov
70703,3723 Compuserve
DIALCOM 41:UNE008

CONTACT FOR PUBLIC INQUIRIES (IF DIFFERENT FROM PRINCIPAL CONTACT):

DATABASE(S):

Name of Database(s): GRID Data Bank

Acronym:

Identification Number (if applicable):

Contents: Processed data.

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Forms/Software In Which Data Are Available: Data are stored in vector, raster or tabular forms. For data transfer, the

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following data storage is preferred: vector storage (as Arc export files); raster storage (uncompressed, unheaded, one image or thematic band per file with accompanying ASCII documentation file); and tabular storage (any format, but uncompressed ASCII text files are preferred).

Hardware and Other Software Requirements: The applications most commonly used at GRID Centres use the following software: GIS (using Arc/Info on Digital VAX under VMS operating system, PC Arc on DOS PCs, Idrisi on DOS PCs, and ERDAS on Sun and DOS PCs); IP (image processing using LAS/ELAS on VAX, ERDAS on Sun and DOS PCs, IAX on IBM 9370, and Idrisi on DOS PCs); and tabular data analysis (using dBase III and LOTUS 123/Quattro/Symphony on DOS PCs).

Access Restrictions and Conditions: One of GRID's central functions is to distribute georeferenced, integrated environmental data. In most cases, data held by GRID are provided by other agencies or individuals and carry a distribution classification. The different classifications are as follows: Free Access (those datasets which GRID is able to distribute without restriction. This class includes the vast majority of the GRID data holds); In House (those datasets which GRID may use for decision-making support activities but which cannot be distributed in original form. This class includes licensed products from commercial concerns which are subject to copyright restrictions, all unprocessed commercial satellite data and those experimental datasets produced during project activities); and Source Approval (those datasets which GRID holds in archive but which require approval from the original source before being distributed. This class includes national and sub-national datasets).

Price Information: No charge is made for archived data, but requesters are required to provide or replace media used.

Language(s): English

User Aids Available: Institutions involved in environmental assessment may seek GRID assistance with: (1) identifying and duplicating data available from GRID archive; (2) accessing specialized hardware and software to perform GIS/IP analyses beyond the in-house capabilities of smaller institutions. This includes computer processing, high-speed printers and plotters, cameras and other peripherals); (3) identifying and acquiring data from sources other than GRID; (4) transcribing data between computer media; (5) reviewing proposed configurations of computer hardware, software and peripherals vis-avis intended applications, and offering recommendations concerning hardware and software requirements, compatibility, data format and transfer, and data management and security issues; (6) advising on the design and layout of GIS/IP work areas; (7) reviewing designed and planned implementation of

technical components of environmental assessment activities, and offering recommendations on digitizing practices and registration of data layers, cleaning and editing of data, and analytical methods; and (8) advising on design and administration of environmental data archives in order to maximize data security, accessibility, compatibility and comparability.

KEY PUBLICATIONS:

United Nations Environment Programme, GRID: Global Resource Information Database (UNEP, Nairobi, 1990).

--, GRID Summary Data Bulletin of Available Data Sets (Nairobi) (UNEP, Nairobi, 1992).

--, GRIDView: Questions and Answers about the GRID Programme (UNEP, Nairobi, 1992).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

KEYWORDS:

GEMS
GIS
GRID
Remote sensing

Area(s) of Record Where More Information Is Particularly Needed:

Data collection frequency
Data output - Are digital files available?
Data output frequency ???
Contact for statistics ??
Contact for public inquiries ?
Database - Source needs to fill in.

Record ISRICSoil.Data

ORGANIZATION, INSTITUTION, OR AGENCY:

International Soil Reference and Information Center

OFFICE, BRANCH, OR DIVISION

STATISTICAL PROGRAM TITLE:

Soil Resources

SUMMARY PROGRAM DESCRIPTION:

The International Soil Reference and Information Center (ISRIC) was established in 1966 by the government of the Netherlands. Its objectives are to: (1) serve as a documentation center on land resources through its collection of soil samples, reports and soil maps of the world, with emphasis on developing countries; (2) improve methods of soil analysis; (3) disseminate specialized information; (4) advise on the establishment of national regional soil reference collections and databases; (5) stimulate and contribute to new developments in soil classification, soil mapping and land evaluation; and (6) provide training and consultancies in soil science. ISRIC developed a database, which FAO has subsequently enhanced, to store site and soil profile descriptions and analytical data. In addition, ISRIC is participating the following mapping projects: Global Assessment of Soil Degradation; World Soils and Terrain Digital Database; and Soil Maps of Eastern Africa.

SUBJECT COVERAGE:

Soil resource survey data are organized under field descriptions, standard analyses, and physical properties.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

The statistical unit is a soil profile. Soil profile data are grouped in the following data blocks: site variables/field description (e.g., location, soil unit, soil moisture, soil temperature, landform, land element, shape, position of site, topography, slope, micro topography, surface sealing/crusting, flooding frequency/duration, land use type, vegetation - crops/grass/species/structure, parent material, rock outcrops abundance, surface stones abundance, rock type, erosion

type/intensity, drainage class/internal-external, watertable, effective soil depth, and human influence); profile variables/horizon description (e.g., designation, depth - upper/lower, color, mottles, texture, structure, % clay, consistency, plasticity, cutans, cementation, pores/voids, rock fragments, mineral nodules, roots, biological features, reaction to hydrochloric acid and field pH); standard analytical variables (e.g., sample depth, pH, EC, phosphorus, nitrogen, organic carbon, calcium carbonate, calcium sulfate, CEC, exchangeable cations, base saturation, fixed K and particle size); soluble salts (e.g., pH, EC, calcium, magnesium, potassium, sodium, boron, carbonate, chlorine, sulfate and nitrate); and physical data (e.g., basic infiltration, surface structure stability, moisture content and bulk density).

STATISTICAL DATA TYPE:

Time Series - Not applicable.

Spatial Data -

TIME PERIOD COVERED:

Soil surveys have been conducted since ____

DATA COLLECTION FREQUENCY:

DATA COLLECTION METHODS:

GEOGRAPHIC COVERAGE:

OTHER SPATIAL DATA CHARACTERISTICS: Not applicable.

QUALITY ASSURANCE PROCEDURES USED:

QUALITY OF DATA:

DATA OUTPUT FORMAT:

DATA OUTPUT FREQUENCY:

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Dr. W.G. Sombroek
Director, ISRIC
9 Duivendaal
P.O. Box 353
6700 AJ Wageningen
The Netherlands

Telephone: (31) (0) 8370-19063

CONTACT FOR PUBLIC INQUIRIES:

DATABASE(S):

Name of Database(s): FAO-ISIR Soil Database

Acronym: SDB

Identification Number (if applicable):

Contents: Information on individual soil profiles in coded, numerical and descriptive format.

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Inquiries about the FAO-ISRIC Soil Database should be addressed to:

Chief, AGLS
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

Forms/Software In Which Data Are Available: SDB is a stand-alone program which does not need a supporting database management system. SDB is 100% dBase III/IV compatible which makes the data available to other systems such as GIS and for interpretation and analysis, for example using land evaluation and statistical programs.

Hardware and Other Software Requirements: Micro computer - IBM PC, XT, or AT or a 100% compatible with at least 512K RAM and preferably a hard disk, although a 720K 3.5inch floppy disk is able to contain the system and store approximately 30-40 soil profiles. PC-DOS or MS-DOS version 2.1 or higher. To ensure a reasonable performance with larger databases, an AT compatible with at least 640K RAM is preferred. SDB can make use of extended or expanded RAM. If expanded RAM is present, SDB will require at least 16K of the expanded memory. Portable micro computers need a full size screen. Printer needs to be a 80 column matrix printer, or laser printer.

Access Restrictions and Conditions:

Price Information:

Language(s):

User Aids Available:

KEY PUBLICATIONS:

Food and Agricultural Organization of the United Nations. FAO Guidelines for Soil Profile Description (FAO, Rome, 1986).

-- and International Soil Reference and Information Center. FAO-ISRIC Soil Database (SDB) (FAO, Rome, 1990).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

Record FAOSoil.Map

ORGANIZATION, INSTITUTION, OR AGENCY:

Food and Agricultural Organization of the United Nations
United Nations Educational, Scientific and Cultural Organization

OFFICE, BRANCH, OR DIVISION:

Land and Water Development Division

STATISTICAL PROGRAM TITLE:

Soil Map of the World

SUMMARY PROGRAM DESCRIPTION:

In response to the recommendation of the Congress of the International Society of Soil Science, the Food and Agricultural Organization of the United Nations (FAO) and United Nations Educational, Scientific and Cultural Organization (UNESCO) agreed to prepare jointly a Soil Map of the World in association with the International Society of Soil Science. The objective of the Soil Map of the World are to (1) make a first appraisal of the world's soil resources; (2) supply a scientific basis for the transfer of experience between areas with similar environments; (3) promote the establishment of a generally accepted soil classification and nomenclature; (4) establish a common framework for more detailed investigations in developing areas; (5) serve as a basic document for educational, research and development activities; and (6) strengthen international contacts in the field of soil science. The FAO/UNESCO Soil Map of the World differs from previous world soil maps in that it is based to the maximum extent possible on factual information derived from actual surveys.

SUBJECT COVERAGE:

The Soil Map of the World shows the distribution of soils as related to soil type, textural classes, slope classes, and soil phases.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

The statistical unit is the map unit, which consists of soil units or associations of soil units occurring within the limits of a mappable physiographic entity.

STATISTICAL DATA TYPE:

Time Series - Not applicable.

Spatial Data - The Soil Map of the World was prepared on the base of the topographic map series of the American Geographical Society of New York at a nominal scale of 1:5,000,000. The base map for the Soil Map of the World comprises 17 map sheets grouped into major regions and 1 legend sheet. An estimated total of about 5,000 map units cover the whole world. The number of map units for each region varies.

TIME PERIOD COVERED:

The Soil Map of the World reflects field soil correlation activities undertaken in the period 1961-72. The first regional sheets were printed in 1970; the last in 1980.

DATA COLLECTION FREQUENCY:

DATA COLLECTION METHODS:

The Soil Map of the World was compiled using existing materials and systematic field correlation. The sources of existing materials, which are indicated on each map sheet by means of small-scale inset map, were systematic soil surveys, reconnaissance surveys, or general information.

GEOGRAPHIC COVERAGE:

World-wide.

OTHER SPATIAL DATA CHARACTERISTICS:

(1) Geographic Area of Coverage: The world.

(2) Size, Scale, or Resolution of Geographic Unit:

1:5,000,000

(3) Cartographic Projection: The Americas are compiled on a bipolar oblique conformal projection. The sheets covering Europe, Africa, Asia and Australasia are based on the Miller oblated stereographic projection, a system consisting of three conformal projections center on Africa, Central Asia and Australasia, joined together in a continuous fashion by so-called "fill in" projections mostly covering oceans.

(4) Data Format: _X_ Map _X_ Digital

(5) Description of Source Data: Approximately 600 soil maps of different scales and legends were used to produce the Soil Map of the World. These existing maps were compiled from systematic soil surveys, reconnaissance soil surveys, and general information.

(6) General Comments: With the cooperation of the United Nations Environment Program (UNEP), the Soil Map of the World has been digitized and will form part of FAO's GIS system and UNEP's GRID system.

QUALITY ASSURANCE PROCEDURES USED:

Successive drafts of regional maps and legends were prepared from a compilation of existing materials combined with systematic field correlation and advisory panel review to ensure consistent interpretation of the international legend.

QUALITY OF DATA:

As the material for the Soil Map of the World was compiled from soil surveys of different intensity, it is not of equal precision and reliability. Where the soil map was based on systematic soil surveys, the boundaries of the mapping units were plotted from field observations, the density of which depends on the scale of the original map. Where the map was compiled from soil reconnaissance, the boundaries were based to a large extent on topographic, geological, vegetational and climatic data. Information regarding the composition of soil associations results from field observations, the density of which, however, is not sufficient to enable the boundaries of the mapping to be checked systematically. For those parts of the soil map compiled from general information, both the boundaries of the mapping units and the composition of the soil associations are largely based on the interpretation of data on land forms, geology, vegetation and climate. Only occasional field observations were made, and these

were insufficient to supply detailed information on the distribution of the different soils through the region.

DATA OUTPUT FORMAT:

Maps and digital files.

DATA OUTPUT FREQUENCY:

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Inquiries about the Soil Map of the World should be addressed to:

Land and Water Development Division
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

CONTACT FOR PUBLIC INQUIRIES:

DATABASE(S):

Name of Database(s):

Acronym:

Identification Number (if applicable):

Contents:

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Forms/Software In Which Data Are Available:

Hardware and Other Software Requirements:

Access Restrictions and Conditions:

Price Information:

Language(s):

User Aids Available:

KEY PUBLICATIONS:

Food and Agricultural Organization of the United Nations. Food and Agricultural Statistics in the Context of a National Information System (FAO, Rome, 1986).

--. Programme for the 1990 World Census of Agriculture (FAO, Rome, 1986).

--. Quality Statistical Data (FAO, Rome, 1986).

--. Supplement for Africa Programme for the 1990 World Census of Agriculture (FAO, Rome, 1991).

--. Supplement for Asia and the Pacific Programme for the 1990 World Census of Agriculture (FAO, Rome, 1990).

--. Supplement for Near East Programme for the 1990 World Census of Agriculture (FAO, Rome, 1990).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

Record FAOFor.Products

ORGANIZATION, INSTITUTION, OR AGENCY:

Food and Agricultural Organization of the United Nations

OFFICE, BRANCH, OR DIVISION:

Forestry Department
Statistics and Economics Staff

STATISTICAL PROGRAM TITLE:

Forest Products

SUMMARY PROGRAM DESCRIPTION:

Since 1946, the Food and Agricultural Organization of the United Nations (FAO) has provided annual statistics, on a world-wide basis, on the production and trade in forest products and the direction of trade.

SUBJECT COVERAGE:

For forest products, coverage includes statistics on the volume of production, the volume and value of trade, the direction of trade, and the unit value in trade of some commodities. Breakdowns are given for individual countries, continental, regional and economic class divisions, and world totals.

STATISTICAL VARIABLE OR UNIT OF MEASUREMENT:

Production data for the aggregate of roundwood forest products are given as solid volume in cubic meters of roundwood (or roundwood equivalent) without bark. Production data for roundwood components, sawnwood and wood-based panels, are given as solid volume in cubic meters. Figures for trade in charcoal are given as weight in metric tons. Pulp production data are given as weight (air-dry = 10 percent moisture) in metric tons, and paper and paperboard production are given as weight in metric tons. The units used for value of trade are US dollars. Unit value of trade is US$ per cubic meter or metric ton, according to the commodity. Figures for exports represent average f.o.b. (free on board) values, while those for imports represent average c.i.f. (cost, insurance and freight) values. Standard factors used in converting the units reported are provided as are exchange rates applicable to the time series.

STATISTICAL DATA TYPE:

Time Series - Statistical data on forest products are reported in the FAO Yearbook of Forest Products for a varying series of recent calendar years (generally the last 12 years for data on production and trade in forest products and the latest 2 years for the direction of trade). The long-term series is maintained and revised as necessary by FAO.

Statistics on total production of forest products refers to production of primary wood products, even though a portion may immediately be consumed in the production of another product (e.g., wood pulp, which may immediately be converted into paper as a continuous process). An exception is made in the case of veneer production, which excludes veneer sheets used for plywood production within the country. Imports refer to products for domestic consumption or processing shipped into the country. Exports refers to all quantities of domestic origin or manufacture shipped out of the country. Production and trade data are given for commodity aggregates with breakdown for commodities where available. Data for coniferous component and/or nonconiferous component of commodity aggregates and commodities are given separately or combined, or both, as appropriate.

Roundwood refers or "wood in the rough" or wood in its natural state as felled, or otherwise harvested, with or without bark, round, split, roughly squared or other forms. Statistics are provided on roundwood and roundwood commodity production quantity and import and export quantity and value. Roundwood commodities include sawlogs and veneer logs, pulpwood, other industrial roundwood, and fuelwood. Other industrial roundwood includes roundwood used for tanning, distillation, match blocks, gazogenes, poles, pilings, posts, pitprops, etc. Fuelwood includes wood in the rough (from trunks and branches of trees) to be used as fuel for purposes such as cooking, heating or power production. Statistics on trade include roundwood from removals, as well as the estimated roundwood equivalent in chips and particles, wood residues and charcoal.

Statistics are provided on sawnwood (plus sleepers = railroad ties) production quantity and import and export quantity and value. Sawnwood refers to sawnwood, planed, unplaned, grooved, tongued, etc. sawn lengthwise, or produced by a profile-chipping process (e.g., planks, beams, joists, boards, rafters, scantlings, laths, boxboards, "lumber", etc.) and planed wood, which may also be finger-jointed, tongued or grooved, chamfered, rabbeted, V-jointed, beaded, etc. Wood flooring is excluded. With few exceptions, sawnwood exceeds 5 mm in thickness.

Production, import and export data for wood-based panels are given for the aggregate and its components, i.e., veneer sheets, plywood, particle board and fiberboard (compressed and not compressed). Likewise, data for wood pulp are given for the aggregate and its components, i.e., mechanical wood pulp, semi-chemical wood pulp, chemical wood pulp, bleached and unbleached sulphite pulp, bleached and unbleached sulphate pulp, dissolving wood pulp and other fiber pulp. For paper and paperboard, the following commodities are included in the aggregate: newsprint, printing and writing paper, other paper and paperboard. Production, import and export data for these components are also reported separately as are data for household and sanitary paper, wrapping and packaging paper, and paper and paperboard not reported elsewhere.

Direction of trade statistics are based on export data. Trade matrices show all countries with a total export or import amounting to one percent of the total. The world total exports are identified with an exporting country and an importing country, or with a total for other countries where the trading partners are not identified or have total trade in the commodity of less than one percent.

Spatial Data - Data for most of the statistics described above are given for individual countries, continents, regions, and economic classes (developed and developing countries).

TIME PERIOD COVERED:

Statistics on the production and trade of forest products have been reported annually in the Yearbook of Forest Products since 1946.

DATA COLLECTION FREQUENCY:

Annual. The time reference for statistics on production is based on the calendar year (1 January - 31 December) or the forest year in which the entire harvest or the bulk of it took place. Import and export data are based on the calendar year. "In-transit" shipments are excluded.

DATA COLLECTION METHODS:

Most of the data and information are supplied by cooperating countries in the form of responses to questionnaires. The data are compiled by FAO in collaboration with the Economic Commission for

Europe (ECE). Certain countries do not report statistics to FAO or report only partial data. In these cases, FAO makes estimates or uses data obtained from sources other than the official replies to questionnaires, such as national yearbooks, reports, or unofficial publications. In other cases, trade data are based on information provided in reports of trading partners.

Figures are generally rounded to the nearest 1,000 units. For countries reporting less than 500 units (and thus rounded to zero), the name of a country is given without a corresponding numerical entry. The regional totals, however, are computed from unrounded figures.

GEOGRAPHIC COVERAGE:

World-wide.

OTHER SPATIAL DATA CHARACTERISTICS:

Not applicable.

QUALITY ASSURANCE PROCEDURES USED:

Adherence to FAO reporting standards provides a degree of quality assurance. Notes on the tables in the Yearbook of Forest Products provide an explanation of the main cases where the data are not strictly consistent with the normal definitions.

QUALITY OF DATA:

The Yearbook of Forest Products contains notes on the adequacy and completeness of relevant statistics for particular commodities. Some figures in the Yearbook are FAO estimates based on unofficial information; others are country-generated data that may have to be revised or adjusted by FAO.

For certain countries, the production of sawlogs, veneer logs, logs for sleepers (railroad ties) and other roundwood for industrial purposes are not distinguished. For others, data on industrial roundwood are not available and have been estimated by converting value of products to roundwood equivalent. From 1988 forward, trade quantities and values for subdivisions between logs, pulpwood and other industrial roundwood are estimated for many countries.

Data on the production of fuelwood and charcoal are not reported for a number of countries but are known to be important in their total use of wood. Estimates for these countries are based on available survey data and are revised as new surveys become available. The annual change in production for these countries is estimated to be proportional to population change.

For Canada and the United States sawnwood, the conversion from board feet to cubic meters requires an additional conversion factor to account for reductions in volume that occur because of sawing conventions.

For some countries, the reported volume of veneer sheets includes veneer sheets produced for plywood manufacture within the country. This is corrected by FAO where possible. In other cases, the volume of production of non-compressed fiberboard is sometimes not distinguished from that of compressed fiberboard. These are separated by FAO where possible.

Statistics distinguishing between different types of pulp and statistics distinguishing between different types of paper and paperboard are not available for a number of countries. Reporting on subcategories of chemical wood pulp and other paper and paperboard is incomplete and consequently best estimates are provided.

DATA OUTPUT FORMAT:

Production statistics are reported annually by FAO in the Yearbook of Forest Products. FAO also offers standard tapes of all production and trade time series (about 40,000) reported in the Yearbook.

DATA OUTPUT FREQUENCY:

Annual.

PRINCIPAL CONTACT FOR PROGRAM STATISTICS:

Inquiries about the technical contents of the Yearbook publication should be addressed to:

Statistics and Economic Analysis Staff
Forestry Department
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

CONTACT FOR PUBLIC INQUIRIES:

Requests for copies of the Yearbook publication should be sent to the FAO sales agent in member countries, or to:

Distribution and Sales Section
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

Information about standard tapes and order forms can be obtained from:

Computer Services Center
FAO
Via delle Terme di Caracalla
00100 Rome, Italy

DATABASE(S):

Name of Database(s):

Acronym:

Identification Number (if applicable):

Contents: The time series on the standard tape are given as annual data for countries/commodities or country groups/commodity groups for a period of years up to the latest year published in the Yearbook of Forest Products. Each annual time series on standard tape starts with the year 1961 and runs through the latest year published in the Yearbook.

Data Caveats or Limitations:

Contact (If Different From Contact(s) Above):

Forms/Software In Which Data Are Available: Data can be acquired on standard tape in machine-readable form.

Hardware and Other Software Requirements:

Access Restrictions and Conditions:

Price Information: Standard tapes cost US$500 each or the equivalent pounds sterling or French francs. Prices are subject to revision.

Language(s): English, French and Spanish.

User Aids Available:

KEY PUBLICATIONS:

Food and Agricultural Organization of the United Nations. Yearbook of Forest Products. (FAO, Rome, annual).

ADDITIONAL COMMENTS, DESCRIPTIONS, INFORMATION, ETC.

AGRICULTURE AND ENVIRONMENT DATA AVAILABLE THROUGH ESDS

FOOD AND AGRICULTURE ORGANIZATION

Trade

Provides commodity-based time-series on trade in agricultural products as published in Yearbook.

Production

Provides commodity-based time-series on production of agricultural products as published in Yearbook.

Fertilizer

Provides time-series data on production, consumption, and trade of fertilizers as published in Yearbook.

Forestry

Provides time-series data for production and trade of forest products as published in the Yearbook.

FAOSTAT (formerly AGROSTAT)

Contains data on production and trade for selected crops and livestock, annual and predicted population, land-use, food balance availability, utilization and intake. Values and quantities are available for a numbe of years.

UNITED NATIONS

Energy Statistics Database

Contains comprehensive energy statistics on production, trade and intermediate and final consumption fc primary and secondary conventional, non-conventional and new and renewable sources of energy. The UNSTAT database comprises information for the period 1950 to 1992 inclusive.

UNITED STATES DEPARTMENT OF AGRICULTURE

World Agricultural Trends and Indicators (WATI/TS-View)

Provides aggregate economic and agricultural growth and performance indicators for the world. The indicators cover such topics as population, gross domestic product, consumption, factors of production, commodity production, and trade.

Production, Supply, and Distribution Data base (PS&D View)

Graphs and displays balance sheet variables for agricultural commodities. Updated quarterly and contains information on more than 190 countries and regions for 1960 to the present.

WORLD RESOURCES INSTITUTE

World Resources 1992-93 Data Base

Contains an expanded version of the data in Part IV (Statistical Appendix) of the World Resources 1992-93 biennial report and covers 483 variables, most spanning twenty-year periods, and include total area of croplands, permanent pasture, wilderness, soil degradation, production and reserves of primary products, and numbers of species.

UNITED NATIONS NATIONS UNIES

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Fax No. (703) 812 2477 875-4594

Mr. Roberto Martin
USAID

Dear Mr. Martin,

As discussed, attached please find the report of the Intergovernmental Working Group on the Advancement of Environment Statistics.

If you have any questions you can call Ms. Reena Shah, her telephone number is (212) 963-4586.

Best regards.

Alessandra Alfieri
Associate Statistician
Environment and Energy
Statistics Branch

LAST LINE OF TEXT / DERNIERE LIGNE DU TEXTE

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CLEARED BY / VISE PAR
Peter Bartelmus, Chief
Environment & Energy Stat. Branch

AUTHORIZED BY / AUTORISE PAR
SIGNATURE: Hermann Habermann, Director
Statistical Division
DATE:
NAME AND TITLE (PLEASE TYPE) / NOM ET QUALITE (A DACTYLOGRAPHIER)

INTER-GOVERNMENTAL WORKING GROUP ON THE ADVANCEMENT OF ENVIRONMENT STATISTICS

REPORT OF THE FOURTH MEETING
(Stockholm, 6-10 February 1995)

Agenda items 1-3: Opening and organisation of the meeting

1. The meeting was opened by Mr. Mats Engström, Deputy Under-Secretary, Ministry of Environment Sweden, who welcomed the participants and stressed the need for environmental statistics for policy formulation and decision-making. He noted that environmental indicators are an important part of the Ministry's work and that the linkage between such indicators and environmental accounting is the subject of much interest and debate in Sweden.

2. Mr. Jan Carling, Director General, Statistics Sweden, also welcomed the participants. He informed the participants of the work of Statistics Sweden in the field of environment statistics which started in the 1970s with data collection from various sources, and has been expanding since then. He noted that the need for indicators for sustainable development has been clearly expressed by users and that environmental statisticians need to examine data availability and quality.

3. Mr. Peter Bartelmus of the United Nations Statistical Division (UNSTAT) expressed his appreciation to Statistics Sweden for hosting the fourth meeting of the Inter-governmental Working Group on the Advancement of Environment Statistics for the second time. He also thanked the governments of Germany, the Netherlands, Norway and Sweden for supporting the participation of several developing countries and countries in transition at the meeting. The list of participants is attached as Annex I.

4. The following persons were elected to serve as chairperson and vice-chairpersons of the meeting: chairperson, Ms. Inger Öhman of Statistics Sweden and vice-chairpersons, Mr. Mostafa Salem Gaafar of the Central Agency for Public Mobilisation and Statistics of Egypt (CAPMAS) and Mr. Premsagar Rajaram Dongre of the Central Statistical Organisation of India. The draft agenda and work schedule (see Annexes II and III) were adopted by the meeting. The list of documents presented at the meeting is attached as Annex IV.

5. The participants expressed their appreciation to Mr. Carling, Director General, Statistics Sweden and to Ms. Ohman, Chairperson and her colleagues from Statistics Sweden for their kind hospitality and generosity shown throughout the meeting, as well as for the extensive social programme arranged for the participants. The participants also expressed their appreciation to the representatives of UNSTAT for their contributions and to Mr. Dongre and Mr. Gaafar for their chairing of some sessions of the meeting.

Agenda items 4.1 and 4.2: Environmental indicators and indicators of sustainable development - general discussion

6. Mr. Bartelmus provided an overview of international activities in the development of these indicators and referred to collaboration with the Division for Sustainable Development in the United Nations Department for Policy Coordination and Sustainable Development (DPCSD). An effort by UNSTAT to achieve compatibility with indicators of sustainable development was made by combining the Framework for the Development of Environment Statistics (FDES) with the clusters of Agenda 21, which resulted in a Framework for Indicators of Sustainable Development (FISD). He pointed out the similarity of FISD to the Pressure/Driving Force-State-Response framework. FISD recognizes the need, however, to go beyond environmental statistics and link up with economic statistical systems, notably the System of National Accounts (SNA) which distinguishes clearly between stock and flow variables. Consistency with the DPCSD core set of indicators is achieved by using as far as possible the same definitions of indicators in the FISD.

7. Mr. Lars Mortensen of DPCSD presented to the meeting the role of the Commission on Sustainable Development (CSD) in monitoring the implementation of Agenda 21, including progress achieved in developing indicators for sustainable development which will be discussed by the CSD at its third session in April 1995. He presented some elements that may be included in a work programme to be submitted to the third session of the CSD. The elements to be included in the work programme, reflecting the outcomes of the Workshop on Indicators of Sustainable Development for Decision-Making (Ghent, Belgium, 9-11 January 1995), may, inter alia, include: a set of methodology sheets describing the indicators in a core set of indicators for sustainable development, developed by DPCSD in cooperation with UNSTAT and in consultation with international organisations and governments. The proposed indicators are intended for use by governments for national policy-making. This core set, to be presented in a Driving Force-State-Response framework should be seen as a menu from which governments can choose indicators according to national priorities, problems and targets. Capacity building programmes should aim at assisting countries in using the indicators. Testing of the indicators in a few selected countries could be used to gain experience, assess the applicability and further develop the indicators.

8. Mr. Mortensen also informed the participants of the results of the above-mentioned Workshop on Indicators of Sustainable Development whose main focus was to identify needs of the user community. The main conclusions of the meeting (Annex IV, no. 1.) were, inter alia, the following: conceptual frameworks, such as the Pressure-State-Response framework, were recognised to be useful to organise and guide indicator development; the economic, social, institutional and environmental aspects of sustainable development should be equally emphasised in a framework of indicators for sustainable development; the CSD should consider making available to governments the methodology for a core set of indicators in the form of a set of methodology sheets; more experience should be gained with the use of indicators included in the core set; indicators should be tested in some countries or regions

on a voluntary basis and, where necessary, adjusted; national statistical services and other appropriate institutions and UNSTAT should in routine data collection begin to include data series needed to calculate indicators of sustainable development and contribute to research, development and harmonization of appropriate indicators; and the importance of and need for capacity building programmes related to the introduction of indicators was stressed.

9. Mr. Frode Brunvoll of Statistics Norway presented the experiences from OECD and Nordic countries on environmental indicators (Annex IV, nos. 2 and 3). OECD has focused its indicator work on the measurement of environmental performance, integration of environmental concerns into sectoral policies, and integration of environmental concerns into economic policies mainly through environmental accounting. He described the Pressure-State-Response framework used by OECD in the development and compilation of environmental indicators. The pilot-report on Nordic Environmental Indicators which is largely based on the OECD framework was also presented to the meeting. The indicators are in many cases similar to those of the OECD but have sometimes been changed due to lack of data or where more suitable indicators for Nordic conditions or problems were found.

10. Ms. Reena Shah of UNSTAT presented a paper on "Environmental indicators - methodological development and compilation" prepared in collaboration with Statistics Sweden (Annex IV, no. 4). She pointed out that a conceptual framework was necessary to collect, compile and organise information. To date, many countries embarking on an environment statistics programme have used the FDES as a starting point for determining the scope and coverage of their programmes. Experience has shown that for countries more advanced in this field, more complex frameworks have been applied. She described briefly the differences and similarities between the Pressure/Driving Force-State-Response framework and the FDES or FISD and referred in this context to the DPCSD core set of indicators for sustainable development. She explained that UNSTAT is focusing its work on a sub-set of environmental and related socio-economic indicators of the DPCSD core set as described in Tables 1 and 2 in the paper (Annex IV, no. 4). A recent ESCAP Seminar on Environment Statistics (Jakarta, 23-27 January 1995), in which UNSTAT participated, stressed that such lists be kept to a minimum number of indicators.

11. The Group considered that the development of environmental and sustainable development indicators is an ongoing and iterative process. Further work is required at the conceptual level with regard to the underlying conceptual framework and the selection and definition of indicators. This work should proceed in parallel to the collection and application of selected indicators based on development work to date. Experience gained and lessons learnt from the compilation and use of these indicators should be used as input to further develop sustainable development indicators. Ongoing development will require input from, and cooperation of, both data users and producers. Data users while able to articulate their needs in general terms are often unable in the first instance to articulate the detail required for the selection and rigorous definition of measurable data items. Data producers have a role in interpreting the general requirements of users and suggesting those data items, obtaining feedback on their use and usefulness, and consequently refining them.

Agenda items 4.3-4.5: Environmental indicators and indicators for sustainable development - proposed lists for methodological development and compilation

12. The proposed lists were discussed in three groups covering the following areas: (a) air and water; (b) land/soil and natural resources; and (c) waste, human settlements and natural disasters. The groups were asked to focus on indicators that were currently available or that might become available in a few years and also to discuss those indicators that should be developed and compiled in the longer term (Tables 2 and 1, Annex IV, no. 4). The economic and social/demographic issues as reflected in the tables were not discussed by the Working Group. For each indicator, the group was asked to report according to the following checklist:

- Is the proposed indicator available? In some countries? In most countries? Regularly?
- Can the indicator be made available in a few years?
- Is the quality good enough?
- What is the need for methodological development?
- Is the indicator adequately documented? (data sources, estimation, aggregation procedure).

The groups were also free to delete indicators, to propose changes and to add indicators to the list.

13. The groups found it difficult to discuss the indicators without complete understanding of the reasons behind their selection. It was decided, therefore, that in the methodological development of indicators, more information should be provided about the choice of indicator and their potential use in decision making. The importance of georeferencing data and GIS/remote sensing was stressed. The comments made on specific indicators are reflected in the annotations to the revised Table 2 which is included as Annex V in this report. In general the Working Group (plenary) recommended that a first international survey of readily available environmental indicators should be carried out by UNSTAT focusing on the "short list" of (bolded) indicators in Annex V. The full list of Annex V would be the basis for further methodological work and review by the Working Group.

Agenda item 4.6: Habitat II indicators

14. Mr. Leif Colléen of the National Board of Housing, Building and Planning of Sweden gave a presentation of the status of work undertaken by UNCHS on urban indicators, in preparation for the Habitat II conference to be held in Istanbul from 3 to 14 June 1996 (Annex IV, no. 5). It was pointed out in the discussion that the connections between urban environmental indicators, typically produced and used by municipal administrations, and environmental statistics, produced by national statistical services, need further examination. As a minimum, comparisons of concepts and methods developed by UNCHS with those of the environmental aspects of human settlements statistics could be carried out.

Agenda item 5: Linking environmental indicators and accounting

15. Mr. Bartelmus presented the relationships between statistics, indicators for sustainable development and environmental accounting in two parts: the first part dealt with the use of existing statistical systems in assessing sustainable development (Annex IV, no. 6); and the second part described data requirements for integrated environmental-economic accounting (Annex IV, no. 7). Integrated policies on environment and development require integrated information. Integrative data systems such as the System of integrated Environmental and Economic Accounting (SEEA) with its focus on economy-environment relationships, Social Accounting Matrices (SAM) linking social and demographic statistics with economic accounting, and the frameworks for environment statistics (FDES) and indicators of sustainable development (FISD) were shown to serve purposes of data linkage and integration. The second part of the presentation provided an overview of the objectives and structure of the SEEA. It also illustrated how physical data were compiled in country projects by means of "working tables" that permit the direct incorporation of these data in the appropriate sections of the SEEA. Additional tables showed the data required for market valuation according to the net-price and user-cost methods, and for maintenance costing.

16. Ms. Eva Hellsten from Statistics Sweden and Ms. Sofia Ahlroth of the National Institute of Economic Research presented the approach and first results of environmental accounting in Sweden (Annex IV, no. 8). Their work focused on the physical measurement and monetary valuation of environmental degradation.

17. In the discussion, methodological questions on valuation, double-counting and the concept of capital were raised. A more programmatic question is if there is a need for developing the statistical data base first before entering into environmental accounting. The Secretariat suggested that the urgent need for assessing the costs and benefits of both the environment and the economy might call for rapid implementation of environmental accounting, even if some data would have to be roughly estimated. Also, environmental statistics and indicators typically encompass a much broader scope and coverage of data than the basic natural resource and emission statistics needed for environmental accounts. Depending on national policy priorities and statistical capabilities a phased approach of implementation might be warranted.

Agenda item 6.1: Country presentations

18. The representative of the United Republic of Tanzania, Mr. Mathew Chimtembo, informed the participants that the development of environment statistics was initiated by the Bureau of Statistics after the second meeting of the Working Group in Arusha in 1992 (Annex IV, no. 9). Statistics Sweden provided a consultant to the Bureau who assisted in the establishment of an environment statistics programme. A first compendium was published in 1994. There are plans now for issuing a biennial publication. Some of the data gaps in the compendium need still to be filled, and there are areas where data estimates need to be further refined.

19. The representative of Estonia, Mr. Jüri Merendi, presented his country's experience with environment statistics. He noted that Estonia had used the FDES to organise their environment statistics. Data collection is divided up mostly between the State Statistical Office and the Ministry of the Environment. Data are published in special brochures on issues such as forestry or pesticides. One of the problems in environment statistics is the data quality.

20. The representative of Côte d'Ivoire, Ms. Fanta Kaba, presented the activities in the development of an environment statistics programme which has used the FDES as the underlying framework (Annex IV, no. 10). Work in Côte d'Ivoire commenced as a pilot project in 1994 with the assistance of a short-term advisory mission by UNSTAT to the Institut National de la Statistique (INS). The objectives of the pilot project were to develop a proposal for a long-term project to establish an environment statistics programme, prepare a report on the state of environment statistics, and publish a first yearbook on the available environment statistics in Côte d'Ivoire in 1995. The meeting welcomed the work currently being carried out in Côte d'Ivoire and encouraged the establishment of such programmes in other countries.

21. The representative of Australia, Ms. Jeannette Heycox, briefly described the current activities and future intention of the Australian environment statistics programme. The presentation also focused on the framework used in the second edition of the environment statistics compendium of the Australian Bureau of Statistics (ABS) (Annex IV, nos. 11 and 12). In the first edition of the compendium, the ABS had used the FDES for organising their information. Feedback from the users of this compendium indicated that it was not balanced and focused too much on the environment and less on interlinkages between the environment, economy and population. The ABS therefore decided to apply the Population-Environment Process (PEP) framework which focuses on the flows between the economy, environment and population. The possibility of basing a framework for sustainability on Paul Ehrlich's I=PAT relationship, cross-tabulated with driving forces, current status and feedback, and control measures was raised.

22. The representative of Egypt, Mr. Gaafar, informed the meeting of the work done in his country in the field of environment statistics (Annex IV, no. 13). It was noted that CAPMAS is the responsible agency for collecting and publishing data for all activities. Its responsibility in the environmental sector is to collect the diverse data and information from other agencies and public bulletins which present numerical information, and also to design or participate in designing forms to collect environmental data in Egypt. To date, environmental statistics have been compiled in different areas but were not published in a separate environment statistics compendium. One of the problems in this field of statistics has been the lack of regular data collection. Training programmes and/or workshops should, in his view, be organised at international and regional levels.

Agenda item 6.2: Previous experiences with pairing of countries

23. The Secretariat presented the state of affairs of the pairing approach between developed and developing countries. It was generally felt that this approach had limited success because of lack of resources required for comparing the methodological work and fo the publication in the statistical series of UNSTAT. It was pointed out by Statistics Sweden that some progress had been made through the pairing approach which stimulated national work in environment statistics. Mr. Hendrik Jan Dijkerman presented a paper prepared by himself and Mr. Leon Tromp, both of Statistics Netherlands, on the work of the Working Group, the limited success of the pairing approach, and on the environment statistics project being carried out by ESCAP with the assistance of the Government of the Netherlands (Annex IV, no. 14). A similar project on environment statistics, also funded by the Government of the Netherlands, has been initiated for the ECA region. The Group welcomed in this context, the preparation of practical manuals for the implementation of national environment statistics programmes.

Agenda item 6.3: Support to developing and transition countries

24. Mr. Thomas Polfeldt of Statistics Sweden informed the meeting about the planned training course in environment statistics expected to take place later this year in the United Republic of Tanzania for selected African countries (Annex IV, no. 15). He pointed out that in this course every attempt would be made to utilize existing international and regional methodological work. If the course is successful it is planned to repeat it again in another African country and possibly in other regions of the world. The Group welcomed this initiative and urged donor countries and organizations to support it.

25. The meeting was also informed about international and bilateral technical assistance available in the field of environment statistics. The Group recommended that UNSTAT serve as a clearing house for requests for technical cooperation from developing countries and countries in transition.

Agenda item 7: Other issues

26. The Secretariat informed the meeting about the status of work on the draft "Glossary of Terms on Environment Statistics" (Annex IV, no. 16). The draft was prepared by a consultant to UNSTAT, Mr. P. Sangal, former director of the Central Statistical Organization of India. The meeting welcomed the draft and stressed its usefulness in practical work on environmental statistics and accounting. Several general observations were made regarding the overall structure and balance of the glossary. It was suggested that the possibility of organizing the terms by subject area as well as alphabetical order should be explored. Participants agreed to send written comments to UNSTAT by the end of March 1995. After incorporation of these comments, the final draft will be circulated for review by the participants.

27. With regard to the network of environmental statisticians, the Group felt that it would be useful to have an irregular newsletter prepared by UNSTAT or any other suitable institution. UNSTAT noted this request but informed the meeting that at the current time this would not be possible due to lack of resources. UNSTAT agreed to prepare a list of environmental statisticians in order to facilitate informal exchange of information through Internet and other electronic means. Possibilities of presenting work on environmental statistics to the general public by means of the file transfer procedure (FTP) will also be explored.

28. Mr. Bo Justusson of Statistics Sweden presented to the meeting different examples of Geographic Information Systems (GIS) applications in Sweden, notably the determination and use of real estate coordinates.

Agenda item 8: Recommendations for future work

29. The Working Group recommends that the following activities be carried out by the Secretariat, in collaboration with other international organisations:

(a) International survey of environmental indicators:

- the Working Group recommends to the Statistical Commission of the United Nations to approve a first international survey of environmental indicators based on the "short list" (in bold) of indicators specified by the Working Group in Annex V

- subject to the approval by the Statistical Commission, UNSTAT, in collaboration with other international organisations, should prepare a draft questionnaire with clear specifications (definitions and classifications) of the indicators for further comments by mail from the Working Group

- UNSTAT should prepare a report on the experience gained in carrying out the survey, including an evaluation of its results, for presentation at the next session of the Working Group

(b) Methodological work on environmental indicators:

- future methodological work should be based on the full ("long") list of indicators specified by the Working Group in Annex V, taking into account the needs for indicators specified by user groups

- this work should be reviewed by the Group at different stages of completion by means of direct comments of the participants and/or meetings of the Group as appropriate

(c) Technical cooperation and substantive support for developing countries and countries in transition:

- the Group recommends that UNSTAT adopt a clearing house function for matching demands for technical cooperation with possibilities of support by national and multi-lateral donors

- the Group welcomes, in this context, the preparation by UNSTAT and the regional commissions of practical manuals for implementing programmes of environmental statistics and integrated environmental-economic accounting and recommends that future support of country activities by international organisations and donor countries be fully coordinated

(d) Other work:

- recognising the current resource constraints of UNSTAT, the Group requests the Secretariat to establish, as a first step towards building up a network of environmental statisticians, a list of persons responsible for environment statistics in countries and international organisations, and if possible, a list of their activities

- the Group welcomes work done on a glossary of environment statistics, emphasises the significance of the glossary for standardising practical statistical work, and expresses its readiness to assist UNSTAT in its completion.

Agenda item 9: Date, venue and agenda of the next meeting

30. The Group agreed on the draft agenda for its next meeting (Annex VI) and requested UNSTAT to explore possibilities of obtaining financial support from governments and international organisations. The representatives of Colombia and Egypt expressed their willingness to host future meetings of the Working Group.

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Annex I

LIST OF PARTICIPANTS

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(Stockholm, Sweden 6-10 February 1995)

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Annex II

AGENDA

1. Opening session
2. Appointment of officers
3. Adoption of agenda
4. Environmental indicators and indicators of sustainable development
5. Linking environmental indicators and accounting
6. Concepts and methods of selected areas of environment statistics
7. Other issues
   - (i) glossary of terms of environmental statistics and accounting
   - (ii) network of environmental statisticians
   - (iii) others
8. Recommendations for future work
9. Date and venue of the next meeting

Annex III

WORK SCHEDULE

Monday, 6 February 1995

11.00-11.45	1.	Opening session Mats Engström, Deputy Under-Secretary, Ministry of Environment Sweden Jan Carling, Director General, Statistics Sweden
	2.	Appointment of officers
	3.	Adoption of the agenda
	4.	Environmental indicators and indicators of sustainable development
	4.1	Introductions
11.45-12.15		- General overview, Mr. P. Bartelmus - Report from Ghent meeting, Mr. L. Mortensen
12.15-12.45		- Report on experiences from OECD work and on Nordic work on indicators, Mr. F. Brunvoll
14.30-15.15		- Report on UNSTAT work, Ms. R. Shah
15.15-16.00	4.2	General discussion on indicators for sustainable development
16.00-17.30		Presentation of country experiences (Part of Item 6 of the agenda) - Tanzania, Mr. M. Chimtembo, Ms. C. Johansson - Estonia, Mr. J. Merendi

Tuesday, 7 February 1995

09.30-09.45	4.3	Summing up of general discussions and starting up group discussions
09.45-13.00	4.4	Group discussions on indicator development for practical use in data collection
	Group 1:	Air and water (Room 5)
	Group 2:	Land/soil and other natural resources (Room A513)
	Group 3:	Wastes, Human settlements, natural disasters (Room B1 502)
15.00-16.30	4.5	Report from Group discussions and joint discussion
16.30-18.00		Presentation of country experiences (Part of Item 6 on the agenda) Expected presentation: Côte d'Ivoire, Ms. F. Kaba Australia, Ms. J. Heycox Egypt, Mr. M. Gaafar

Wednesday, 8 February 1995

09.30-14.00		Excursion
14.00-15.30	4.6	Discussions on "Habitat II - Indicators" (or "urban environmental indicators") Introduction: Mr. L. Colléen
15.30-18.00	5.	Linking environmental indicators and accounting (i) Data systems for sustainable development, (ii) Statistical requirements for integrated environmental and economic accounting Introduction: Mr. P. Bartelmus Presentation of country experience: Sweden Introduction: Ms. E. Hellsten and Ms. S. Ahlrot

Thursday, 9 February 1995

09.30-11.00	6.	Concepts and methods of selected areas of environment statistics
	6.1	Summing up of presentations
	6.2	Discussions on previous experiences with pairing of countries
	6.3	Discussions on ways of supporting developing and transition countries in the development of environment statistics Introduction: Mr. P. Bartelmus, Mr. H. J. Dijkerman, Mr. T. Polfeldt
11.00-13.30	7.	Other issues
	7.1	Glossary of terms of environmental statistics and accounting Introduction: Ms. R. Shah
	7.2	Network of environmental statisticians
Afternoon		Free

Friday, 10 February 1995

09.30-10.30	8.	Recommendations for future work
	8.1	Discussions
10.30-11.30		Presentation of Swedish experiences in using GIS Mr. B. Justusson
11.30-13.00	8.2	Adoption of the report of the meeting
	9.	Date and venue of the next meeting

Annex IV

LIST OF DOCUMENTS PRESENTED

Agenda item 4. Environmental indicators and indicators of sustainable development

1. Workshop on Indicators of Sustainable Development for Decision-Making - main findings (L. Mortensen)

2. Environmental indicators: OECD Core Set (Introduction only) (F. Brunvoll)

3. Nordic experiences in environmental indicators (F. Brunvoll)

4. Environmental indicators - methodological development and compilation (UNSTAT in collaboration with Statistics Sweden)

5. Guidelines for national preparations - Habitat II: The United Nations Conference on Human Settlements (Istanbul, 3-14 June 1996) (L. Colléen)

Agenda item 5. Linking environmental indicators and accounting

6. Data systems for sustainable development - diversities, links and commonalities (UNSTAT)

7. Integrated environmental and economic accounting - data requirements (UNSTAT)

8. Swedish economic and environmental accounts (E. Hellsten and S. Ahlrot)

Agenda item 6. Concepts and methods of selected areas of environment statistics, including country presentations

9. Work on environment statistics in Tanzania: a synopsis (M. Chimtembo)

10. Report on activities in environment statistics of the Institut National de la Statistique of Côte d'Ivoire (F. Kaba)

11. The selection of a framework for the 1995 environment statistics compendium of the Australian Bureau of Statistics (J. Heycox)

12. Environmental and natural resource statistics in the Australian Bureau of Statistics (J. Heycox)

13. Statistics related to environment in the Central Agency for Public Mobilisation and Statistics of Egypt (M. Gaafar)

14. Contribution by the Netherlands (J. Dijkerman and L. Tromp)

15. Preparations for a course on environment statistics by Statistics Sweden (T. Polfeldt)

Agenda item 7. Other issues, including the glossary and the network

16. Draft glossary of terms of environmental statistics and accounting (UNSTAT)

Annex V

List of environmental and related socio-economic indicators

Agenda 21 Issues (clusters)	FDES Information categories			
	A. Socioeconomic activities, events (pressure/driving force)	B. Impacts and effects (part of state)	C. Responses to impacts (response)	D. Inventories, stocks, background conditions (part of state)
ECONOMIC ISSUES	Real GDP per capita growth rate Production and consumption patterns Investment share in GDP	EDP/EVA per capita Capital accumulation (environmentally adjusted)	Environmental protection expenditure as % of GDP Environmental taxes and subsidies as % of government revenue	Produced capital stock
SOCIAL/DEMO-GRAPHIC ISSUES	Population growth rate Population density Urban/rural migration rate Calorie supply per capita	% of urban population exposed to concentrations of SO_2, particulates, ozone, CO and Pb Infant mortality rate Incidence of environmentally related diseases		Population living in absolute poverty Adult literacy rate Combined primary and secondary school enrollment ratio Life expectancy at birth Females per 100 males in secondary school
AIR/CLIMATE	Emissions of CO_2, SO_2 and NO_x Consumption of ozone depleting substances	Ambient concentrations of CO, SO_2, NO_x O_3 and TSP in urban areas Air quality index	Expenditure on air pollution abatement Reduction in consumption of substances and emissions	Weather and climate conditions

LAND/SOIL	Land use change Livestock per km² of arid and semi-arid lands Use of fertilizers Use of agricultural pesticides	Area affected by soil erosion Land affected by desertification Area affected by salinization and water logging	Protected area as % of total land area	Arable land per capita
WATER Fresh water resources	Industrial, agricultural and municipal discharges directly into freshwater bodies Annual withdrawals of ground and surface water Domestic consumption of water per capita Industrial, agricultural water use per GDP	Concentration of lead, cadmium, mercury and pesticides in fresh water bodies Concentration of fecal coliform in fresh water bodies Acidification of fresh water bodies BOD and COD in fresh water bodies Water quality index by fresh water bodies	Waste water treatment, total and by type of treatment (% of population served) Access to safe drinking water (% of population served)	Groundwater reserves
Marine water resources	Industrial, agricultural and municipal discharges directly into marine water bodies Discharges of oil into coastal waters	Deviation in stock from maximum sustainable yield of marine species Loading of N and P in coastal waters		

OTHER NATURAL RESOURCES				
Biological resources	Annual roundwood production Fuelwood consumption per capita Catches of marine species	Deforestation rate Threatened, extinct species	Reforestation rate Protected forest area as % of total land area	Forest inventory Ecosystems inventory Fauna and flora inventory Fish stocks
Mineral (incl. energy) resources	Annual energy consumption per capita Extraction of other mineral resources	Depletion of mineral resources (% of proven reserves) Lifetime of proven reserves		Proven mineral reserves Proven energy reserves
WASTE	Municipal waste disposal Generation of hazardous waste Imports and exports of hazardous wastes	Area of land contaminated by toxic waste	Expenditure on waste collection and treatment Waste recycling	
HUMAN SETTLEMENTS	Rate of growth of urban population % of population in urban areas Motor vehicles in use per 1000 habitants	Area and population in marginal settlements Shelter index % of population with sanitary services	Expenditure on low-cost housing	Stock of shelter and infrastructure
NATURAL DISASTERS	Frequency of natural disasters	Cost and number of injuries and fatalities related to natural disasters	Expenditure on disaster prevention and mitigation	Human settlements vulnerable to natural disasters

Explanations and annotations

ECONOMIC and SOCIAL/DEMOGRAPHIC ISSUES: not discussed by the Working Group, since the proposed indicators are readily available from existing statistical systems.

AIR/CLIMATE

Emissions: compare emission factors; total vs. sectoral breakdown.
Ozone depleting substances: apparent consumption (output + import - export) as proxy measure; compile index weighted by ozone depleting potential; use definitions of Montreal protocols.
Ambient concentrations: difficult to compare; compile mean, range (percentiles), exceedings of standards as appropriate.
Weather and climate: background information; includes meteorological data (precipitation, sunshine, cloudiness etc.).

LAND/SOIL

Land use change: land use readily available; intervals for land use change to be specified; use broad categories, e.g. four categories of OECD; use remote sensing and GIS to improve data quality; develop land use atlas.
Livestock per km² of (semi)arid lands: define arid, semi-arid; refer to indigenous animals; not applicable in many European countries.
Use of fertilizers: supply (apparent consumption) available only; compile per unit of crop yield.
Use of pesticides: supply (apparent consumption); per unit of area; problem of aggregation of different pesticides.
Soil erosion: data not readily available; use FAO categories; include in agriculture census; develop erosion modelling.
Protected area: consider protection costs.
Arable land per capita: define according to FAO criteria (alternative total crop land).
Salinization and water logging: not available in most countries.

WATER

General comment: problems of comparability of water-body and site-specific indicators.
Discharges into freshwater and marinewater bodies: unknown flow of discharges into marine water bodies.
Concentrations of chemicals: mean annual value and range for selected sites.
Concentrations of fecal coliform: difficult to compare and interpret - for different countries.
Waste water treatment: distinguish mechanical, chemical, biological, if possible.
Groundwater reserves: elaborate through modelling.

OTHER NATURAL RESOURCES

Roundwood production: check coverage of "unofficial" production.
Fuelwood consumption: data availability is limited.

Deforestation, reforestation: improve data base through GIS and remote sensing.
Threatened species: specify total number and taxonomic level. This number could also be expressed as a percentage of total number of evaluated species.
Forest inventory: specify intervals of compilation.
Ecosystem inventory: data availability is very limited.
Flora and fauna inventories: data availability is very limited.
Proven mineral reserves: select main minerals; consider ratio of proven over probable reserves.

WASTE
Hazardous wastes: develop definitions and classifications.
Waste recycling: include reuse, composting etc.
Municipal waste disposal: specify definitions and classifications.

HUMAN SETTLEMENTS
Urban population: define "urban".
Motor vehicles in use: specify coverage of vehicles.
Marginal settlements: provide definition.
Sanitary services: provide definition and classification.
Expenditures on low-cost housing: provide definition; problems of comparability.

NATURAL DISASTERS: specify classification.

Annex VI

FIFTH MEETING

DRAFT AGENDA

1. Opening session
2. Appointment of officers
3. Adoption of agenda
4. Environmental indicators and indicators of sustainable development
5. Linking environmental indicators and accounting
6. Concepts and methods of selected areas of environment statistics
7. Other issues
   - (i) glossary of terms of environmental statistics and accounting
   - (ii) network of environmental statisticians
   - (iii) others
8. Technical cooperation and capacity building
9. Conclusions and recommendations for future work
10. Date and venue of the next meeting

BIOPHYSICAL INDICATORS OF SUSTAINABILITY: AN ECOLOGICAL PERSPECTIVE

Barbara Carol Bellows (Washington State University / SANREM CRSP)

Introduction

The identification and assessment of indicators of sustainability is a priority objective within the SANREM CRSP (Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program)[1]. Within the SANREM CRSP, the identification and assessment of indicators of sustainability will serve both research and development functions. As a research function, indicators of sustainability provide information about how system processes operate and respond to change. As a development tool, indicators of sustainability can be used to predict the impact of alternate interventions during the stage of project development and to assess the impact of project interventions on agricultural and natural resource sustainability during the evaluation stage.

Indicators are measurements or proxy markers of state conditions and change processes or impacts. Functionally, indicators serve as estimates of performance and predictors of change. Depending on the role of in the change process, indicators can be subdivided into baseline or state conditions, pressure or stressor indicators, and exposure indicators. State conditions provide important contextual information regarding the ecological and socioeconomic conditions and relationships at the time that pressure, in the form of a natural stress or human intervention, occurs. Pressure indicators represent both positive and negative changes or perturbations to the system while exposure indicators represent how the system responds to the pressure impacts. Since conditions affecting sustainability are specific to each environment, state, pressure, and impact indicators must be analyzed in relationship to one-another and in relation to the prevailing as well as the unimpacted, baseline condition of the system. Also, since sustainability is a dynamic process, impacts of pressures and stressors will change over time as interactions are formed and exchange balances are established within impacted systems or among previously separated systems.

Indicator assessments are not limited to direct measurements. Eswaran et al. (1994) describes four classes of indicators; directly measurable, qualitative, surrogate or secondary parameters, and crypto or indirectly associated indicators. Directly measurable indicators are assessments that can be subject to numerical analysis while qualitative indicators are non-analytical assessments including perceptions and values. Surrogate indicators include

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[1] The SANREM CRSP (Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program) is an international research and training program funded by the United States Agency for International Development and managed by the University of Georgia. The mission of this program is to develop a new paradigm for development based on an approach that is user-participatory, interdisciplinary, intersectoral, and landscape-based.

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secondary processes or impacts while crypto indicators are changes that have no direct relationship to the change being monitored but may provide insights into processes affecting that change. A secondary indicator for soil erosion, for example, is siltation while a crypto indicator is a change in crop species or agricultural management practices due to consequent decreases in soil quality. For deforestation, a secondary indicator may be time required to gather firewood while a crypto indicator may be distance traveled to fetch water.

Frameworks for the identification of indicators have been proposed by Hunsaker and Carpenter (1990), Hamblin (1992 and 1994), Smyth and Dumanski (1993), Muller (1994), Stockle et al. (1994), and Tunstall et al. (1994) among others. These frameworks provide hierarchy classification systems for indicator identification and processes for identifying indicators within the context of a research and development projects. Commonly-mentioned attributes of indicators frameworks include: 1) classification or indicators within the context of specific ecological conditions, 2) specifying discrete measurable or assessable properties as subsets of ecological elements or properties (e.g. soil organic matter as a subset of soil quality), 3) describing relationships among indicators and sustainability processes across hierarchy levels, and 4) processes for identifying and assessing indicators based on program objectives.

Sustainability may be defined "narrowly" as a characteristic of systems or "broadly" as the balance among economic, ecological, and social processes necessary for the continuation of life on earth. Conway (1985) defined sustainability as "the ability of the system to maintain productivity in spite of a major disturbance such as caused by intensive stress or a large perturbation." Other authors use human medicine as a metaphor for assessing agroecosystem quality or degradation (Norton, 1991; Schaeffer et al, 1988; Rapport, 1989). These authors, along with many farmers, use the term "agroecosystem health" in lieu of "sustainability" to describe an optimally functioning agroecosystem. The term "sustainability" in this sense may be interchangeable with system resiliency.

The "broad" definition of sustainability exists at the intersection among economic viability, social equity, and environmental soundness. Assessments according to the "broad" definition are concerned with identifying interactions among economic, environmental, and social processes, developing interdisciplinary and intersectoral interactions, viewing and assessing interactions across hierarchy levels, and addressing trade-offs existing within society. The SANREM CRSP seeks to address this "broad" definition of agricultural and natural resource sustainability through program development that is participatory, intersectoral, interdisciplinary, and landscape based. Indicators of sustainability that provide an integration between biophysical and socioeconomic processes can be for predicting and assessing the impact of project activities on the agroecosystem and on the quality of life of the people living within and managing the agroecosystem.

This paper is used to develop a framework for the identification of biophysical indicators of sustainability using an ecological, system-based perspective. Relationships between system characteristics and agroecosystem sustainability are explained using soil

quality, nutrient cycling, pest-predator relationships, and successional processes as examples. To demonstrate how ecological processes may guide the development of an interdisciplinary assessment of sustainability, social, cultural, economic, and policy examples of indicators of sustainability are also provided.

Sustainability as a Characteristic of Systems

In its most basic form, a system is a grouping of parts that operate together for a common goal or purpose (Forrester, 1968). More specifically, systems are composed of components that interact through energy transfers or other forms of communication (Woodmansee, 1990). Characteristics of systems include: 1) defined boundary conditions, 2) a spatial and temporal hierarchy of subsystems nested within larger systems, 3) holistic interrelationships among system components, 4) dynamic change and adaptation through feedback mechanisms, and 5) resiliency or buffering against change due to redundancy of stocks, components, and pathways (Norton, 1991; Wilson and Morren, 1990; Woodmansee, 1990; Schaeffer et al., 1988; Holling, 1978). System processes involve interchanges across both temporal and spatial dimensions. Changes in the quality of any system characteristics may result in a change in the sustainability of either the system or a component subsystem. Assessment of sustainability based on a system-based approach allows for the analysis of individual system components as well as an examination of the relationships and interactions among system components.

How systems respond to change depends on the relationship between system structure and function. System structure refers to the geophysical stocks and biotic communities while function refers to the processes and outputs resulting from interactions within the system. For example, the structure of a soil microbial community includes the species of organisms and their substrates while the function of this system may include decomposition and nitrogen transformation processes. Possible interactions between structure and function include: 1) a tight linkage between structure and function such that a change in one causes a change in the other, 2) changes in structure, that due to functional redundancy, do not cause a change in function, 3) changes in function are not accompanied by changes in structure, and 4) structure and function appear unlinked although actual linkages are present (Cairns and Pratt, 1986 and Schaeffer et al., 1988). The amount and timing of material flowing between systems affects the structure and function of systems by impacting on the configuration of system processes and feedback interactions (Elliott et al., 1994). The structure and function relationship that predominates in a given system is determined by evolutionary postulates that, in the context of indicators, describe state conditions. These evolutionary postulates are: 1) species in natural communities are products of co-evolutionary processes, 2) ecological processes are discontinuous, chaotic, or suspended in systems having threshold levels that are not met or are exceeded, and 3) biological processes have thresholds below which random forces prevail over adaptive forces (Soulé, 1985).

From the perspective of indicator assessment, the baseline or state condition of a system may be represented by either the current or the unimpacted structure and function

of the systems. Exposure effects may be assessed as changes in the richness (number of species or genera) or evenness (relative proportions of species) of the community structure. Exposure also may be measured based on changes in the function or outputs from the system. Threshold values for sustainability may be related to the unimpacted condition of the system or to a maxima endurance level where the system looses the ability to recover.

An understanding of how system structure and function relationships operate can provide guidelines for predicting and assessing thresholds of system integrity and for integrating indicators across hierarchy levels. The remainder of this paper is used to describe the system characteristics of boundary conditions, hierarchy interactions, holistic relationships, dynamic functions, and resiliency factors and to discuss how assessments of changes in these conditions can be used to identify indicators of sustainability. Examples are provided for state conditions, pressure indicators, and exposure indicators related to each ecosystem process.

Boundary Conditions: Boundaries exist among microenvironments in a soil system, between agricultural and natural features in an agroecosystem, and separate physical features within a landscape. Boundaries in soil systems or fields include divisions among soil types, moisture regimes, or between soil horizons. Landscape boundaries may be natural or geopolitical. Biophysical boundaries are affected by climatic and geological processes and include transitions between land and water, drier and wetter climates, elevations, soil types, and biotic communities. Geopolitical boundaries are defined by political, community, social, and land-tenure interactions. Biophysical and geopolitical boundaries may be coincidental or divergent. The relationship between biophysical and geopolitical boundaries will affect data collection and aggregation processes. As described below, processes occurring over a limited range may not be detectable at more extensive levels of assessments. Furthermore, aggregation of information across boundaries may reduce the integrity of the data.

Boundaries define habitat zones and the location of sources and sinks for information and energy. Boundaries also serve as barriers to or conduits for the movement of organisms, resources, information, or energy. The function of boundaries is determined by whether the boundaries are porous and have a gradual transition gradient or are abrupt and exhibit a high contrast transition between systems (Forman and Moore, 1992). Impacts on the systems may result in changes in the characteristic or function of boundaries, in boundary locations, or in the removal or obscuring of boundaries.

Boundary functions are affected by structural characteristics of the boundaries as well as by the spatial pattern and heterogeneity of the subsystems within the system. The size and distribution of subsystem patches or mosaics affect community structures and resiliency (Turner, 1989). Mosaics of optimal size enhance the natural regeneration of plant species by serving as a source of germplasm across a landscape. Excessive fragmentation results in the disruption of ecological process within the ecosystem patches (Soulé, 1985). Fragmentation modifies ecosystem function by uncoupling ecological cycles, expanding the impact of boundary phenomena by increasing the proportion of area near a boundary, or

by increasing the distance separating similar ecosystem patches (Carroll, 1990). A decrease in the ecosystem area will cause a subsequent decline in species diversity until a new equilibrium, based on the new size of the ecosystem, is realized (Wilcox, 1980). When the size of ecosystem patches falls below threshold levels or individual patches become excessively separated, however, the risk of ecosystem loss increases. Ultimately, the fragmented system is absorbed into the dominate landscape system.

Natural or technological changes can cause changes in boundary locations or boundary characteristics. Climatic changes, volcanic eruptions, stream rechanneling, or natural introductions of genetic material into an area are among the natural changes that will affect boundary locations and characteristics. Technological changes impacting on boundary conditions include the development of transportation systems, information exchange networks, and trade relationships. Ecotones or transition zones between boundaries exhibit characteristics intermediary to adjacent systems. Due to these intermediate characteristics, ecotones may serve an important role in biomonitoring since these areas serve important functions within the adjacent ecosystems and serve as the frontiers of changes in successional processes (Rusek, 1992). On the landscape scale, transportation and market forces exhibit decreasing impacts as distance increases from urban centers. Consequently, analyses conducted across the landscape can be used as surrogate time series assessments for factors such as the impact of land-use intensity, technology adoption, or cultural integration (Bellows, 1994).

A change in boundary conditions can result in a change in the identity and potential of the system (Senanayake, 1991). An increase in boundary porosity may result in previously separate systems becoming linked or combined. For example, increased access to markets may result in linkages between fields and the external environment in the form of crop removals and the application of external inputs. Boundaries among soil systems or microenvironments may be obscured when natural areas are converted into agroecosystems and a heterogenous landscape is transformed into a homogeneous field. Linkages among systems may affect the integrity of system processes by impacting on component interactions and cycling processes, by allowing components or materials to be removed or introduced into the system, by the substitution of components within the original system by components from the external system. The obscuring of boundaries may result in the formation of uncoupled or incompatible interactions among species or between biological and geophysical components of the system.

Boundary conditions affect socioeconomic as well as biophysical interactions. Socioeconomically, in-migrations of people from the dominant culture into an indigenous community often results in the displacement of indigenous knowledge systems (Jiggins, 1989) and traditional management processes (Gadgil, 1987) by the introduced technologies and economic interactions. The development of transportation corridors also serve to breach traditional social and economic boundaries resulting in increased movement of people and goods between previously separated systems. As a result, the resource cycling, management process, and cultural interactions within the system may be disrupted.

Assessments of boundary conditions provide insights into changes in system sustainability (Table 1). Changes in boundary characteristics impact on the integrity of system interactions by altering flows between a system and the external environment. Impacts of changes in boundary characteristics may be expressed as resource movements from one system into another, the amount of diversity and heterogeneity in the system, or as the degree of interaction among previously separated systems. As boundaries become more porous and systems become more interactive, system processes become increasingly impacted by interactions occurring at higher hierarchy levels.

Table 1: Indicators of sustainability based on boundary conditions.

Boundary conditions		
	state conditions	
		fractal characteristics
		diversity of landscape patches/heterogeneity of physical relief
		amount of ground cover
Boundary porosity		
	state conditions	
		system accessibility
	pressure indicators	
		introduction of exotics
		land clearing/soil surface exposure
		infrastructure development: transportation/information
	exposure indicators	
		change in species diversity
		exportation of natural resources
		removal of topsoil by erosion
		seasonal and permanent cross-landscape migration
		loss of cultural heritage/indigenous knowledge
Change in boundary location		
	exposure indicators	
		field expansion
		stream channelization
		wetland drainage
		changes in political or property boundaries

Hierarchical: Ecosystem hierarchy levels have spatial and temporal dimensions. Conway and Barbier (1990) divided agroecosystem interactions into hierarchy levels ranging from the soil-water-microbe system to the crop-animal system, the farming system, the community, the watershed, the region, the nation, the economic and policy systems, and finally to the global level. Hierarchy levels also may be defined according to functional categories; natural resource stocks, land-use, and socioeconomic interactions (Haber, 1990). Discussions about interactions among and within hierarchy levels necessitate defining

hierarchy boundaries. Hierarchy boundaries at the less extensive levels are delineated based on biophysical processes. Above the field level, ecologically defined boundaries are often different from geopolitical boundaries. As mentioned above, these boundary differences may lead to a confounding of information when biophysical and socioeconomic information is compared.

An understanding of systems at each hierarchy level requires knowledge of the levels immediately above and below (Woodmansee, 1990). Transfers and transformations of information, resources, and energy occur across hierarchy levels. These transfers occur in the form of flows, feedback processes, and component substitution. The impact of these transfers depends on the direction of these flows among hierarchy levels. More extensive hierarchy systems change according to a slower dynamic than less extensive hierarchy systems. However, processes at the more extensive levels have a greater impact on the system than processes at less extensive levels. Odum (1988) described the relationship between different hierarchy levels in terms of energy pulses. Pulses at lower levels of the ecosystem may be absorbed by the system whereas pulses at higher levels of the hierarchy cause the whole system to pulse. For example, a disruption of soil microbial relationships in one field will have a limited impact on processes occurring at the watershed level whereas changes in stream flows across the landscape may have a profound effect on processes occurring at the field level.

System interactions and boundaries at higher hierarchy levels are defined by transportable system components (Haber, 1990). Air and water are biophysical components that exhibit high transportability while policies, prices, markets, and information are socioeconomic components that rapidly penetrate boundaries. These elements connect adjacent systems together into higher hierarchy systems. For example, stream flow define the boundaries of a watershed while market interactions define the boundaries of an economic community.

Ecosystem and hierarchy boundaries become increasingly porous as ecosystems are transformed from natural vegetation, to subsistence agriculture, and finally to commercial cropping systems. The dominant processes affecting systems also alter as the hierarchy perspective increases in extent from the plant-soil interface to the national and international level. Biophysical processes are dominant at the lower hierarchy levels while socioeconomic processes dominate the higher hierarchy perspectives.

This layering of socioeconomic factors over biophysical processes at higher hierarchy levels has implications both for the assessment of indicators of sustainability and for the development of recommendations for the maintenance of sustainability. Often, the primary stressors causing soil degradation are not biophysical but are economic, social, and political factors such as land tenancy, upslope migration, agricultural price policies, and the promotion of inappropriate technologies (Redclift, 1990, de Janvry and Garcia, 1988, Collins, 1986). In this case, soil degradation is an impact indicator due to a specific combination of biophysical, management, and policy stressors or pressure factors.

The formation of linkages across hierarchy levels also may result in components from the larger system substituting for components in the less extensive system. For example, the integration of subsistence farming systems into a market system allows for economic and management factors, such as the application of fertilizers and pesticides, to substitute for ecological processes such as fallows and rotations. Socioeconomically, off-farm employment opportunities may substitute for dependency on on-farm activities.

Hierarchies are temporal as well as spatial. Lower hierarchy systems are composed of organisms with short generation times and having a relatively short sustainability perspective while higher hierarchy systems are composed of organisms with long generational time periods and consequently longer sustainability perspective. Goodland et al. (1991) recommended using a time period spanning a minimum of three harvests for assessing the sustainability of agricultural or forestry systems. For factors affecting human systems, a temporal perspective of several human generations has been recommended (Toman, 1992; Eswaran, 1992; Forman, 1990).

Assessments of agroecosystem sustainability must be related to the appropriate ecosystem hierarchy level (Schaeffer et al., 1988). The structure and function of a system must be defined and assessed at the same hierarchy level (Anderson, 1994). Higher hierarchy systems cannot be analyzed simply as the sum or aggregation of the lower hierarchy subsystems (Conway and Barbier, 1990) since systems at a higher hierarchy levels exhibit emergent or different characteristics than the sum of their component subsystems parts (Wilson and Morren, 1990). As a result of emergent characteristics, including differences in energy pulses and generational times, more extensive hierarchy levels may be stable while instability is exhibited at less extensive spatial scales (Turner, 1989). Accordingly, assessments at the landscape level may be insensitive to changes occurring at the crop-soil or farming system levels while changes at the crop-soil level may not be detectable at the landscape perspective.

To retain integrity, data developed at each hierarchy level must exhibit a consistency between the extent and grain of the data (Dumanski et al., 1993). Since the predominance of specific phenomena changes across hierarchy levels, data assessment across levels should not be based on aggregation. Instead, the form of the data should change as the extent of the system increases. For example, as the hierarchy level increases from the field to the watershed, data used to describe soil quality would change in form from the depth of the topsoil to the amount of sediment moving through the watershed. Data integrity can be maintained while integrating information across hierarchy levels through the integrated nesting of data sets compiled at each hierarchy level (Dumanski et al., 1993, Swift and Izac, 1994). In this manner, assessments of soil quality or crop yields at the field level could be combined with analyses of percent soil coverage or marketable production at the regional level.

Holistic: Intact and unimpacted systems exhibit holistic interrelationships among all system components and community populations (Wilson and Morren, 1990). These

interactions, including food webs and nutrient cycling processes, are circular and are buffered against stress through feedback mechanisms and functional redundancy. Functional redundancy refers to the presence of multiple species that perform similar functions within the system. The number of feedback loops and the degree of functional redundancy within the system determines the selectivity of interactions among community populations. A greater number of species is generally associated with a lower connection among species while, for stable systems, increased community persistence results in greater connections among community members (Pimm, 1984). The stronger the interspecies connections within the system, the greater the change in the composition and biomass that will occur when each species is removed.

The strength of interspecies connections affects interactions between system structure and function. The expression of these interactions, in turn, determines how ecosystem changes should be analyzed (Holling, 1978). In systems where species diversity results in functional redundancy, some species loss may occur without affecting the functional capacity of the system. Consequently, the assessment of species diversity provides a more sensitive measure of system changes than do assessments of system functional responses (Schaeffer et al., 1988). The mycorrhizal community on a given site, for example, may be composed of numerous species and genotypes that differ in environmental tolerances, physiological requirements, and habitat preferences. Environmental changes may affect the predominance of specific mycorrhizal species while not substantially affecting the functional role of mycorrhizae-plant relationships (Perry et al., 1989). Rapid species adaption may also allow system functions to continue as is the case with the restoration of respiration and substrate decomposition processes in a fungicide-affected soil system following the development of fungicide-resistant microbial species (Domsch, 1968).

Systems displaying low functional redundancy or controlled by species with specialized interactions exhibit tight interactions between structure and function. Nitrification is a processes that exhibits low functional redundancy since it is controlled by a few species of bacteria. Consequently, it is more sensitive to environmental disturbances than processes controlled by a greater diversity of microorganisms (Visser and Parkinson, 1992). "Keystone" species, by performing specialized interactions or playing a critical role in the food web, control ecosystem processes and system resources (Moore, 1983). For example, single species control disease interactions through "gene-for-gene" relationships between pathogens and host plant varieties (Day, 1974). Similarly, single species of insects may be responsible for performing cross-fertilizations of plant species. For these directly controlled systems, loss or mutation of a specialized or keystone species can result in the loss of other species and have long-range consequences on the system (Crow, 1990; Soulé, 1985).

Functional change without changes in community structure may occur when species functions alter in response to environmental changes. Facultative bacteria adapt to the presences or absence of oxygen by performing different functions and using different substrates and electron acceptors under different environmental conditions. For this system,

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the species composition of the community may remain relatively stable while functional changes result in a change in system outputs. At the farming system level, use of agroforestry species for fuelwood or fodder rather than for nutrient inputs and mulching also results in a change in the function of the system without substantially affecting the system structure.

Impacted systems may exhibit interactions between community structure and system functions that appear uncoupled. The introduction of exotic plant or animal species may cause an imbalance in the system due to their incomplete functional interrelationships with other species in the system. This imbalance can result in the transformation of exotic species into pests, as is the case for many weed species (Ramakrishnan, 1988), and result in a decrease in system diversity (Soulé, 1985). Under these circumstances, community structure will change since introduced species substitute for and displace native species. Simultaneously, changes in functional responses of species will occur due to the changing community composition and consequent changes in environmental conditions.

Uncoupling of structure and function interactions also may occur when an homogeneous agricultural system is imposed over a heterogenous soil system. Incompatibility between the soil and agricultural system may include lack of synchrony among nutrient application, transformation, and uptake processes and impediments to water infiltration and uptake processes.

Natural systems exhibit holistic interactions due to adaptation of species to the system environment and co-evolution of species within the system. Traditional management systems that were developed within the structure of natural, ecological processes conserve resources by employing land-use practices that are compatible with natural ecological processes (Gadgil, 1987). For example, the Kayapó of the Amazon plant crops within concentric circles employing crop segregation and crop rotational practices. This practice maximizes both yields and nutrient cycling by exploiting complementary associations among crops and between crops and soil types (Hecht, 1989; Hecht et al., 1988). Agricultural interventions that mimic the structural and functional interrelationships of the natural ecosystem of the area similarly display high ecological sustainability (Hart, 1980; Ewel, 1986). Managed fallows (Unruh, 1988) or successional cropping systems (Hart, 1980) mimic natural ecosystems by providing a continuous plant or residue cover over the soil surface. Multistory canopies in natural and agricultural systems utilize solar energy efficiently and exhibit process that enhance nutrient cycling and discourage weed establishment. Agroecosystem diversity that mimics the diversity of plants in natural systems can reduce pest infestations by providing conditions favorable to maintaining a balance between pests and predator Oligotrophic or environments with low soil nutrient reserves exhibit close temporal and spatial linkages between decomposition and uptake processes. Agricultural practices in these in environments should exhibit land preparation and cropping practices that ensure temporal synchrony between nutrient decomposition and uptake (Swift, 1985) and spatial proximity between nutrient stores and consumers (Jordan and Herrera, 1981).

Decreasing sustainability often is associated with management practices that disrupt natural ecological processes and are indifferent to the environmental specifics of the location (Jodha, 1990). The removal of organic substrates from the soil results in decreased diversity of microbial community and disruptions in nutrient and hydrological cycles (Sims, 1990). Across the landscape, disruptions in holistic systems interactions occur when incomplete market integration or improper farming practices result in nutrient removals exceeding nutrient returns to the land. Incomplete integration of infrastructure development and functional involvement of the community in regional markets can favor resource extraction and economic exploitation of the community. Increased land-use intensity disrupts natural temporal dynamics for nutrient recycling and land regeneration while spatial intensification of land use across the landscape decreases biodiversity and boundary mosaics (Trenbath et al., 1990). Additional indicators of sustainability based on changes in biophysical and socioeconomic system integrity are presented in Table 2.

Table 2: Examples of indicators of sustainability based on holistic interactions.

System function

- state conditions
  - symbiotic relationships
  - nutrient cycling
  - water filtering capacity of soils
  - functional biodiversity
  - balances between pests and predators
  - crop yields
  - food security
  - social reciprocal networks/social interactions
  - accountability
- pressure indicators
  - substitution of agricultural inputs for natural regeneration or nutrient cycling processes
  - change from subsistence to commercial agricultural production
- exposure indicators
  - change in primary productivity
  - change in rate of nitrogen fixation
  - nutrient and pesticide leaching
  - change in decomposition/mineralization rate
  - change in rate of succession
  - change in capacity of system to detoxify substances
  - increase in dependency/access to off-farm employment
  - change in participation in community affairs

System structure

- state conditions
  - diversity of canopy levels
  - diversity of rooting depths
  - biodiversity
  - number of tropic links on feeding pathways
- pressure indicators
  - introduction of exotics
  - infrastructure development
  - market development
- exposure indicators
  - change in population density
  - change in species richness
  - increase in the percentage of physically smaller species to larger species
  - change in the percentage of ecological generalists to specialists
  - change in land use from nature to agricultural or from agricultural to urban
  - change in landholding concentration
  - change in market/investment autonomy or interaction

Integrity of interspecies and inter-system interactions

- exposure indicators
  - substitution of small ruminants for large ruminants due to decreasing pasture productivity
  - substitution of shallow rooting plants for deep rooting plants due to decreasing soil physical quality
  - synchrony of nutrient decomposition and uptake
  - increased diseases and/or amorphology
  - increasing dependency on agricultural inputs
  - increasing dependency on loans/assistance programs

Dynamic: Sustainable systems are not static or perfectly stable. Instead, sustainable systems are dynamic, changing or adapting across time and space (Senanayake, 1991; Forman, 1990; Marten, 1988). Usual mechanisms for adapting to changing conditions include successional processes, feedback loops, and the replacement of stress-sensitive species with functionally similar but more resistant species (Rapport et al., 1985). Interventions that counteract the tendency of systems to fluctuate, such as monocropping, disrupt system dynamics and require outside inputs for continuing function.

System dynamics are ecosystem specific. System dynamics also vary according to sequential changes in succession and according to the spatial scale of the system. In general, system change is more rapid during early stages of succession. Also, smaller systems change according to a more rapid dynamic than larger systems (Allen and Starr, 1982). Forman (1990) described the dynamic fluctuations of heterogeneous systems as mosaic stability. Systems exhibiting mosaic stability are comprised of a larger, background system that is

changing gradually or remaining in a steady state while component spatial units change at varying rates and intensities.

System dynamics are temporal as well as spatial. Odum (1988) described energy changes in systems as undergoing pulses involving rapid periods of consumption followed by longer periods of recovery, with the pulsation rates based on turnover time. This pattern of consumption and recovery is characteristic of traditional slash-and-burn or crop-fallow agricultural systems where a rapid period of nutrient removal due to site preparation and cropping is followed by a longer period of fallow and system regeneration. If land-use intensity increases, recovery of land quality characteristics may be inhibited since nutrient utilization and decomposition processes no longer are synchronized. Ramakrishnan and Toky (1981) reported low rates of recovery of soil phosphorus in slash-and-burn fields subjected to short fallow cycles of 5 years or less. For field fallowed 10 years or more prior to recultivation, however, soil phosphorus increased rapidly upon return to fallow.

Systems exhibit optimal rates for pulses in energy flows. For systems exhibiting more than one equilibrium or stability region, sharp shifts in behavior are normal (Holling, 1978) as occurs when temperate-climate ecosystems adapt to temperature changes. Systems also exhibit specific co-evolutionary, adaptative responses to normal variations in environmental conditions. Stresses normal to the system, such as temperate-area stream scouring, are referred to as eustresses (Rapport et al., 1985). Suppression of these normal disturbances will cause a change to a different community structure (Rykiel, 1985). Mergalef (1975) suggested that ecosystems, such as tropical forests and coral reefs, not normally subjected to serious environmental stresses are more sensitive to outside disturbances than are naturally stressed systems. For example, boreal ecosystems are dependent on occasional fires to maintain community structure and function (Rapport et al., 1985) while frequent fires disrupt successional processes on tropical uplands (Ramakrishnan and Toky, 1981). Nematode populations exhibit an increase in species diversity directly related to the amount of stress impacting on the system up to intermediate stress levels (Neher et al., 1993). This greater amount of diversity buffers the community and allows species functions to continue at higher stress levels.

Stress responses to the disruption of system dynamics include changes in primary productivity and successional retrogression. A change in the pulse dynamics due to an extension of the cropping cycle or a shortening of the recovery cycle decreases system productivity and alters successional patterns (Peters and Neuenshwander, 1988; Trenbath et al., 1990; Golley, 1983; Nye and Greenland, 1960). Retrogressive succession, or an alteration of community dynamics in the direction of less mature systems, may occur in response to the introduction of exotics, ecosystem contamination, or a disruption of stress-recovery cycles (Rapport et al., 1985). For example, yearly burning of an agroecosystem favors the growth of rhizomous grasses and inhibits the growth of perennial species.

Systems dynamically respond to stresses through corrective feedback loops that allow a disrupted system to return to within satisfactory limits (Marten, 1988). Structural elements

of feedback loops include: 1) a point of reference, 2) a measure of how the system is functioning, 3) a comparison of the assessment with the reference, and 4) array of corrective action. Feedback processes vary according to the severity of system stress. Under severe stress, ecosystems develop external feedback loops that link the system with external systems (Rapport et al., 1985). For example, an ecosystem that has been destroyed or disrupted by fire, flooding, or a volcanic eruption may regenerate as nutrients and genetic materials are transported into the area by the wind or animals. For human impacted systems, system recovery may rely on access to external economic and material aid. Additional indicators of sustainability based on changes in system dynamics are presented in Table 3.

Table 3: Examples of indicators of sustainability based on dynamic interactions.

Tendency to fluctuate		
	State conditions	
		frequency, intensity, and seasonality of precipitation and temperatures
		fluctuations in pest and predator populations
		price fluctuations
		migrations of people and/or animals across the landscape
		seasonality of food supplies
	Pressure indicators	
		conversion from a multiple cropping systems to monocropping
		application of pesticides
		access to irrigation
		access to communal pastures
		access to markets
	Exposure indicators	
		change in variability of crop yields
		change in variability of pest populations
		change in migration patterns/conversion to sedentary agriculture
		change in seasonal availability of food supplies
Feedback loops/recovery rates		
	State conditions	
		availability of seeds and nutrients for natural regeneration
		cultivation to fallow ratio
		synchrony of nutrient release and plant uptake
		access to traditional/indigenous knowledge
		access to education, training, and technical assistance
		access to loans/other economic assistance
	Exposure indicators	
		change in weed populations
		change in disease incidence
		change in nutrient availability/nutrient holding capacity
		change in dependency on external assistance

Changes in systems dynamics in response to change or stress may be either incremental or qualitative. Soil loss may be incremental in the form of gradual soil erosion while soil loss due to landslides will cause a qualitative change in the landscape. Similarly, flooding or excess flashiness of stream flows is qualitatively different from the incremental absorption of water into rivers. Sustainability thresholds may be designated based on the transition from an incremental to a qualitative response to impacts. When and whether system dynamics are transformed from incremental changes to qualitative changes depends on the capacity of the system and on the effectiveness of buffering mechanisms.

Resiliency: Buffering factors provide a system with resiliency or the ability to return to its previous structure, function, and diversity following stress. Buffering factors include species diversity, functional redundancy of system pathways and processes, and a surfeit of physical stocks. As discussed above, a system may be buffered by a diversity of organisms operating at different environmental optima but performing the same function (Perry et al., 1989; Schaeffer et al., 1988). Species diversity and system complexity enhance system resiliency by providing a multiplicity of feedback interactions (Pimm, 1984). For soil systems, a high diversity of soil microorganisms allows for a diversity of nutrient cycling feedback mechanisms and for the development of component interactions such as symbioses (Sanginga et al., 1992).

Buffering applies to physical as well as biological characteristics of the ecosystem. Inherent differences in physical stocks or biodiversity entail that systems exhibit differential fragility or differences in buffering capacity (Norton, 1992). Lal (1985) noted that erosion losses from soils with deep, well-structured subsoils represents a loss of plant available nutrients but has limited impact on plant rooting capabilities. In contrast, erosion of soils with shallow rooting depth may result in irreversible soil physical degradation. Similarly, soils with deep topsoils have a greater buffering capacity against erosional losses than do soils with naturally shallow topsoils. For this reason, Liverman et al. (1988) recommended using a rate-to-stock indicator, such as the amount of topsoil lost in relation to the amount remaining, as a more meaningful indicator of sustainability than soil loss per hectare.

Mechanisms for buffering are system specific. Eutrophic soil-plant systems, characterized by soils with high nutrient holding capacity, retain nutrients predominantly in the soil system. Oligotrophic systems, characterized by soils with low activity clay minerals, retain nutrients predominantly in the plant biomass (Jordan and Herrera, 1981). Accordingly, burning or cutting the biomass cover will decrease the nutrient buffer of an oligotrophic system more than that of a eutrophic system. Buffering mechanisms to insure species survival also are species and system specific. Organisms that evolve in less diverse or densely populated habitats are selected for greater reproductive capacity while organisms evolving in more diverse or highly populated habitats are selected for greater ability to compete for resources (Ramakrishnan, 1988).

System resiliency can be measured based on the elasticity, amplitude, and malleability of recovery (Westman, 1978). Elasticity is the rate of recovery following stress while

amplitude refers to the establishment of a new equilibrium state in response to stress. Following recovery, a perfectly resilient system exhibits no change in an attribute while a system that experiences a change in amplitude exhibits a net system change. Malleability is the ease with which permanent net changes in the system may occur. In contrast, buffering represents the resistance of a system to change. A resilient system may exhibit slow elasticity and express unsustainable characteristics prior to establishing a new equilibrium. Alternatively, a system may recover rapidly but only reach an equilibrium lower than that of the original system. Net changes in a system may be expressed as a decrease in the number of indigenous species, regressive succession, changes in standing crop or microbial biomass, changes in gross or net primary productivity, changes in energy flows to decomposer food chains, and changes in natural macronutrient stocks (Schaeffer et al., 1988).

Increased malleability of the system may be due to decreased physical stocks or "stress fatigue." Stress fatigue occurs when ecosystems are exposed to repeated stresses or to stresses with which they have not co-evolved (Rapport, 1989). For example, removal of vegetation exposes soils to raindrop impact resulting in soil physical and chemical degradation due to compaction and erosion. Frequent burning of previously forested tropical upland areas also causes soil physical (Giovannini et al., 1987) and chemical degradation (Ramakrishnan and Toky, 1981). Soil degradation, in turn, results in regressive succession as forest species are replaced with aggressive, rhizomatous species such as *Imperata cylindrica* or *Pteridium aquilinum* (Kellman, 1980). Contaminants, such as chemical residues, also will delay or impair normal successional processes (Schaeffer et al., 1988), while, in agricultural systems, soil degradation encourages weed encroachment (Kushwaha et al., 1981; Ramakrishnan, 1988). Suboptimal soil nutrient levels also may be related to increased plant disease incidence (Altieri, 1991).

Economic buffering processes may either be combined with or substitute for ecological buffering processes. Economic buffering at the farming systems level is provided by savings and a diversification of agronomic products, off-farm income-generating activities, loan sources, and access to insurance or external aid. Economic savings, insurance, or access to viable loan sources provides resiliency against crop failure, enhances input substitution for biological processes, allows for substitution of management practices to increase profitability or resource conservation, and increases opportunities for off-farm income generation. Crop diversification provides both agronomic and economic buffering. Agronomically, a diversity of crops enhances resistance to disease and pest infestations while economically, a diversity of agronomic products protects against market fluctuations. Additional indicators of sustainability based on changes in system resiliency are presented in Table 4.

Table 4: Examples of indicators of sustainability based on resiliency.

Surfeit of stocks
- state conditions
  - depth of topsoil
  - physical and chemical conditions of soils
  - access to arable land for agricultural expansion
  - savings / size of land holdings
  - employment opportunities
  - opportunities for technological changes
  - potential for yield increases
- exposure indicators
  - erosion losses:remain topsoil
  - nutrients removed:nutrients returned
  - percentage of forest lands remaining
  - change in depth to water table
  - concentration of chemicals in streams and air
  - amount of land distributed to each heir
  - farm profits after loan payments

Functional redundancy in the system
- state indicators
  - functional diversity of biotic community
  - diversity of income sources
  - diversity of social networks
- exposure indicators
  - change in functional diversity in food webs
  - dependency on a limited source of income
  - social isolation

Availability of substitution factors
- State conditions
  - access to seeds of different varieties
  - access to off-farm soil nutrient inputs
  - access to off-farm employment
  - access to loans at a reasonable rate
  - presence of labor saving technologies

Stress Fatigue
- Pressure indicators
  - intensity of land use/cultivation
  - repeated land burning
  - increasing debt load
- exposure indicators
  - retrogressive succession
  - risk aversion in adopting new technologies

Conclusions and a Proposed Framework for Assessing Indicators of Sustainability

An understanding of ecological processes can provide a framework for the assessment of system sustainability. This framework can employ an analysis of system boundary characteristics, dynamic processes, and buffering factors to define the baseline conditions of the system. Impacts of stressors on this ecological and socioeconomic context could then be predicted and analyzed based on the effects of changes on the integrity of intrasystem and intersystem interactions, balances of material and energy flows across system boundaries, and the maintenance of adaptive and integrated relationships among components in the system structure and processes of system function. Assessments of intersystem interactions should involve analyses across as well as within hierarchy levels.

In human impacted systems, management factors, have an overriding influence on biophysical sustainability processes. Changes in agricultural technologies, land use intensity, natural resource extraction and management practices, marketing interactions, and policies impact directly or indirectly on the natural resource base. Due to the dependency of humans on food, fiber, fuel, and housing derived from natural resources, the sustainability of the natural resource base has reverberating effects on the sustainability of social and economic processes. Overlaying biophysical systems with human systems results in changes within both biophysical and socioeconomic systems that affect boundary characteristics, integrity of interactions within and among systems, and the substitution or elimination of system structural components Thus, many of the same processes that define and regulate biophysical interactions also operate in socioeconomic systems and can be used to assess changes in these systems.

A framework for the assessment of sustainability using an ecological systems perspectives should contain the following components: 1) an assessment of the baseline conditions of the unimpacted or least impacted system, 2) an assessment of the current system, 3) the identification of historical and current primary natural perturbations and human impacts on the system, and 4) the identification of changes in system processes due to the identified stressor factors.

An assessment of baseline conditions provide a context for the analysis of impacts. Highly buffered systems, such as the level, fertile lands of the U.S. Great Plains have a greater capacity to withstand and adapt to change than more fragile ecosystems, such as the sloping uplands of Asia and Central America. Similarly, the expansion of agricultural and economic boundaries impacts less on the system dynamics of homogeneous landscapes than on those of more heterogenous or disconnected environments. Baseline conditions for biophysical systems can be analyzed through retrospective assessments of historical data or estimated based on analyses of natural outcroppings in the landscape. In areas where infrastructure and marketing linkages are incomplete, baseline conditions of agricultural systems can be estimated through assessments of land use practices in remote areas.

Assessments of both the baseline conditions and the current system should include determinations of the degree of integration or isolation between the system and outside systems, the primary factors that buffer or provide the system with resilience, and the primary or controlling system functions. These assessments will permit the identification of sub-systems or hierarchy levels that exhibit controlling influence over system processes. Analyses of system integrity can then focus on how the dominant buffering factors and functions interact with processes in the system under investigation. For systems that are dependent on buffering factors or function processes occurring in an outside system or at another hierarchy level, system sustainability will depend the integrity of intersystem connections and balances in material and energy flows between the dependent and controlling systems. For example, external input-based agricultural systems exhibit higher levels of sustainability in societies where farmers linkages with markets and lending institutions are well established and equitable than in societies where farmer linkages with banks and markets are more marginal.

The identification of stressors and exposure impacts should be conducted across hierarchy levels and involve both quantitative and qualitative assessments. Analytical integrity of field and community-based information can be enhanced by conducting data integration starting from the least extensive hierarchy level and embedding this disaggregated information into assessments at more extensive levels. User-based appropriateness of data can be enhanced by basing assessments of change on perceptual and experiential information from community members and other resource users. Experiential information provides insights into community-based priorities as well perceived interactions among system operations or change processes. Understanding the dynamics between the community-based priority factors and the system-controlling functional factors can guide the development of appropriate interventions. Assessments of these relationships can also be used to formulate predictions regarding the ability and interest of the community in adopting specific types of interventions. By basing assessments of these dynamics on an understanding of the characteristics of ecological systems, a basis for an integrated analysis of changes in system sustainability may be formulated.

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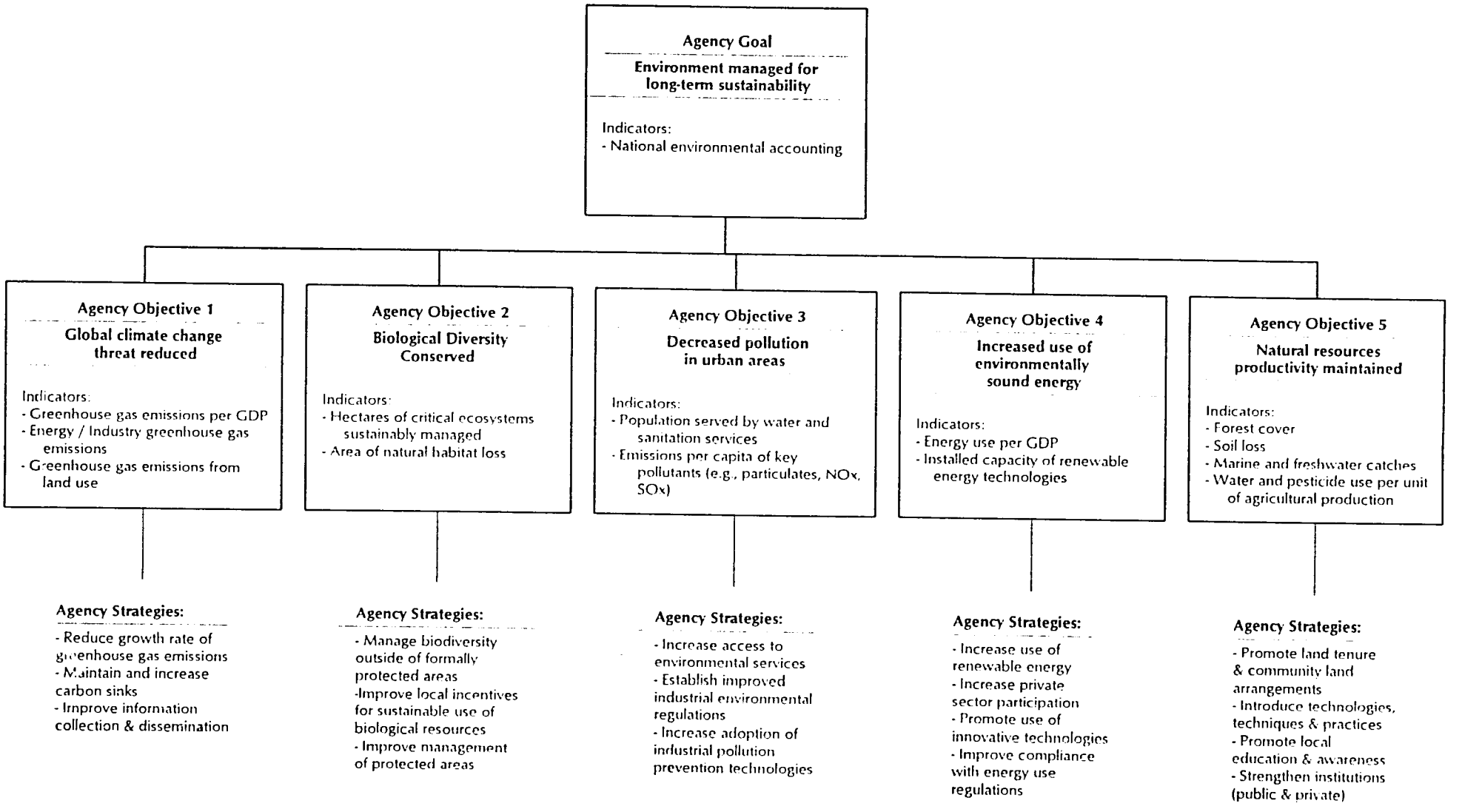

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GLOSSARY OF TERMS
STRATEGIC PLANNING & PERFORMANCE MEASUREMENT

ACTIVITY: An USAID-funded assistance effort organized to contribute to a clearly defined program outcome. A specific activity or project as listed in the program and financing schedules of the Agency.

ANALYTICAL FRAMEWORK: A framework that logically links different levels of results or outcomes according to a causal theory.

ASSUMPTION: A statement that is presumed to be true, often temporarily or for a specific purpose.

OUTPUT MEASURE: The tabulation, calculation, or recording of activity or effort and can be expressed in a quantitative or qualitative manner.

PERFORMANCE GOAL: A target level of performance expressed as a tangible, measurable objective, against which actual achievement can be compared, including a goal expressed as a quantitative standard, value, or rate.

PERFORMANCE INDICATOR: A measure to track progress toward achieving program outcomes or strategic objectives. A particular value or characteristic used to measure output or outcome.

PROGRAM: A collection of USAID-funded activities which share a common set of program outcomes, usually within one sector, and, together, contribute toward achievement of a higher-order strategic objective.

PROGRAM OUTCOME: A measurable outcome of one or more activities which, in turn, contributes to achieving a higher-order strategic objective; the intermediate level in the hierarchy of objectives linking specific activities to strategic objectives.

STRATEGIC OBJECTIVE: A significant development result which can be achieve or toward which substantial progress can be made and for which the operational unit is held accountable in an approved strategic plan. Typically, the time-frame of a strategic objective is 5-8 years for sustainable development programs, but may be shorter for programs operating under conditions of uncertainty.

STRATEGIC PLAN: A delimitation of the strategic-level objectives an operational unit plans to pursue and description of how it plans to deploy resources to accomplish them; a strategic plan is prepared for each portfolio, whether it is managed at the country level, regionally, or centrally.

STRATEGY STATEMENT: A summary statement of broad strategic direction and program goals at the Agency or operational Bureau level; a strategy statement provides a framework for the development of strategic plans by individual operating units and may set parameters on the selection of strategic objectives and/or programmatic approaches.