INTRODUCTION

By means of water we give life to everything (The Koran 21:30)

Without water there would be no life — it is the world's most precious natural asset. Sufficient quantities of clean water for human use, economic growth, and ecosystems can be ensured ***only if we manage this resource properly***. Over the next five years, the US Agency for International Development will be focusing considerable effort to help developing nations improve the way water is managed in upland, fresh-water watersheds; in coastal and marine ecosystems; and in some of the world's largest and most crowded urban centers through a program based on *integrated*, *comprehensive* (i.e., multisectoral- and watershed-focused) water and coastal resources management. This edition of *Water Resources Update* presents a range of papers showcasing international water management issues and projects.

WHY INTEGRATED, COMPREHENSIVE WATER MANAGEMENT?

An integrated, comprehensive approach is key to sustainability. The rationale is simple: within a watershed, the effects of human activity are concentrated in the quantity and quality of fresh and coastal waters, and in the health of aquatic resources such as seagrasses, fisheries, and coral reefs. Human activity affects water quantity (flooding and siltation from deforestation), water quality (irrigation return flows high in salinity, pesticides, and nutrients; and improperly treated sewage), and aquatic resources (biodiversity losses from the conversion of mangrove stands to coastal resorts). An *integrated*, multi-sectoral approach to water resources planning and management provides half the solution to avoid these undesirable outcomes. *Comprehensive* watershed-wide implementation provides the rest.

For many years, the U.S.,[1] other developed nations, and developing economies alike have taken relatively narrow approaches to water resources management. Such approaches have typically limited investment, regulation, or conservation initiatives, for example, to a single sector like agriculture, fisheries, or rural communities. Many initiatives have focused on a single or limited number of project purposes — storing water to produce hydroelectric power, draining wetlands to create arable land, or developing coastlines to attract foreign tourists. In too many cases, projects have gone forward without meaningful participation from interests that stand to benefit from, or who may be harmed by, alterations in the hydrologic regime or land use. In many developing economies, ministries with divergent objectives pursue policies at odds with integrated, comprehensive water resources management. These actions can confuse communities that seek sensible water management, generate unnecessary conflict, limit opportunities to explore creative policy or project options, or prevent integrated approaches altogether.

PRINCIPLES OF INTEGRATED, COMPREHENSIVE WATER RESOURCES MANAGEMENT

The papers in this issue suggest that internationally, one can identify a series of principles that taken together, constitute a framework for water management policy and program design:

- ***Sustainability*** - Water represents a limited asset base upon which all forms of life depend. Consequently, water resources must be managed to sustain environmental values and the health of the economy.

- ***Avoid, minimize, mitigate*** - Approaches to water resources protection must emphasize avoiding or minimizing pollution and resource degradation and only if necessary afterwards, mitigating the effects of releasing pollutants into or disturbing ecosystems.

- ***Appropriate governance and involvement*** - Problem solving strategies can be enhanced by creating opportunities for, and strengthening the capabilities of, all levels of government, NGOs, and the private sector to work together to plan and finance water use, conservation, and protection, with those entities most appropriate to the problem principally responsible for implementing solutions.

- ***Watershed-level projects and results*** - Water resource management and protection efforts should focus on results for communities, the economy, and

the environment within appropriate hydrologic units or watersheds, with successes and failures in attaining water resources goals measured and reported to all stakeholders.

- ***Interconnectedness of resources*** - Policies and programs should adopt a holistic resource protection and use perspective, taking into account the interconnectedness of the quality and quantity of surface and groundwater, and aquatic and related land resources.

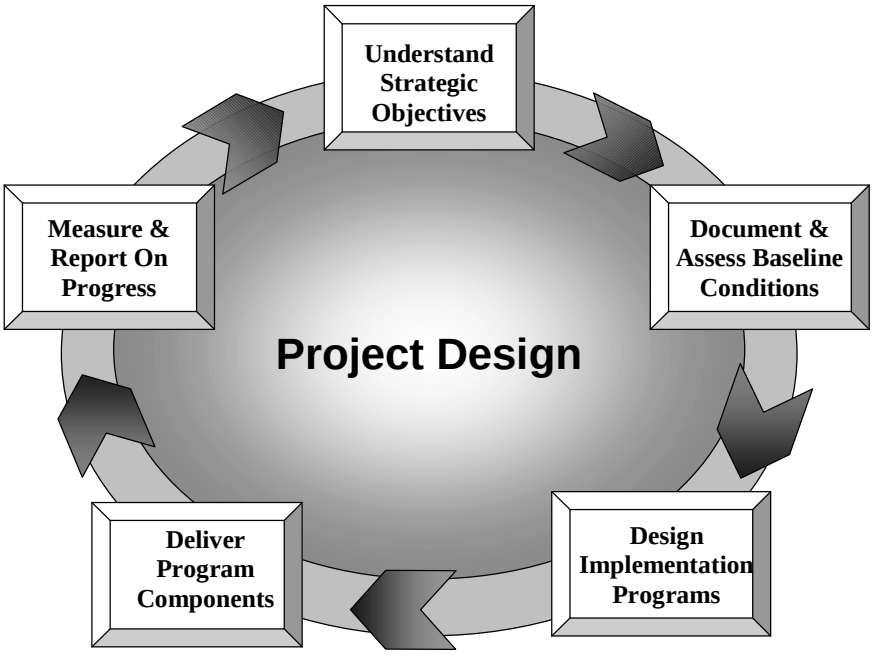
- ***Use of intervention and incentives*** - To meet public and private needs in developing economies, programs and projects to protect and beneficially use water resources should include a mix of voluntary, mandatory, and market-based approaches suited to local conditions.

- ***Sound scientific basis and technology to support decisions*** - A sound scientific understanding of natural and artificially altered environments and their interaction is critical to improving the quality of both. The use of new, high-technology tools can greatly enhance decision making.

- ***Water has value*** - Beneficiaries of water resources investments should generally pay the full cost of these investments, while contributors to water quality, habitat, or resource impairment should fully internalize the cost of their actions. In some instances, governments may be best suited to spread equitably the cost of delivering public goods such as biodiversity or aquatic habitat preservation.

PROCESS FOR PROJECT PLANNING AND EXECUTION

To fit within their general project framework, US AID-sponsored programs for integrated, comprehensive water management can be designed using a five-step model:



- ***Step 1 - Understand strategic objectives:*** Working with USAID Missions and their customers (host country institutions and organizations), provide input to USAID's strategic objectives, targets, indicators to attain progress toward objectives. Integrate water management objectives with economic, social, environmental, and related sector objectives. Formulate preliminary project design.

- ***Step 2 - Document and assess baseline conditions:*** Collect and disseminate baseline data on all applicable dimensions of the water resource and any potential structural or non-structural alteration thereto, including meteorology, hydrology, ecology, water use, culture, law, economics, finance, institutions, politics, and decision dynamics. Understand knowledge, interests, values, and behaviors of project beneficiaries and those who might be adversely affected. In short: assess conditions and threats to attaining objectives. Reconsider preliminary project design.

- ***Step 3 - Design solutions and implementation programs*:** Finalize design of program activities to deliver incremental progress toward objectives. Integrate water resources management plans and programs with other sectoral plans and programs. Identify and facilitate needed institutional support and coordination. Evaluate opportunities to use USAID and other donor resources as financial leverage. Build institutional capacity to perform these functions.

- ***Step 4 - Deliver program components:*** Provide longer-term services including drafting of laws and regulations; development of management, pricing, allocation, conservation, and related enabling policies; training of people in local, regional and national institutions to perform services; implementing stakeholder involvement and consensus-building processes; preparing hard engineering plans; procuring and installing equipment; and developing information management and decision support tools. Pre-test approaches where prudent.

- ***Step 5 - Measure and report on progress:*** Develop performance monitoring systems, collect data, and report on performance indicators; build capacity to sustain these activities locally; and use these data to reformulate objectives, strategies, and tactics as necessary.

PAPERS IN THIS ISSUE

In the first paper, *Vahid Alavian*, Vice President of Rankin International, argues that a unifying legal, institutional, and technical framework — integrated, comprehensive water resources management — is critical to solving current and potential inter-jurisdictional water conflicts in the Middle East, parts of Asia, and elsewhere in the developing world.

The next two papers from the Harvard Institute for International Development present respectively, a case study of economic incentives to attain water management goals and an institutional approach designed to improve the efficiency of water use in irrigation.

Applications of environmental management systems to solve water use and pollution problems are demonstrated in two papers offered by Hagler Bailly Services, Inc. In the first, *Jack Schramm* describes an innovative management system to improve water quality and use within an urban watershed in Egypt. Second, *William Meade* and *Patricio Gonzales-Morel* report on successful management systems to reduce water use in the tourism sector in Jamaica.

Gail Bingham and *Bruce Steadman* of Resolve, Inc., argue that if comprehensive water management is to work, it is important to develop processes that involve and integrate the interests of diverse parties in the design and implementation of customized management options. *Tiffen Shewmake*, from the Water Environment Federation, describes programs in Bulgaria and Poland where professional associations acted as the catalyst to bring together diverse stakeholders to exchange ideas on water resources management.

In the next paper, *Larry Brazil, Gerald Day, and Daniel Epstein* of Riverside Technology, Inc. present several technological advances in water resources management to protect and save lives, extend and optimally use limited resources, and provide useful information to assist in the sustainable growth and development of natural resources in the developing world.

In the final paper, *David Burack* draws on the experiences of CH2MHill to argue for cooperation among policy makers, water planners, engineers, economists, environmental scientists, and the public large to bridge the gap between policy and technology at of water management.

ENDNOTE

[1]Since as early as 1908, when the Inland Waterways Commission recommended comprehensive water quality and water use planning, U.S. decision makers have recognized the value of, and legislated, comprehensive water management policies. Because of our federalist form of government, however, few examples of such management have been implemented despite repeated attempts of U.S. administrations from 1930 to 1970 to reform fractional policies, create inclusive institutions, or integrate disparate water management efforts. Over the last 60 years, the Tennessee Valley Authority has created one of only a few successful U.S. models of integrated water resources management. See *Watershed Planning and Management*, Hagler Bailly (d.b.a Apogee Research, Inc.), prepared for the Steering Committee of Water Quality 2000, November 25, 1995.