World Bank Global Issues Seminar Series

The Global Water Challenge

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Water, Growth and Poverty Reduction

The world community is making renewed commitments to urgently needed poverty reduction in the developing world. To achieve this goal – as agreed at the 2002 Monterrey Conference and the Earth Summit in Johannesburg and outlined in the Millennium Development Goals – increased growth will be key: low income countries need to grow at per capita rates of 3.6 percent per year if the 29 percent of the world's population living on less than US$1 a day in 1990 is to be halved by 2015. The payoff will be great: increased growth means decreases in extreme poverty, decline in child malnutrition, and enhanced regional and global security. This growth needs to be one that puts social equity and environmental responsibility at the center.

At the same time, consensus is growing worldwide that water and water services are essential because they touch on almost all Millennium Development Goals. Investment in water infrastructure—to protect against droughts and floods, produce renewable energy, and provide water supply to cities and rural areas, and water to grow food—is basic for economic growth and poverty reduction in poor countries.

Thus, water has evolved as a priority on the development agenda. It was a major topic at Monterrey, the "most important topic" at the 2002 Earth Summit in Johannesburg,[1] and a primary focus of the Meeting of the G8 meeting in France in June of 2003.

With international consensus around the importance of water, it is clear that in the development arena water has ceased to be an issue for only water specialists. Water is a cross-cutting issue that affects the economy of countries as a whole and transcends a number of crucial productive sectors, including water and sanitation supply, irrigation, drainage and food production, renewable energy generation and the environment. It has now been recognized as one of the key resources for development, growth and poverty reduction.

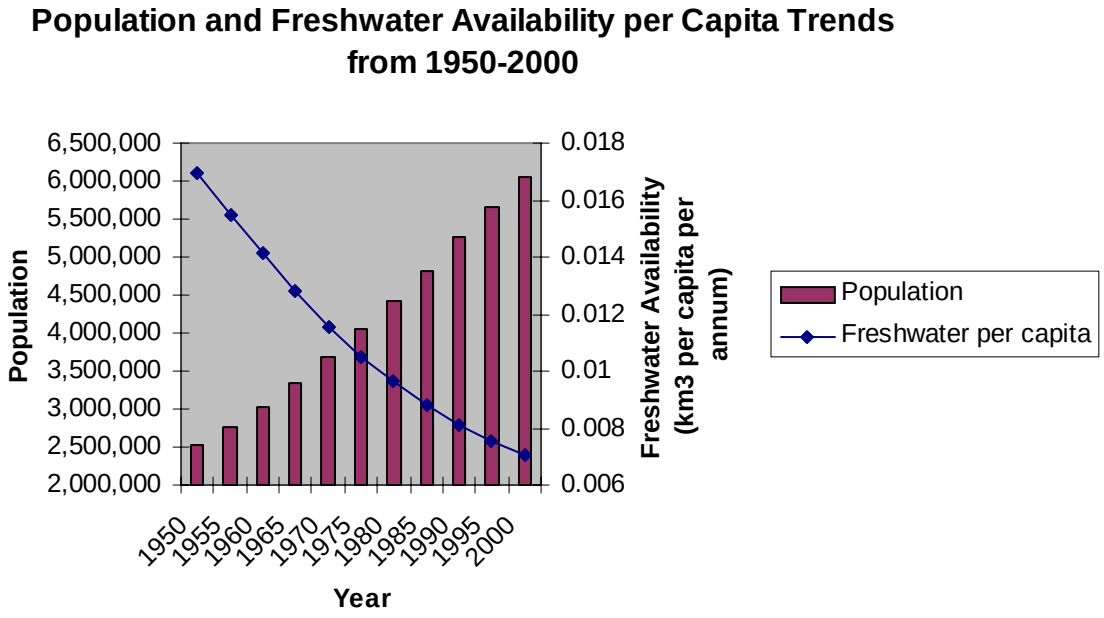
The messages coming from all these fora suggest that: To harness the potential of water to function as a driver of growth, the indispensable ingredients are increased investments in the water-related sectors—water resources management, water supply and sanitation, irrigation and drainage, hydropower, and water/environment—accompanied by urgently needed reforms. The need for such reforms and investments is growing more widely understood and more urgent by the day. It is now becoming clear that "the gloomy arithmetic of water" is also a "gloomy arithmetic of water financing" and therefore a "gloomy arithmetic of responsible growth" in developing countries.

1 According to the GlobeScan Survey (January 2002) undertaken by Environics, a Canadian public opinion firm specialized in Sustainable Development, at 81 percent, water was the most important topic identified by decision makers at the Earth Summit. In Johannesburg hydropower was recognized as a renewable source of energy that needed to be promoted in developing countries, and sanitation was added to the Millennium Development Goals.

Water as a Driver of Responsible Growth for a Growing World Population

The graph below shows the trend in water availability per capita over the past 50 years. It demonstrates that population growth has far outstripped water availability, which in the graph is assumed to have remained constant. But per capita water availability has not decreased solely because of growing populations. Pollution, which degrades water's usefulness, has also decreased availability;. Additional demands are rising, driven by economic growth. Climate variability makes timely access to water less reliable in many cases. If these additional factors are taken into account, the curve below might be even steeper. With estimates suggesting that an additional 2 billion people will be added to the world's population over the next 30 years, and another billion in the following 20 years, most of whom are in developing countries, the need for action is clear.

Figure 1:



Source: World Resources Institute (2002) *Earth Trends*, and United Nations Population Division/Department of Economic and Social Affairs (2001) *World Population Prospects: The 2000 Revision*

Water is vital for life, human life, life of our ecosystem, economic and social well being. With water resources threatened in so many parts of the globe, and especially in developing countries, life itself is threatened. Action is, therefore, needed worldwide to reverse this trend and to better manage our water.

A specific challenge is the fact that a growing world population requires more water services and water infrastructure for the underlying economic activities that enable development, notably to provide for safe water supply and sanitation, meet increasing food needs and secure inputs for industrial processes. At the same time, however, our ecosystems, which provide valuable services to us and sustain life on Earth, also need sufficient amounts of water to function. For this reason, sustainable development *and* management of water is a must in the responsible-growth equation.

How Water Affects Growth and Poverty Reduction

Water resources management and development is central to responsible growth and poverty reduction; and, therefore, of central importance to the world community. It is relevant in a number of different and complementary ways. Figure 2 provides a rudimentary but useful typology for assessing how water management affects poverty

Type 1 actions are broad-based water resources interventions (including major water storage infrastructure) that provide national and regional economic benefits that extend to all, including the poor.

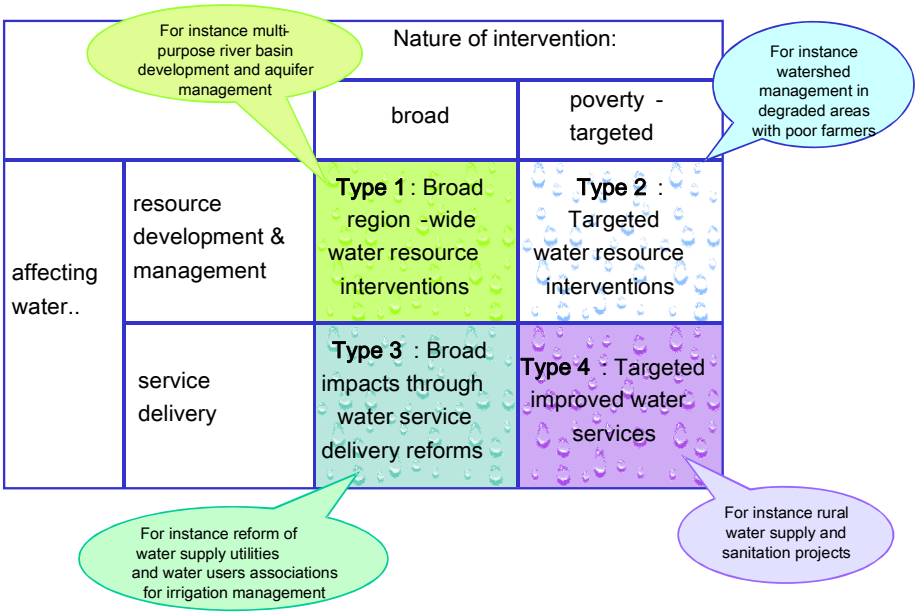
Type 2 initiatives improve water resources management - such as watershed projects in degraded environments - in ways that directly benefit poor people because it is usually the poor who inhabit degraded landscapes where improvements of catchment quality and provision of livelihoods for the poor are of major importance.

Type 3 measures are broad-based interventions in the water service sectors - aimed at improving the performance of utilities, user associations and irrigation departments – benefit everyone, including the poor.

Type 4 programs provide targeted services (including water and sanitation, irrigation and hydropower) to the poor. They play a major role in reaching some of the Millennium Development Goals.

In most developing countries, growth-oriented, poverty-reducing water strategies would ideally involve action in all four of these areas. This is highlighted in Figure 2 below.

Figure 2. Types of Water Investments and Their Impact on Growth ad Poverty Reduction



There are several main observations. First, water policies and investments affect the poor in a variety of direct and indirect ways, most of which are important in most contexts. Second, broad interventions (Types 1 and 3) generally stimulate growth and revenue because they affect the economy as a whole. Third, targeted interventions (Types 2 and 4) usually depend on subsidies. Fourth, there are also important distinctions between the impact of management interventions (where the benefits are often indirect and long-term) and the impact of investment and development projects (which are direct and immediate). Fifth, there are distributional distinctions between the poverty impact of rehabilitation (which benefits those who benefited from the initial investments) and new projects (where new people benefit and which are usually more equitable).

A viable way for countries to strategically plan their water strategies would be for them to contemplate a blend of all of these interventions in a broad and systemic manner and directly targeting the poor. For example, well conceived water investments and policies would:

- Provide the basis for overall regional development and associated economic opportunities for the poor (Type 1 benefit).

- Improve watershed management—with associated benefits for the poor, who usually constitute the majority of people living in such degraded environments— and develop operating rules that specify ecological flows for the benefit of downstream riparians (Type 2 benefit).

- Include steps towards reform of the power, irrigation and water supply sectors, with broad benefits from which the poor and especially poor women benefit (Type 3 benefit).

- Provide targeted benefits to the poor who are resettled or otherwise affected by the project or who live in the vicinity of the project, and generate revenues that are shared in a way that directly benefit poor people (Type 4 benefits).

The following sections outline what the specific challenges and paths for action are in regard to: water resources management and development; water supply and sanitation services; irrigation, drainage and food security; the water-environment equation; and hydropower. .Each of these areas is different, but the underlying issues, investment and reform to maximize the potential of water for responsible growth and poverty reduction, are the same.

Water Resources: Towards Development *and* Management

The Challenge

Many developing countries face daunting water resources challenges as the needs for water supply, irrigation and hydropower grow, as water becomes scarcer, quality declines and environmental and social concerns increase; and as the threats posed by floods and droughts are exacerbated by climate change. As a consequence, there is a high and increasing demand for engagement by the world community, including developing and developed countries.

Lessons Learned

During the Rio Earth Summit process, a global consensus was forged that modern water resources management should be based on three fundamental principles (known as "the Dublin Principles"): (a) the *ecological principle*, which argues that independent management of water by different water-using sectors is not appropriate, that the river basin must become the unit of analysis, that land and

water need to be managed together, and that much greater attention needs to be paid to the environment; (b) the *institutional principle*, which argues that water resources management is best done when all stakeholders participate, including the state, the private sector and civil society; that women need to be included; and that resources management should respect the principle of subsidiarity, with actions taken at the lowest appropriate level; and, (c). the *instrument principle*, which argues that water is a scarce resource, and that greater use needs to be made of incentives and economic principles in improving allocation and enhancing quality.

A decade later, evidence is accumulating on experience with implementing the "Dublin Principles." A major review of industrialized countries (by the OECD) has concluded that progress has been difficult, slow and uneven and that even the most advanced countries are very far from full compliance with the Dublin Principles. Clearly, the situation in developing countries needs to be seen in this light and expectations regarding implementation of the Dublin Principles need to be adjusted in a pragmatic manner that helps developing countries move forward.

The Priorities: Where and How to Focus?

Most developing countries need to be active both in management AND development of water resources infrastructure. Water resources challenges need to be approached without preconceptions. Not all problems can be solved with infrastructure and, at the same time, in environments with minimal infrastructure, all problems cannot be addressed through better management. A balance needs to be struck between stakeholders in developing countries and donors and financial institutions alike in the analysis of needs and development of investment plans.

The main management challenge is not a vision of integrated water resources management but a "pragmatic and principled" approach that respects principles of efficiency, equity and sustainability, and recognizes that water resources management is intensely political, and that reform requires the articulation of prioritized, sequenced, practical and patient interventions. More explicit attention in design and implementation needs to be paid to the political economy of reform. This will mean recognizing that: (a) solutions have to be tailored to specific, widely-varying, circumstances, ; (b) broader reforms outside of the water sector (often relating to overall economic liberalization, fiscal and political reform) must be established providing pre-conditions for improving resource and service management; and (c) those who are willing to change must design reform programs and must be supported..

Providing security against climatic variability is the reason why industrialized countries have invested in major hydraulic infrastructure such as dams and inter-basin transfer schemes. Many developing countries have as little as $1/100^{th}$ as much hydraulic infrastructure as do developed countries with comparable climatic variability. While industrialized countries use most available hydropower potential as a source of renewable energy, most developing countries harness only a small fraction. . Because most developing countries have inadequate stocks of hydraulic infrastructure, **developing countries need to consider—and be assisted in—developing and maintaining appropriate stocks of well performing hydraulic infrastructure and in mobilizing public and private financing, while meeting environmental and social standards that benefit their populations.**

Water resources and the water service sectors thus need to be managed and developed in such a manner that they stimulate and underpin growth and reduce poverty. This requires countries to look seriously at the potential for policy change and to develop appropriate sources of financing.

Water Supply – Moving Beyond the Public vs. Private Debate for Providing Effective Services to the Poor

The Challenge

Improving access to water supply is a pillar for socio-economic development and poverty reduction. Water supply services contribute directly or indirectly to income generation, health, and education. The challenge is to translate the new priority setting of the Millennium Development Goals into improvements on the ground by:

- Mobilizing all actors to expand, improve and sustain water supply services;
- Ensuring cost-effective use of resources and their allocation to highest priority investment needs; and
- Increasing resource mobilization from all sources.

Facts and Figures

- Over the past 20 years more than 2 billion people have gained access to water supply.
- Over 1 billion people still lack access to improved water services.
- 3.5 million people die each day as a result of water-related diseases

Lessons Learned

Investment in infrastructure without policy and institutional reforms will be ineffectual. Reform includes foremost the introduction of sound policies and responsive institutions at all levels. Using the private sector or communities to deliver services can be an effective way to improve performance. However, overall control of the policy environment and of the resource always remains with sovereign governments. Decentralizing service delivery is key for rural water supply, requiring intensive capacity building efforts. While much can be gained by increasing capital efficiency, investments worldwide also need to increase.

- *Water supply is always paid for by someone, inevitably consumers or taxpayers.* Only service providers that generate sufficient cash can operate and maintain present systems and attract investments to expand services. At a minimum, revenues from consumers should cover operation and maintenance costs. Closing the revenue cycle depends both on reducing costs and increasing revenues.
- *Better water supply services require working through other sectors.* Water supply sector priorities can only be achieved if they are integrated into the government's strategic objectives and resources are allocated accordingly. Water supply policies should be implemented in an integrated manner with various sectoral policies, such as those for sanitation, health, and land use planning.
- *Sector institutions must be accountable to communities, either directly or through their representatives.* The traditional "top down" approach of service delivery has not worked. Experience in rural areas has shown that community-driven development results in more equitable and efficient management and a greater likelihood that water points will be maintained, user fees will be collected, and the water resource will be sustainable. The key action required today in rural water supply is to scale up successful pilots of community-driven development. In urban areas public officials, and public and private service providers should be made answerable for their policies, actions, and use of funds through formal elected bodies or informal community groups.
- *Building professional capacity to run institutions is the very basis of introducing and sustaining new sector approaches.* Policies, institutions and financial arrangements are only as good as the people who implement them. Developing in-country capacity comprising the full range of technical, managerial and operational disciplines is key to transforming the sector.
- *The poor in cities, rural areas AND secondary towns all need to be served.* Significant numbers of poor people are not benefiting from reform of urban utilities or rural service provision because they

live in secondary towns. Efforts must be made to improve service provision in these communities and to prepare them for longer-term expansion and development.

The Priorities: Where and How to Focus?

There is an urgent need to move beyond what has become a stale and polarized debate on public or private management. The debate is not about public or private but about sustainable access to safe water supply. Only by concerted action on the part of all parties can improvements be made.

Countries have to set and implement in-country priorities. Each country is unique and has to plan policy reform dialogue, capacity building, actual reform and development of infrastructure in an integrated, timely, and sequential manner.

The international water community must set global priorities to maximize the impact of limited resources. Support to countries where governments are committed to expedite the implementation of reforms and invest their own resources will yield quick results. However, reaching out to the poor will also mean engaging in countries at early stages of the reform process and over the long term.

Sanitation and Hygiene – New Approaches for Cleaner and Healthier Lives

Facts and Figures

- 2.4 billion people still live without improved sanitation.
- 4.0 billion people live without sound wastewater disposal.
- The urban population is expected to grow by 1 billion people in the coming 15 years, many of whom will live in unsanitary slums.
- 2.2 million people die from diarrheal diseases every year. Handwashing with soap can reduce diarrheal disease by one-third.

The Challenge

Despite significant investments in the water supply and sanitation sector over the past few decades, hygiene and sanitation continue to lag far behind when it comes to effective increases in coverage. Increased international attention to the issues of sanitation and hygiene, most recently reflected in the decision to include sanitation as an explicit, global target during the Johannesburg summit, provides an opportunity to intensify efforts to make sanitation improvements at household, neighborhood, city, and basin levels.

Lessons Learned

- *Sanitation and hygiene affect everyone.* Above all improved sanitation and hygiene offer health benefits at the household level. Away from the home, the provision of sanitation (sewerage, wastewater treatment and drainage) improves living conditions for others living in the neighborhood, city, or further downstream.
- *Behavioral change is essential and requires major efforts.* The energies of all parties need to be harnessed to promote and support changes in household behaviors, and water professionals need to team up with those involved in social marketing and health education. An important tool for behavioral change is school hygiene education that promotes practices to future generations.
- *The greatest sanitation challenge lies in the rapid growth of high-density slums.* Given the scale of the problem in urban areas, more emphasis should be placed on building sanitation firmly into the urban development agenda. Progress needs to be made on at least two fronts. First, the process of restructuring informal settlements needs to be accelerated and to integrate sanitation and hygiene. Second, the sanitation needs of informal slums cannot be forgotten, and the informal sector should be supported to serve these communities until restructuring.

- *Sanitation and hygiene is more than an add-on to water supply.* Benefits of improved sanitation and hygiene depend largely on investment decisions at the household level. Demand for sanitation lags behind demand for water, and willingness to pay is low. The order of introducing sanitation infrastructure, starting with household facilities and followed by public infrastructure, differs from water supply. The characteristics of sanitation and hygiene provision require distinct approaches rather than merely copying successful water supply management models.
- *A single management model will not be sufficient to deliver universal sanitation services.* Traditional supply-driven approaches in which services were planned and provided by professionals without reference to consumer preferences and willingness to pay often have not been sustainable. Successful programs require more widespread stakeholder consultations and the subsequent matching of supply to demand. Innovative ways of providing access to sanitation and hygiene need to be developed, piloted and scaled up, including promoting public-private partnerships.
- *Better sanitation services require action in other sectors.* Sanitation strategies must fit into the existing broader city or rural development strategies and economy-wide priority setting, and should be implemented in cooperation with other sectors. Reaching the poor will require engagement with policy and regulatory processes, and the integration of sanitation and hygiene within broader local government reform initiatives, land use policies, building codes, and solid waste policies.

The Priorities: Where and How to Focus?

Concerted action by all parties, communities and governments as well as NGOs, private sector, international organizations and academia, is needed to make progress.

Countries need to develop their own priorities and strategies based on local aspirations and available resources. Country strategies should include policies to close access and financing gaps and building institutional capacities to execute and scale up sanitation service delivery.

The international water community must support countries through concerted action and long-term engagement to cement results. This includes development of new approaches to managing and financing sanitation, capacity building, and financial assistance.

Irrigation and Drainage: For the Poor, Food Production Never Goes Out of Fashion

The Challenge

Irrigation and drainage have been successful for food production, poverty reduction and regional development, but donor financing has declined dramatically: irrigation is no longer "in vogue." Improving irrigation and drainage systems is essential for achieving the Millennium Development Goals of poverty and hunger reduction, and will influence achievement of sustainable development, but the sector is now facing new and conflicting challenges:

- Achieving food security under increasing food demand, water scarcity and environmental concerns;
- Implementing simultaneous actions for institutional reforms to introduce accountability, more farmer participation and investments in modernization and

Key Data

- Irrigated land (about 250 million ha.) produces 40% of food on 17% of the agricultural land. This percentage should increase to 50% in the next 25 years.
- 90% of food production increase in the next 25 years is to come from existing land. That means a need to double the productivity of irrigated land.
- Irrigation consumes at present 67% of the water, but in many developing countries this percentage is much higher.
- New water supply for urban and industrial uses and for the environment will come increasingly from volumes transferred from irrigation.
- There is a need to double investment in irrigation and drainage modernization for food production and for water supply to other sectors.

rehabilitation of existing irrigation and drainage infrastructure to improve efficiency; and
- Obtaining more transparent, accountable and efficient public financing with increased participation from users and the private sector.

Lessons Learned

- *Given present trends there is likely to be only a minimal number of new publicly financed surface water irrigation systems.* This is due to a number of factors: (a) the high and rising cost of new systems; (b) low agricultural commodity prices, which reduce the economic return of new irrigation investments; (c) significant environmental costs of increasing water demand on rivers and aquifers; and (d) fiscal constraints that reduce available public financing for the sector.
- *Modernization and rehabilitation of irrigation and drainage systems and improved operation and management are key actions* to diminish water logging and salinity, increase water efficiency, improve agricultural productivity, reduce poverty and minimize negative irrigation and drainage impacts on water ecosystems. These interventions are needed to restore sustainability of the irrigation and drainage systems and to cope with the dramatic increase in productivity and output of land and water required to provide food for the increasing urban population of developing countries while expanding the income of farmers in rural areas.
- *There is a need to better align irrigation and drainage institutions* by reviewing the roles and responsibilities of governments, users, civil society and the private sector. Transferring responsibilities for operation, maintenance and management of irrigation and drainage systems to organized user groups, including full operation and maintenance cost recovery, should be encouraged. Benchmarking of irrigation and drainage systems is a necessary management tool to improve performance and accountability.
- T*here is scope for sharing infrastructure improvement costs with farmers and other sectors*, and that this mechanism should receive more attention. Improved financial mechanisms are needed to enable farmers, as well as farmers' organizations, to participate in cost sharing. Beneficiaries can make significant financial contributions for drainage improvement, particularly at the farm level. Other sectors benefiting from water transfers from irrigation systems should contribute to investments for modernization.
- *An efficient system of water rights and volumetric delivery,* which can support a market of these rights, has the potential to become an incentive to increase efficiency (less efficient users can transfer water temporarily or permanently to more efficient or higher value users). New financial instruments are needed to enable farmers to use water rights as collateral for credit. This will help farmers to share the cost of modernizing and rehabilitating irrigation and drainage systems.
- *Where irrigation systems are not viable due to financial or environmental factors that cannot be mitigated, the systems should be re-dimensioned.* However, maintenance of non-viable irrigation systems may be preferred for a period when the social and economic costs of resettling people are taken into consideration. Irrigation systems with high pumping costs, often found in countries with transition economies, need special attention. Over-exploited aquifers also involve sustainability and management of common property resources that need to consider public participation and the involvement of relevant environmental agencies.

The Priorities: Where and How to Focus?

- The new "global deal" on water in general is needed for irrigation, too. Developing countries should use public finance with greater fiscal responsibility (lowering subsidies on water and energy), facilitate private sector involvement in irrigation and drainage, and promote strong and autonomous water user organizations with responsibility, authority and effective cost recovery for operation and maintenance. Developed countries should more widely share scientific knowledge and technology, promote models of good governance in operating their own irrigation and drainage systems, and also reduce agricultural subsidies that limit the markets for

developing country agricultural production. Developed countries should also finance improvement of irrigation and drainage schemes in developing countries through their development aid programs.

- The international community needs to identify and capitalize on good practices for irrigation and drainage financing, including more farmer participation. This should include simplification of the irrigation project preparation process to reduce costs and lead time while maintaining an emphasis on factors for success. Conditioned on country specific needs, public-user-private partnerships may be useful for construction, improvement and operation of irrigation and drainage systems.
- Innovative instruments are needed to support irrigation farmers, especially smallholders, in adapting irrigation technology, improving their irrigation application and shifting to higher value crops. This can help farmers to increase their irrigated area, improve productivity and facilitate access to markets. This is also a promising area for changing from adverse subsidies on factors such as energy, water, and fertilizer, which lead to environmental degradation, to virtuous subsidies that foster innovative and sustainable irrigation practices.

Environment – the "poor cousin" is a key stakeholder to achieve responsible growth

The Challenge

Water resources—watersheds, rivers, wetlands, lakes, aquifers, and floodplains—are essential for the sustenance and health of all species. They form the basis of human life and economic development, provide receptors for wastewater discharges and sustain the integrity of ecosystems that serve important ecological and hydrological functions.

Unsustainable use and management practices due to poor environmental, social or economic policies and actions are increasing the stress on the world's water resources. Threats arise from the degradation of water resources at local, basin and transboundary levels, and from global climate variability and change. The resulting hydrological, ecological, and economic consequences are significant. They can:

- Threaten the ability of the water resources to provide basic hydrological and ecological services that water supplies and energy utilities depend on.
- Cause irreversible damage to already stressed resources.
- Undermine investments in water supply, irrigation, and energy services.
- Affect downstream freshwater, coastal and marine resources, and communities, often the poor, who depend on these resources.

Climate variability and change impose huge costs on national economies and impact water supply and demand, not only climate sensitive uses such as agriculture and irrigation, but also urban and energy supply and use.

Lessons Learned

- *Managing the environmental dimension of water is essential to sustain the basis for economic development, growth and poverty reduction.*
- *Environmental objectives cannot be managed separately from consumptive objectives.* Both must be integrated into water policy reforms, water resources planning, management decision-making, and be properly funded and supported.

- *Environmental Impact Assessments are useful tools* for predicting potential impacts of large infrastructure projects, but these impacts are often not managed because of inadequate water policies, absence of guidelines (e.g., environmental flow assessment), capacity constraints, and lack of commitment and political will.
- *Freshwater lakes and reservoirs, the major source of water for human consumption, are deteriorating.*
- *There is little understanding of the importance of the functions provided by aquatic ecosystems.* Halting loss and degradation of ecosystem functions need to be a priority in important watersheds, recharge areas, and wetlands.
- *Failure to use economic instruments* to manage water demand, guide allocation, and control waste discharge results in inefficiencies.
- *The downstream impact of drainage and sanitation projects* is often under-predicted.
- *Invasive weeds, fish and other species impose high costs on communities*, particularly the poor.
- *Water and energy utility management reforms, public and private, need to be accompanied by strong water resources and environmental regulatory reforms.*

Major Threats*

- Over abstraction (Aral Sea) and excessive river regulation (Australia, Yellow River, China) compromise ecosystem functioning and can cause tensions and conflicts in water scarce regions (e.g., Kenya).
- Unsustainable pumping of groundwater (e.g., Yemen and Mexico) — 10% of the world's agricultural food production depends on mined groundwater which causes land subsidence (Bangkok)and saltwater intrusion in coastal aquifers (Gujarat, Bahrain, Java, Saudi Arabia).
- Lakes store over 90% of the world's freshwater, yet global attention is not focused on them.
- Water pollution from municipal, industrial, mining, livestock, and agricultural discharges increases public health problems and affects downstream uses (e.g., India, China, Brazil, Mexico and many other countries).
- Degradation of catchments and recharge areas impacts water supply (Kenya) and contributes to flooding (Yangtze River, China).
- Drainage, salinity, and toxicity affects agricultural productivity (e.g., Pakistan, Rajasthan, and other semi-arid regions).
- 50% of the world's wetlands have been lost along with the important functions provided by those wetlands.
- The rate of freshwater fish species extinction is five times that of salt water species.
- Aquatic weeds are proliferating (SADC Region, Lake Victoria, Senegal, Sudan, Orissa (India).

The Priorities: Where and How to Focus?

- The environment cannot speak. Yet, environmental functions are vital for development. Therefore, countries need to ensure that the water flows and water quality needed for ecological functions are factored into water resources planning and management (including the conduct of environmental assessments), because of the links between functioning aquatic ecosystems and health, poverty reduction, and economic growth.
- Accordingly, countries need to adopt a framework that provides incentives for ensuring that water resources planning, development and management includes environmental considerations.
- Country and sub-national governments need to ensure that river basins are used as the basis for planning and managing water resources units (linking upstream and downstream uses as well as all sectoral uses) and that environmental objectives are integrated with consumptive objectives in planning decisions.
- Governments need to support a shift from remedial to preventive action to manage water quality degradation from point and non-point sources and introduced species, particularly in vital water bodies such as lakes, wetlands and groundwater systems.
- Water needs to be valued (in its dual dimensions of quantity and quality) as a truly, and increasingly, scarce resource.
- Reuse of wastewater and demand management need to be central elements of water and energy sector investment in water scarce areas.
- Water managers need to incorporate impacts of climate change and variability into water resources planning and management, including adaptive planning, strengthening predictive and forecasting capability, and developing strategic drought management strategies.

Water and Energy – Managing for Growth

The Challenge

The 2002 Earth Summit in Johannesburg called for the increased use of renewable energies, with one of the major sources of renewable energy being hydropower. The challenges facing hydropower fall into two categories: financing and public acceptance.

Financing challenges are due to:

- The capital intensive nature, with costs being recovered over a design life typically five times the maturities of commercial loans.
- High fixed costs (capital charges and operating) resulting in much higher exposure to regulatory and market risks than for thermal alternatives.
- High proportion of civil costs resulting in increased development risks because of geological uncertainties.
- High proportion of local costs, which are difficult to finance with export credits, the traditional source of private power financing.
- Longer gestation periods, which unfavorably impact the risk profile.
- Uncertainty about output due to variable hydrology.
- Higher costs of environmental and social mitigation measures compared to alternatives.

The challenge of gaining public acceptance arises from public perception (sometimes real, sometimes not) that environmental and social impacts are greater than thermal alternatives and the belief that other renewable energy sources can fulfill all future demand requirements.

Facts and Figures

- Today, hydropower provides about 19% (2,650 TWh/yr) of the world's electricity supply.
- The remaining economically exploitable potential is about 5,400 TWh per year, about 90% of which is in developing countries.
- In rich countries over 70% of economically-viable hydropower is developed; in Africa the corresponding figure is only 3%, and in developing countries overall it is about 20%.
- Large hydropower development programs are underway in some countries (notably China) with adequate local finance, but there is little development in countries that rely on external funding.
- In the private power boom of the early 1990s, hydropower only accounted for about 2.5% of capacity developed.

Lessons Learned

- *Hydropower needs to be considered as one of the options for a country's development needs.*
- Future development of hydropower in most developing countries will be very limited if it is left entirely to the private sector. While pure public financing might be appropriate in very poor countries, the magnitude of required investment will probably dictate public-private partnerships in most developing countries.
- The key to public acceptance is the recognition that affected communities and natural resources are clearly beneficiaries rather than losers due to a hydropower project.

The Priorities: Where and How to Focus?

Governments and public power purchasers can help to overcome the challenges by:

- Arranging upstream basin and sector studies, instituting water basin development and management strategies, and promoting realistic options assessments, feasibility and preparation work, such as site investigations and surveys at selected project sites, before engaging the private sector.
- Planning and managing hydropower investments from an integrated water resources management perspective that takes into account other uses, such as the farmers (dependent on downstream flows) and environmental streamflow needs.

- Putting in place an appropriate regulatory and power purchase framework that helps to overcome the financing difficulties through measures including deferred taxation, tariff certainty, and valuation methodology that recognizes system benefits such as peaking and ancillary services as well as community benefits arising from avoided atmospheric emissions.
- Providing incentives for acceptance of an appropriate proportion of risk in line with the principle that risk should be borne by the party best able to manage it.
- Acceptance of techniques for equalizing the power purchase prices, at least over the duration of debt repayment, in order to lower this price in the initial years of the power purchase agreement.
- Arranging credit support for loans for project development.
- Providing local currency equity or loans.
- Facilitating participation by, and consultation with, affected communities and mitigation of social impacts.
- Devoting a proportion of net revenues of the project to improvement of the welfare of affected communities and the environment in the project area.

Multilateral and bilateral institutions can help by:

- Financing the upstream and preparation work within an integrated water resources management perspective.
- Assisting to develop appropriate regulatory frameworks.
- Providing partial risk and partial credit guarantees to private developers.
- Financing public portions of multipurpose projects, government equity contributions and government loans to the developer.
- Ensuring that environmental and social impact assessments and mitigation plans are to the highest standards, enabling the materialization of planned benefits.

Developers (whether public or private) can contribute by:

- Preparing environmental and social impact assessments and mitigation plans to the highest international standards.
- Ensuring that project design incorporates measures that mitigate negative environmental and social effects and enhance positive impacts.
- In full consultation with affected communities, developing forward thinking resettlement plans, which treat resettlement as a development opportunity, so that affected people are better off after the project than before and their ability to develop further is enhanced by the project.
- Using environmental mitigation funds as a development opportunity.

Creating the Incentives for Reform and Increased Investment

The Challenge

The water sector in most developing countries is at a crossroads, where business-as-usual equals inadequate and unsustainable use of water and financial resources, sub-optimal economic growth and increasing social tensions. A central challenge for governments, municipalities, basin organizations and water user associations is to carry out the necessary water reforms, be it:

- water resources development and management;

- the provision of adequate water supply and sanitation services to the urban and rural poor,

- the harnessing of water's energy potential;
- the factoring in of environmental and ecosystem needs in water management decisions; or,
- the need to feed a growing world population.

Policy changes are urgently needed in all these water-related activities.

What Do Reforms Do and Why Are They a Priority?

Reforms change the incentives for those involved in the sector—water users, government officials, water service providers, investors. Incentives need to be changed in order to increase financial flows to the sector, achieve better returns on investments, and improve performance by managers and water users.

Key incentives originate from the degree of transparency in decision- making processes, the involvement of stakeholders, the prices water users have to pay, their perception of their rights to water resources and to water services, and the enforcement of regulations and laws.

Transparency and involvement of stakeholders. Government officials need to have an incentive to make the best decisions about the allocation of financial resources to investments and management. Examples from many countries show that when civil society receives information and is consulted, then a higher level of transparency is achieved and decision- making by government officials at different levels more directly takes into account the needs of different stakeholder groups, including the poor and the environment.

Similarly, water management changes often require tough decisions. For instance, in many semi-arid and arid regions water resources are nowadays over-allocated, effectively not providing enough water for all. To re-establish a balance, consumption patterns need to be changed, water resources may need to be reallocated between sectors and some users may need to agree to use less water. Politically feasible and, usually voluntary, reallocation mechanisms must be given priority. Similarly, in the water supply and sanitation sector, long-term sustainability of water utilities and expansion of services to excluded segments of society can often only be achieved when current water users, especially those who are better-off, pay a higher tariff. Stakeholders are much more likely to agree to improved management, even when changes may hurt them in the short run, when their interests have been taken into account and options have been discussed. Therefore transparency, access to information, involvement of stakeholders and decentralization of decision- making is essential as a step of the reform process and to make reforms succeed.

Pricing of water and water services. Pricing a resource or a service has two functions. First, it provides the user with information on the value of the resources or the service, inducing more considerate use than if it were free. Second, the income derived from the tariff is the basis for building new and maintaining existing infrastructure. Water and water services have traditionally been under-priced, resulting in inefficient use by those who have had access to cheap water, for instance in agriculture, and in households and industries. It has also led to a dearth of financial resources where the water sector has not been self-financing, but has lived from subsidies. Therefore, more investment in the water sector, be it from public or private sources, must go hand in hand with the recognition that water pricing is an essential instrument to enhance the sustainability of the resource, expand services, including operation and maintenance of water utilities and irrigation systems, and maintain water resources management functions, etc. Most improvements in the water-related sectors will not occur if governments do not consider developing socially acceptable pricing and tariff policies.

Water rights and obligations. Realizing the potential of water as a fundamental resource in a country's economy requires significant efforts, including harnessing the water resource, putting efficient and equitable allocation mechanisms into place, building structures, motivating good performance of water utilities and irrigation districts, and providing for effective drought and flood management. All these actions are interconnected. They require management capacity, investment, and information as well as a long-term vision for the sustainability of the resource. The assignment of water rights is essential in ensuring this long-term vision and inducing efficient and sustainable water (service) management and facilitating voluntary reallocation of rights. Water rights also incorporate obligations by stakeholders to take care of their resource. For this reason, policy changes need to include the definition of a water rights system which may consider both individual and collective water rights, depending on the cultural context in the country.

There is no unanimity on the concept of water rights, for some see this as an unhealthy commodification of a public good. Nor is it meant to imply that it is simple to introduce rights-based systems for a fugitive resource with deep cultural implications in administratively weak environments. On the other hand, there has been substantial progress in recent years (in Chile, Mexico, Brazil, and South Africa), and there are pressures from the local level (villagers who have stored rainwater in Rajasthan, for instance) to the international level (between the United States and Mexico, for example) to define the rights to use an ever-scarcer resource.

In doing this, it is necessary to clarify that in most countries water is publicly owned and that a water right is usufructuary —it is a right to use, not a right to own water. Water rights (of individuals and communities, including traditional users) enjoy the same legal certainty as land and other property rights. Once established, such rights give rise to a series of fundamental and healthy changes. First, those requiring additional resources (such as growing cities) will frequently be able to meet their needs by acquiring the rights of those who are using water for low-value purposes. Second, there are strong incentives for these latter users to voluntarily desist, making reallocation both politically attractive and practical. Third, the establishment of formal water rights gives rise to strong pressures for improving the data required to manage the resource. And fourth, this reduces the pressures of a "race to the bottom," since those who have rights have a powerful interest in sustainability.

Starting the Virtuous Cycle. With these building blocks; namely,: incentives through transparency and information; stakeholder involvement and decentralization; incentives through definition of rights and obligations; and incentives through pricing as a tool to ensure mutual obligations of suppliers and users; and to signal the value of water and services, a virtuous cycle can be started that enables countries to actively tackle their water challenges.

Adapted to the economic, social, and cultural circumstances of individual countries, appropriate policy changes can be designed that enable the mobilization and productive use of financial resources for investment in water, open the door for governments, public and private sectors, individuals, international financing organizations and donors to contribute to responsible growth.