

Part 1. Summary

Summary / Deborah Moore and David Seckler

Earth is the water planet—almost 70 percent of the earth's surface is covered by water. Indeed, water is the essence of life for people, plants, animals, and ecosystems alike. Adequate water supplies are critical for development of drinking water supplies, agriculture, and industry, but water scarcity and pollution crises are ignored around the world.

Despite enormous expenditures by national governments and international aid agencies like the World Bank, supplying water for food production, drinking water, fisheries, and environmental protection has not kept pace with population and economic growth. The loss and degradation of rivers, lakes, wetlands, and other water-dependent ecosystems around the world has been the result, along with declining human health. In addition, large amounts of precious fresh water are wasted or are dissipated in very low value uses. The question becomes, "Is there enough water to go around?"

The conventional approach to meeting new water demands has been to develop new supplies by building large dams. However, such dams have become very expensive, they destroy aquatic habitats, and they often displace local communities. If we are to succeed in fulfilling human needs for water, we must find means to do so that are compatible with maintaining water-dependent ecosystems and with respecting local and indigenous communities' needs. Therefore, another question is, "What are the means of supplying water in environmentally sustainable ways, and how can we shift our investments and policies to support these means?"

On March 4, 1993, the Environmental Defense Fund, a U.S.-based nongovernmental environmental advocacy group, and Winrock International, a nongovernmental research and policy institute focused on development issues, convened a 1-day round table discussion of researchers and policy advocates to try to answer these questions and find solutions to water scarcity problems in developing countries that reconcile the goals of economic development with environmental protection. The purpose of the meeting was to take the first step toward bridging several gaps we perceived between groups and interests involved in the field of water resources management. Research and advocacy organizations are often working on similar issues, but with different strategies that may or may not be complementary. We hoped to begin building a bridge between the development community and environmental community working on solutions to water scarcity, particularly in developing countries.

By bringing together experts from different communities that do not often communicate with each other, namely research and advocacy organizations, we hoped to better understand the opinions, positions, and priorities regarding strategies to combat water scarcity. During this meeting, we had the opportunity to introduce each other to our work in this field and to identify areas of agreement and overlap where there may be synergism. We wanted to make the developmentalists aware of environmental and social equity considerations, and we wanted to make environmentalists aware of economic and development considerations. We wanted to generate a list of the barriers or

obstacles constraining the achievement of improved water management and to specify institutions and policies that need reform.

There are several opportunities where a broader consensus and constituency will be useful. For example, the World Bank will soon complete its water resources policy statement, which is intended to guide its investments in water over the next few decades. Comments from outside the bank will be needed when it develops regional and country strategies for implementing the new water resources policy. Similarly, the World Bank is embarking on a process to create an agriculture policy. The Sustainable Agriculture for Rural Development program of the U.N. Food and Agriculture Organization is also getting under way. Finally, the U.S. Agency for International Development is continuing to re-think its involvement in the water sector. All of these efforts provide opportunities for the research, advocacy, development, and environmental communities to work together toward common goals. A preliminary scoping of the range of positions and strategies is necessary, however, before such collaboration can begin in earnest.

We are publishing the proceedings of this meeting to further facilitate a dialogue among the various interests that are working to solve water scarcity problems with the hope that together we can formulate consensus on appropriate priorities and strategies. This summary of the meeting covers the main points made by participants, the priorities identified, and the areas of agreement and disagreement about appropriate strategies to combat the problems identified.

The format of the meeting included two overview presentations to define the area of debate over trends in global water supplies and demands, the potential of water conservation and re-use to meet new demands, the need to develop new water supplies, the importance of protecting aquatic ecosystems, the role of international institutions, and the prospects for policy reform and innovative approaches. The overviews were followed by open discussion of the issues presented. Four small working groups then identified priorities for research and advocacy during lunch. The afternoon was spent defining strategies to address the priorities identified.

Overview of the debate: How to meet new demands for water without sacrificing the environment

The world's ability to supply water in adequate quantities and of adequate quality now and in the future depends on many factors: the amount and rate of change in water consumption of the global population; global food requirements; precipitation patterns and impacts of global climate changes; the amount of water needed to maintain rivers, lakes, wetlands, and water quality; and the technologies and policies societies choose to manage their water supplies. Our debate centered around the potential for water-use efficiency and conservation improvements to save enough water to meet new human demands and to satisfy environmental needs for water. Related to this central theme, various opinions were expressed over trends in food supplies and urban water uses, the need to develop new water supplies, the advantages and disadvantages of water pricing and water marketing, the effectiveness of conventional versus indigenous and alterna-

tive approaches to irrigation and water management, and the relevancy of the experience with conservation in the energy sector. Many participants were interested in formulating consensus around the issues of large dams versus small dams and of finding viable alternatives to large dams, in large part because of a desire to change the priorities and investment strategies of international aid and development institutions like the multilateral development banks. Significantly, we found that there is widespread agreement over the goals of satisfying human needs for food, water, and economic opportunities while simultaneously maintaining the viability of water-dependent ecosystems and environmental quality. However, there is still considerable debate over the appropriate means or methods of reaching these goals.

Deborah Moore, staff scientist for the Environmental Defense Fund, presented an optimistic case that future human needs for water could be met without sacrificing environmental quality through greater emphasis on water-use efficiency and conservation, particularly in the irrigation sector, through transfers of water from irrigation to urban, industrial, and environmental uses, and through new sustainable alternatives to conventional large-scale water development. Ms. Moore identified the lack of local public participation, vested political and economic interests, and inadequate financing of, and research on, alternatives as the primary obstacles to shifting to a sustainable approach to managing water resources. She recommended changing the investment and procurement strategies of the multilateral development banks that fund water projects to ensure that all alternatives and views are considered in the project and policy design process.

David Seckler, director of Winrock International's Center for Economic Policy Studies, presented a more pessimistic case that human needs for water may outstrip supplies despite efforts at conserving existing supplies as well as developing new ones. Dr. Seckler discussed the "illusion of water conservation," or the difference between increasing water-use efficiency at the project level versus saving water that was previously consumptively lost to the system as a whole. He identified environmental needs as one of the biggest constraints to satisfying human demands for water and argued that water conservation and new technologies will not substitute for large-scale dams in the long term. Instead we will need to utilize all the available options, including conservation and small-scale projects, as well as conventional large-scale projects.

The following sections describe the primary areas of debate, issues raised, and conclusions reached.

Water conservation and reallocation: Are the savings an illusion?

A central question in developing a new approach to supplying water is whether the savings from efficiency improvements and conservation activities are real, i.e., do the savings represent a new quantum of water that can be supplied for another use? For example, if drip irrigation technologies are used instead of flood irrigation, how much water is saved that did not previously return to the river or aquifer, and can this saved water be transferred to another consumptive use?

In the discussion, this question was defined as the difference between project efficiency and basin efficiency, or the difference between "wet water" and "dry water" savings, or the difference between saving water previously returned to the system (return flows) and reducing consumptive losses. Many examples were given where improvements in one irrigation use simply deprives an adjacent irrigation use that depends on that "waste," such as in Egypt's Nile River basin. It is true that water is never really lost—it reappears as groundwater recharge, return flow to a stream, or evaporation to the atmosphere. However, it is also true that water that is wasted may not reappear in the same system. It may be lost through surface and subsurface flows to the seas or deep percolation to aquifers, return to the stream in lower quality, evaporate before reaching the crop, or be used for a product worth less than the cost of supplying the water. In addition, flows in the stream may be excessively depleted if more water is diverted than is really required for the particular use, such as crop production. Finally, there are measures that can cut the consumptive use of water, such as switching from water-intensive crops to crops with lower water requirements.

The concern raised over relying on water conservation and efficiency improvements, especially in the irrigation sector where most of the world's available water supplies are used, is that the gains will not be enough to keep pace with increasing demand for water and food in the longer term. In addition, some participants were concerned about taking irrigated land out of production to transfer the water to satisfy growing urban and environmental water demands, at the same time that demands for food require increasing the lands under irrigation. There were a few participants who believed that "efficiency improvements" produce almost zero real water savings.

While agreeing with the necessary distinction between wet water and dry water savings, most participants recognized that there are many environmental benefits to reducing the amount of water necessary to deliver to a farm or a city. Environmental benefits include increasing the amount of water remaining in a stream reach, enhancing low stream flows during critical periods, and improving water quality by reducing polluted return flow. In addition, in some cases the water saved may be enough to substitute for a new dam or imported water. Water conservation technologies can also be far cheaper than new infrastructure programs.

So, the ultimate questions remain: How much water can be saved, and is it enough to satisfy the projected new demands? Therefore, while there was considerable disagreement among the participants over the details of gains from conservation and efficiency potentially available in specific localities, the consensus was that reducing waste and improving efficiency has potential to reduce the costs of new water supplies and wastewater treatment, to make more water available for other non-irrigation uses, and to reduce diversions of water from rivers, lakes, and wetlands. There was also a lot of discussion about the true nature of future food demands. If the estimated doubling in demand for cereals is too high, then the result could be the development of surplus irrigation capacity at great socioeconomic and environmental expense. If, on the other hand, the estimates of the potential to change the nature of food demand from meat to grains are not correct, then we may risk retarding the necessary agricultural develop

ment and causing hardship and environmental damage as water is diverted to other uses.

There was general agreement that more data collection, monitoring, and research was needed to better quantify and separate the net savings due to efficiency improvements from the uses supported by return flows, groundwater recharge, and in-stream flow enhancement, among others. Furthermore, to ensure that all of these linkages and interdependencies are considered, participants agreed that the appropriate unit for evaluation is the hydrologic basin or watershed.

Efficiency gains in the energy sector: Are they analogous in the water sector?

While many acknowledge that water scarcity has the potential of becoming the next "oil crisis," the lessons learned from the energy sector about increasing productivity without increasing supplies have not been fully applied in the water sector. Despite significant physical differences between water and energy, the analogy is worth exploring further. For example, since 1973, GNP in the U.S. has grown while energy consumption has remained stable until the last few years. The story for water use in the U.S. is similar, particularly in the industrial sector. For those interested in promoting economic development, it is critical to look at ways of increasing the economic output, whether industrial or agricultural, with the water available. This involves using water more efficiently, as well as making social and economic choices about the most appropriate and beneficial use of limited water supplies.

The two historic drivers in energy policy have been the price of energy and national security issues, particularly related to oil. Soaring energy prices in the mid-1970s made conservation economically competitive. In addition, the rising capital costs of building new power plants, especially nuclear plants, as well as public opposition and new environmental regulations made construction of new plants extremely expensive. Furthermore, the political costs of reliance on foreign oil supplies made developing alternative sources of energy, including efficiency improvements, more attractive. So, substitutions were made, technological innovations were developed, and consumer habits were changed, with the result being greater economic output for the same energy use.

In the water sector, prices have not yet risen to the level where they are driving conservation. However, limits on supply and water quality are forcing substitutions in the industrial sector. The economics of large dams, as well as growing public opposition, is beginning to force water supply entities into examining alternative options more closely. By obviating the need to build new dams and water diversion projects or by reducing the capacity required, water conservation and water-use efficiency improvements can help protect remaining river and wetland environments. A final similarity with energy is that many countries are experiencing rising tensions over their reliance on foreign sources of water. The Nile River basin between Egypt and Sudan is one example, and others can be found throughout the Middle East. The political and military costs of maintaining foreign water supplies may make the conservation of existing internal supplies more attractive.

Many differences between water and energy were outlined, as well. In energy, the energy wasted is truly lost or dissipated as heat. With water, on the other hand, some water is lost to evaporation, but the balance can end up downstream supporting some other use. There is only a net benefit if the use of the water saved is more valuable than the previous use supported by the "wasted" water downstream. Some participants believed that there are few factor substitutions for water that can be made, particularly in the irrigation sector, without sacrificing yields. Others believed that there are substitutions or choices that can be made in the irrigation sector that would significantly reduce the consumptive use, such as switching crops and improving irrigation scheduling. Finally, the consequences of raising water prices substantially, and hence possibly raising food prices, may be detrimental to human welfare.

Despite such physical differences, however, the processes that have led to changes in the energy sector, and the extent to which there are parallel processes in the water sector, are worth examining further if we are to develop a strategy to influence institutions, technologies, and economic and environmental policies.

Large vs. small projects: Is there a clear preference?

During the last decade or so, the construction of large-scale dam projects (over 250 feet high) has become increasingly controversial for social, environmental, and economic reasons. A famous example is the World Bank-financed Sardar Sarovar Dam in India, which was projected to cost more than \$5 billion, to adversely affect several hundred thousand people, to inundate 25,000 hectares of forest and agricultural lands, and to harm fisheries downstream. The benefits were to produce 415 megawatts of hydropower, to irrigate 1.9 million hectares, and to provide drinking water to hundreds of thousands of people. After years of substantial worldwide public opposition to the project, the Government of India recently asked the World Bank to stop financing the project because it could not meet the environmental and resettlement conditions the bank had imposed.

Opponents of large dam projects want to find alternative means of providing the necessary water and power supplies that will have fewer social and environmental impacts - options such as conservation, transfers, small-scale irrigation, and enhancing rainfed agriculture. Proponents of large dams, on the other hand, believe that the alternatives are not substitutes for large dams, but rather complements that will not work in many situations. The challenges are to develop greater consensus regarding (1) the mechanisms to make the alternatives feasible, thereby limiting the need for more large dams, and (2) the conditions under which large dams may be acceptable, if the alternatives are found not to be feasible in a particular case.

Participants who defined themselves as primarily in the development community believe that large dam projects provide more carryover storage necessary to supply water through long dry periods than do small dams. Some argued that the economic returns for large projects are more favorable, although many internal evaluations of World Bank-financed large dams show fairly dismal economic results. In addition, for large projects, the opportunity cost of capital and the long time required for construction

before benefits begin to accrue make the financial investments huge and risky. Finally, most participants agreed that fewer large projects are easier to manage than hundreds of smaller projects from the perspective of a government or an international institution like the World Bank.

The participants from the environmental community tended to prefer small projects, while agreeing that there are currently many unknowns and disincentives surrounding small-scale projects and other alternatives. Smaller projects have shorter implementation time frames, thereby producing benefits sooner and freeing up capital for other uses. There was not agreement that large projects are more cost-effective, since many traditional and indigenous technologies for irrigation and watershed development are quite inexpensive. In addition, such community-based knowledge of the water system may optimize many local conditions of which outsiders are unaware, such as resolving community conflicts over water rights. While some small-scale projects may not be cheap, the risk of making a very expensive mistake is smaller than with a large project. Furthermore, although the relative gains in efficiency or productivity from a small irrigation or rainfed agriculture project may be small compared to their large-scale counterparts, the smaller gains may be spread over a wider area resulting in substantial absolute increases in production. Finally, there are many non-monetary benefits to smaller, community-based water and agriculture projects, including developing local institutional capacities, management skills, and self-reliance, as well as having smaller environmental impacts and providing benefits that are more equitably distributed.

The debate over large-scale versus small-scale water projects, led the participants to discuss the assessment process needed to better evaluate both the large- and small-scale approaches. Clearly, improved public and community participation in designing, implementing, and managing projects is required in all projects. Often, indigenous knowledge may be more amenable to a smaller scale approach. In addition, financial and economic accountability and transparency need to be created in the decision-making process. In this way, alternatives to large dams will be given equal consideration and validity in the evaluation process. The evaluation also must consider downstream environmental effects and incorporate measures to eliminate or reduce, not just mitigate, such effects. Similarly, compensation for affected communities and individuals must be included in the assessment. Lastly, the evaluation process should be based more on probabilities, or actual track records of the particular institution with large projects, than on possibilities or hoped-for results. Perhaps some kind of risk assessment that includes environmental and social risks can be utilized.

From the discussion, there still appear to be many differences in opinion and emphasis on the preference for large-scale versus small-scale water projects. Agreement continues to break down over the economic costs and benefits of the respective approaches, the relative importance and values associated with social and environmental upheavals from large-scale projects, and the feasibility of the alternatives to fulfill human and environmental needs. While no clear consensus emerged, agreement was reached over the need for better information, for equal and fair treatment of alternatives in the decision-making process, for greater and more productive public participation, and for the

improved evaluation of the economic, social, and environmental risks of large-scale projects.

Institutional change: What are the opportunities and constraints?

Much of the day's discussion focused on technical issues related to quantifying the savings or gains from a particular type of technology or approach. However, all the participants recognized explicitly that the root of the problems lies with institutions, political will, and, ultimately, people. The solutions, then, must be found in the same places. The difficulty is in identifying the barriers, constraints, and disincentives to creating the change and policy reform needed to solve water scarcity problems. Although institutional problems exist at all levels - local, regional, national, and international- our discussion tended to focus on the role of international institutions.

All the participants agreed that the international aid institutions and multilateral development banks play an enormous role in setting the direction for development projects because of the substantial financial resources they have. There is a great pressure to lend within the multilateral development banks that favors project quantity over project quality. The recent internal evaluation of the World Bank's investment portfolio, the Wapenhans report, substantiates this assertion. In addition, there are significant vested interests both within developing and developed countries that stand to benefit from the status quo. For example, the procurement process in projects financed by multilateral development banks favors firms from industrialized countries. Indeed, more money returns to some industrialized countries, such as Switzerland, in the form of procurement contracts, than is disbursed to some developing countries, such as Bangladesh. Furthermore, because many small-scale and local projects are more difficult to manage from afar, there is little incentive to change the top-down management style or to experiment with different financing mechanisms.

The mechanisms to influence the multilateral development banks and international aid institutions are often based on politics, not on technical arguments. For advocacy organizations, dealing in the political realm is part of the strategy and approach, whereas for researchers who must maintain objectivity, politics can compromise their credibility. Advocates have a desire and responsibility to be technically credible, as well. Among the participants who are researchers, there was a strong concern that becoming more vocal with their criticisms of particular institutions or specific projects based on their research would not only affect their credibility, but would also endanger their access into certain countries, risk their relationships with government agencies, and undermine their funding bases. However, the researchers also recognized that pressure on the international institutions must be brought to bear from the inside as well as from the outside.

The participants from advocacy organizations were not necessarily asking researchers to become advocates, but rather to bring their expertise to bear on questions and issues raised by the advocacy community, as well to better share the results of the research with those who can bring the findings into the decision-making process. The advocates believed that outside pressure was critical for influencing these large institutions,

which are accountable to no government or international law. Furthermore, the advocates did not see the management difficulties associated with evaluating and funding numerous small projects as insurmountable. Rather, they saw the inflexibility and resistance to experimentation of World Bank staff and management as obstacles.

While there was not necessarily full agreement on the types of influence and reform that is needed in international aid institutions, there was agreement that better coordination among donors is necessary, that guidelines for evaluation, consultation, and participation are needed (such as those suggested for dam assessments, above), and that a level playing field must be ensured in decision making. Some participants felt that the multilateral development banks have already made substantial changes concerning environmental protection, large dams, and social concerns. But others cited examples that the investment strategy, despite changes in rhetoric, is essentially unchanged. Although there was a general belief that the priorities of the multilateral development banks need to come from the outside in response to local and national needs, there was not agreement on what those priorities for investment should be, whether for development of new water supplies or for conservation of existing supplies.

Developing strategies for sustainable water management

The meeting succeeded in encouraging participants to raise issues and outline their concerns. At this stage in bridging the gaps between the environment and development communities, few conclusions or agreements were reached on technical issues or institutional reforms. Yet, the questions and differences were more clearly articulated, which could lead to more rigorous examination of the substance and specifics behind the generalities.

The questions posed above as section headings point in the direction of additional research that is required before people can reach agreement on appropriate priorities and strategies. These research questions include:

- *Is conservation an illusion?* There is an acute need, within a river basin, for better quantifying the water withdrawals, consumptive uses, ecosystem needs, and net or real savings from conservation and efficiency improvements that could be redirected to meet additional consumptive or ecosystem needs.
- *Are strategies used in the energy sector relevant in the water sector?* There is a need to better determine the role that factors contributing to increased energy productivity-price, new technologies, input substitutions, supply limitations, public opinion, and national security issues - can play in developing a strategy to promote change in the water sector.
- *Is there a clear preference between large versus small dam projects?* There is a need for side-by-side comparisons of the cost-benefit, cost effectiveness, opportunity costs, environmental costs and benefits, resettlement and rehabilitation costs, social and equity considerations, and community development aspects in large and small dam projects to better determine their respective merits and problems.

Guidelines should be developed for dam assessments and conditions under which new dams should be considered.

- *Can the constraints to institutional reform be overcome?* There is a need to evaluate the incentives and disincentives--economic, political, social--to changing project design, evaluation, procurement, implementation, and management within the international institutions. Meaningful public participation should be encouraged. Relationships among researchers and advocates should be built to better share information and influence decision makers. Experimentation with new approaches to irrigation, water conservation, ecosystem protection and restoration, and financing mechanisms should be promoted. Those involved in water policy should recognize that pressure and ideas for institutional reform must come from both inside and outside the institutions. Ultimately, reform will require greater communication and collaboration between those on the inside and those outside.

This list of issues to pursue is by no means exhaustive. The participants discussed a few means of pursuing the debate started at the meeting. People favored the idea of convening small working groups to jointly pursue the answers to a few key questions, such as the first one regarding quantifying potential gains from efficiency. The results of such joint research could then be distributed to provoke further dialogue and debate with other NGOs, researchers, and policy advocates, as well as with staff in international institutions such as the World Bank and USAID.

We expect to convene other meetings in the future to continue building a dialogue about substantive issues.