

Water Crisis

Current Perceptions and Future Realities

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Abstract: *Water crisis was not considered seriously at the Dublin and Rio conferences. It was put on the world agenda primarily by the Stockholm Water Symposia. Water management is likely to change more during the next twenty years compared to the past 2,000 years. The paper reviews the global water situation based on the latest data available. In terms of water availability, it concludes that one can now be cautiously optimistic of the global water future. If there is to be a crisis, it is likely to be for two reasons, water quality and lack of investments. Neither of these two issues is receiving adequate attention at present. The roles IWRA can play in the future are briefly outlined.*

Keywords: *Water crisis, water quality, investment requirements, global water data, water pricing, institutions.*

Introduction

Leonardo da Vinci, the eminent Renaissance scholar and philosopher, said, "water is the driver of nature." Many may have considered it to be an overstatement in the past, but at the threshold of the third millennium, no sane individual would disagree with Leonardo's view. Water is becoming an increasingly scarce resource for most of the world's citizens. The current trends indicate that the overall situation is likely to deteriorate further, at least for the next decade, unless the water profession eschews "business as usual" practices, which can only allow incremental changes to occur.

Global Water Perspective, 1990-2000

Strangely enough, the water profession as a whole neither realised nor appreciated the seriousness of the global water situation as late as 1990, even though a few observers have been pointing out the increasing urgency of the situation from around 1982. For example, the seriousness of the crisis was not a major issue, either at the International Conference on Water and the Environment, which was organised by the United Nations system in Dublin, or at the United Nations Conference on Environment and Development at Rio de Janeiro held in 1992, both are considered to be important events for the water sector for the current decade. It is now being increasingly recognised that the Dublin Conference was poorly planned and organised, and thus, not surprisingly, it produced very little, if any, worthwhile results.

Furthermore, as the Dublin Conference was expected to make the necessary inputs to the Rio discussions, water did not receive adequate emphasis at Rio.

For all practical purposes, at Rio, water was basically ignored by all the Heads of States, whose primary interests were focused on issues like climate change, biodiversity, and deforestation. Water at best was a very minor issue during the plenary session at Rio. Equally, the chapter on water in Agenda 21 is not only the longest but also is the most poorly formulated. Thus, in spite of the rhetoric of many international institutions, the impacts of the Dublin and Rio Conferences on water management, globally and regionally, have not been discernible. In all probability, developments in the water sector would not have been materially different even if these two events had not occurred. Thus, both Dublin and Rio constituted lost opportunities for water, since they failed to put water on to the international agenda.

In retrospect, it has to be admitted that the global water crisis was brought to prominence on the international agenda not through the efforts of international organizations like the United Nations Agencies, but primarily because of the efforts of the Stockholm Water Symposium, an annual event that is now attended by leading water experts from all over the world. By constantly focusing on the importance and relevance of water to the future socio-economic development of the world and its importance to environmental conservation, the Stockholm Water Symposium managed to convince the water profession that the global water situation, at least during the early part of the 21

century, is likely to get worse, and thus must be considered most seriously. This is a remarkable achievement since the Symposium is not an institution, and its overall direction is provided by a small Scientific Programme Committee. Furthermore, the Symposium itself has managed to reach this pre-eminent position of influencing global water discussions in only nine years. Viewed from any direction, it is a most laudable feat.

By the second half of the 1990s, much of the water profession had accepted that the world is heading for a water crisis that is unprecedented in human history. Just as at the beginning of the decade the water crisis was not taken very seriously by most members of the profession, now nearly everyone believes such a crisis is inevitable. It will be argued later that just as the previous position was erroneous, so is the current thinking.

Another water-oriented development of the late 1990s is worth noting. During the 1972-1992 period, global discussions on water were mostly carried out under the aegis of the United Nations Agencies. The UN System during the 1970s and the early 1980s had many competent, dedicated, and charismatic water leaders who provided the leadership for these discussions. With their departure from the global scene, the UN system has played a less relevant role on global water discussions as the decade of the Nineties progressed. Current trends indicate that this process is likely to accelerate further in the future.

During the last five years, new institutions like the World Water Council (WWC), and the Global Water Partnership (GWP) have filled the vacuum created by the continually diminishing role of the UN System. Also, increasingly, the Stockholm Water Symposium is providing a focus where global and regional discussions are taking place each year, either within the framework of the Symposium itself, or within the events associated with it during the same week in Stockholm. Thus, the Symposium, by providing a clear focus for timely, relevant, and objective discussions on the various aspects of water each year, on a multi-disciplinary and multi-sectoral oasis, has now firmly established itself as the "global centrepiece" for discussions on water. In addition, increasingly important water-oriented institutions like WWC and GWP have started to congregate each year in Stockholm to conduct their own activities, thus giving added impetus to the importance of the Symposium. However while this has added considerable gravitas to the Stockholm Water Symposium, it also may pose a major threat to its future as the world's most important annual water

event. Too many activities in one week and in one place may start to detract from the overall technical focus of the Symposium, and thus dilute its overall impacts.

Two other global developments of the current decade are also worth noting. First is the establishment of the World Commission on Water (WCW). This top-level Commission clearly has forced the water community into thinking about the future of the world's water, a feat the profession has never achieved during its entire history. It is still too early to judge what will be the overall impact of this Commission, since a preliminary draft of its report is not yet available. However, at the very least, it has already forced the water profession into thinking seriously about the global water future on a collective basis, which by itself is a most remarkable achievement. Furthermore, what the Commission has already achieved in less than a year's work and with a very limited budget, other international institutions have been unable to accomplish even a fraction of this over the decades with a cumulative budget several hundred times that of the WCW. Depending on the quality of its final report, the Commission undoubtedly has the potential to set the global water agenda for the next five to ten years, in a way that has never been possible before.

The second event is the formulation of the Club of Tokyo. This informal group of around 15 of the most influential water personalities of the world, selected on the basis of peer survey, is loosely based on a model of the Club of Rome during its heydays of the early 1970s. This very select group of influentials will make a determined attempt not only to put water on the international political agenda, but also to guide discussions at the various international fora in an appropriate direction.

It is highly likely that the work and activities of the World Commission on Water and the Club of Tokyo will have significant impacts on future global water developments, especially during the first decade of the new millennium.

Water Crisis

While predicting the future is an extremely hazardous business, one item can be predicted with complete certainty: the world in the year 2025 will be vastly different from what it is today, in the same way that the world today is significantly different from what it was in 1975. Among the main driving forces that are likely to contribute to these changes are rapidly evolving demographic conditions, technological advances in all fields, the

speed and extent of globalisation, improvements in human capital, and national and inter-governmental policies.

The water sector is an integral component of the global system, and thus it will undergo major changes as well during the next 25 years. In fact, water development and management will change more during the next twenty years than it has during the past 2000 years. The water profession has generally ignored so far the global forces outside the water sector that are already shaping the future availability of the resource and its use and management practices. These impacts are likely to increase significantly in the next quarter of a century, and yet, the water profession has not started to consider seriously the implications of accelerating developments in areas like globalisation, biotechnology, desalination, information, and communication, which are likely to revolutionise future water use and management.

It is now widely accepted that the world will face a major water crisis in the coming decades because of increasing scarcities in numerous countries. Many international organisations have published maps in recent years, all somewhat similar, which show that more and more countries of the world are becoming rapidly water stressed because of increasing scarcities.

For many different reasons, it is now time to review critically the reliability of such forecasts. First, the information base on which such forecasts and maps are based is highly unreliable. Extensive review by the Third World Centre for Water Management indicates that the national estimates on which the current global figures are based are often erroneous (in many cases by several hundred percent), and in other instances, the facts are totally wrong. For many major countries, like India and China, estimates of water availability and use are currently available, but no one has a clear idea about the accuracy and usefulness of such national statistics. Thus, it is impossible to get any reasonably reliable picture of the global and regional water situations, which are based on the aggregation of such incomplete and unreliable national data sets.

Secondly, water abstraction is at present widely used as a proxy for water use. Methodologically, this, of course, is fundamentally wrong. Unlike oil, water is a reusable resource, which can be used and then reused many times. For example, some scientists have pointed out that each drop of the Colorado River water is currently used six to seven times before it reaches the sea. Also, globally, water is being increasingly reused, both formally and informally, and all the indications are that the

extent of reuse in all countries will accelerate further in the coming decades. Thus, the current practice of using water abstraction as a proxy for water use is already significantly erroneous. In about a decade, when reuse becomes even more extensive, this practice of using water abstraction data would be completely meaningless because of very serious underestimation of water actually used.

Currently, no reasonable estimates exist for reuse of water, even at the national levels, let alone for the world as a whole. Some data do exist for a very few developed countries like Japan. In addition, the water profession, regrettably, has not considered reuse as an important factor in global water availability and use considerations, as a result of which the existing forecasts are highly suspect.

Thirdly, private sector involvement and water pricing are likely to play increasingly important roles as the 21st century progresses. The net result of these two developments is likely to be significant advances in demand management, which currently plays a minor role in most countries of the world. This would mean that, within a short period of about a decade or so, all projections of future water use would have to be revised downwards significantly because of increasing emphasis on demand management.

Fourthly, as water pricing becomes increasingly acceptable, and technology advances further, it is highly likely that the estimates of groundwater availability would have to be revised significantly upwards. At present, since water for agriculture, which is the major user of water, in most countries is virtually free, there has not been much economic incentive to explore groundwater on a comprehensive basis. Accordingly, the current global and national estimates of usable groundwater are likely to be very serious underestimates.

In this connection, it is worth noting a possible analogy with oil. In 1973, when the energy crisis hit the world, proven oil reserves amounted to 640 billion barrels. By 1996, the proven reserves had increased to 1,030 billion barrels. This is in spite of the fact that the global annual oil consumption increased by 32 percent during this period. Because of the energy crisis, as oil prices increased and many oil companies moved from the public to the private sector, oil exploration economically became an attractive alternative. This, plus continuous advances in technology, has steadily increased the proven world oil reserves, even though a tremendous amount of oil is used each year.

It is highly likely that in the coming years:

- Water pricing will become more widespread than it is at present;
- Technological advances will make many sources of groundwater that are not economically exploitable at present usable in the future. Furthermore, as water prices increase, there will be more demand for groundwater exploration to increase supply, which will stimulate accelerated research to develop new technology to abstract this resource, thus creating a virtual cycle; and
- Private sector interests will play an increasingly important role in water development and management.

Under the above conditions, the global estimates of economically usable groundwater are, likely to increase significantly.

Thus, the current estimates of the future global water requirements are likely to prove far too high and will have to be revised significantly downwards during the next decade. Simultaneously, the amount of water that is available for use at present is seriously underestimated because reuse and recycling are ignored; estimates of groundwater availability will have to be revised upwards; and technological advances are making costs of desalination and new non-conventional sources of water (i.e., rubber bags to transport water over long distances) more and more attractive. Given the upward adjustments in water availability and downward revisions in requirements, one can now be cautiously optimistic about the global water future.

This, of course, does not mean that it would be an easy process for countries to adjust to the new realities of a rapidly changing global water scene. Equally, many countries are likely to find it difficult to manage the transformation without discontinuities because of socio-political constraints, institutional inertia, increasing management complexities, and current and past inefficient water management practices. However, since "business as usual" will not be a feasible option for the future in nearly all countries, policy-makers, water professionals, and water institutions, whether they like it or not, will be forced to embrace the new conditions, most probably within the next ten to fifteen years. All these and other associated developments are likely to make the present "gloom and doom" forecasts of a global crisis due to water scarcities somewhat unlikely in the coming decades.

On the basis of the above analysis and other associated issues, the threat of a global water crisis

because of physical scarcities only, as expected at present, is now probably overstated. If there is to be a crisis in the water sector, it will probably be due to two reasons, neither of which is receiving adequate attention at present.

The first cause that could contribute to a crisis could be due to continuous water quality deterioration. Globally, water quality is receiving inadequate attention, even though it is rapidly becoming a critical issue. While global data on water quantity are poor, they are virtually non-existent for water quality. Even for major developed countries like the United States or Japan, a clear picture of the national water quality situation currently does not exist. For developing countries and for countries in transition, ranging from Indonesia to Nigeria and Russia to Mexico, existing frameworks and networks for water quality monitoring are highly deficient, adequate expertise on water quality management simply does not exist, and laboratories for water quality assessments suffer very seriously from poor quality control and quality assurance practices. Furthermore, senior water policy makers in most developing countries become interested in quality aspects primarily when there are major local crises due to political and/or media interventions. Sadly, for all practical purposes, water quality is still receiving only lip service from most senior bureaucrats and politicians in developing countries and countries in transition.

Not surprisingly, because of the above deficiencies, water quality problems are becoming increasingly serious in all developing countries. For example, nearly all surface water bodies within and near urban-industrial centres are now highly polluted. While data on the existing groundwater quality are extremely poor, it is highly likely that groundwater is also becoming increasingly contaminated near centres of population.

As a result of a poor water quality management system, whatever national data are available in developing countries and countries in transition mostly give an erroneous picture of the existing water quality conditions. As a general rule, in these countries, the official pictures of water quality situations are mostly better than the current conditions warrant.

Recent estimates made by the Third World Centre for Water Management indicate that in spite of the official rhetoric and figures published by several international organisations, only about six percent of wastewater generated in Latin America is properly treated and disposed of. Furthermore, most universities in the developing world cannot provide appropriate education and training on

water quality management. Accordingly, rapid capacity building in this area would be a Herculean task under the best of circumstances. In addition, currently no reasonable estimates exist as to what would be the investment needed in Latin America to improve wastewater treatment from a paltry six percent to a reasonably tolerable level of 60 to 70 percent. All that can be stated at present with complete confidence is that the total investment costs for wastewater treatment and management are likely to be astronomical, and most countries would find it extremely difficult to meet these very high resource requirements in a timely manner.

The second possible crisis is likely to come from lack of investment both for water quantity and quality considerations. Investment requirements for wastewater treatment were noted above. These are for point sources only; investment needs for controlling non-point sources of pollution like agricultural runoff are simply unknown at present, even for the OECD countries. In addition, most existing water development projects in developing countries need massive investment for rehabilitation and modernisation. Equally, new projects are becoming increasingly expensive to develop because more efficient project sites have already been developed or are in the process of development and because of the social and environmental countermeasures necessary. Analyses of current cost estimates for the next generation of water supply projects in developing countries indicate that these are likely to be 1.75 to 3 times the cost of the present generation of projects, in real terms and per cubic metre of water supplied. These high costs are still not adequately reflected in the current budget estimates of nearly all water agencies.

Construction of new large dams in the United States, Canada, and Western Europe during the past two decades has been few and far between. Construction costs in Japan, one of the few advanced countries that is continuing to build new large dams, have increased significantly in recent years. For example, for the 155-metre-high Miyagase Dam in Japan, with a two million cubic meter volume, the construction of which is now nearly complete, the cost per cubic metre of water storage is approximately 200 yen (\$1.62 at July 1999 exchange rate). This is significantly higher than the current costs of desalinating seawater.

Globally, the total investment costs for modernising and efficiently managing existing water development projects and wastewater treatment plants and to construct new ones are likely to be astronomical. Currently, not even "ballpark" estimates of such costs are available.

Thus, the main issue is from where would such financial investment be available? Governments all over the world now have high national debts and resource generating capacities of all developing countries and countries in transition, where most of the water projects have to be rehabilitated and the new ones are to be constructed, are limited. Moreover, the World Bank and the regional development banks have steadily reduced their assistance to water development projects as a percentage of their total loan portfolio. Furthermore, because of strong pressures from social and environmental activities, international financial institutions are becoming increasingly reluctant to finance new water projects, irrespective of their overall societal benefits. In fact, an historian in the 21st century may very well argue in a retrospective analysis that the Sardar Sarovar Project (Narmada Dam) in India became the World Bank's "Viet Nam" in terms of support of water projects during the 1990s. The regional development banks, which for all practical purposes follow the World Bank leadership in most areas, have taken, at least unofficially, a very similar stance.

Thus, it is likely that unless the current situation improves, the lack of investments may precipitate a water crisis in the 21st century.

Conclusions

The world is changing very rapidly, and with it, the existing water management practices must change as well. However, the potential prospects and problems of future water issues must be objectively analysed in the light of changes that are expected. In the final analysis, it is deeds, not words, that will be most important in solving future water issues. Problems and potential solutions must be objectively considered in order to address them efficiently in a timely manner. Yesterday's forecasts can no longer shed any light on this coming, new, turbulent environment, which is likely to have diversified interests reflecting different assessments, rapid technological changes, globalisation, and relentless economic competition.

A major attribute of all pioneers is their determination and will to succeed. They do not retreat at the first sign of adversity, nor do they have unrealistic expectations. The water resources field now needs some pioneers who can handle successes and failures with equanimity. Technology, globalisation, and the information revolution are now collapsing borders and barriers, between disciplines as well as between countries. A

main challenge before the water profession in the coming decade would be how best to take advantage of these rapid advances to improve the existing management practices.

As the world moves into the 21st century, a clear vision of the future, and of how this vision could be achieved in the best way to serve humanity, is needed. It is important to discern what societies value most, which will determine and drive their unique visions of the future. Taking these steps in a timely and cost-effective manner will not be an easy task, but it will be an essential requirement for the water profession of the future. There is now a revolution taking place, even though most observers may not be aware of it. In the wake of this revolution, long-held concepts and models are likely to evolve further in an accelerated manner, and some will even disappear completely. Never before in human history have such profound changes taken place within such a short period of time in how water should be efficiently managed as are likely to be witnessed during the coming two decades. It is essential that the water profession not only identify those changes but also reinforce them.

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