WATER MANAGEMENT IN THE 21ST CENTURY FOR THE DEVELOPING WORLD

By

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Introduction

Water has been considered to be an essential ingredient for human survival and development throughout history. For example, more than 2½ millennia ago, the Greek philosopher Thales of Miletus said "best of everything is water". While the world has changed dramatically since the time of Thales, the fact still remains that human survival and well being continues to depend on water. Social and economic developments are often linked to water through a variety of pathways, including through food, energy, industrial and commercial activities, transportation, and environmental conservation.

Technological developments and industrial progress have meant that the economies of developed countries are now less dependent on water compared to the situations that prevailed some 5 decades ago. However, in spite of these developments, water affects the economic, social and environmental conditions of developed countries in numerous ways, some direct but others indirect, some tangible and others intangible. In contrast, the linkages between developing countries and water continue to be strong, primarily because of their continued high dependence on agricultural activities because of food production and employment generation. In addition, developing countries still have not developed their water infrastructures to the same advanced level as developed countries. Accordingly, floods and droughts currently affect developing countries much more than developed countries in economic and social terms, especially in terms of extensive human sufferings. This situation is unlikely to change significantly in the foreseeable future. It is thus essential to objectively and reliably assess the future global, regional and national water scenarios in terms of their social, economic and environmental implications.

Global water crisis: myth or reality?

While predicting the future is an extremely hazardous business, one item can be predicted with complete certainty: the world in the year 2030 will be vastly different from what it is today. The changes that we are likely to witness during the next 25 years will probably be far-ranging and far-reaching, and these changes will certainly be several orders of magnitude higher and more complex than what we have witnessed during the past 25 years. Among the main driving forces that are likely to contribute to these changes are rapidly evolving demographic conditions, concurrent urbanization and ruralisation in developing countries, rapid technological advances, the speed, extent and impacts of globalization, improvements in human capital, governance and functioning of institutions, formulation and implementation of effective national and intergovernmental policies, and advances in human expectations and knowledge due to accelerating information and the communications revolution.

The water sector is an integral component of the global system, and it will most certainly undergo major changes during the next 25 years. In fact, water management practices and processes are likely to experience more changes during the next 20 years than has occurred during the past 2000 years. Many of these new developments will be driven by changes stemming from non-water sectors, on which the water profession will have no, or at best limited, control or say.

Customarily, water professionals have mostly ignored the global forces that are external to the water sector, even though these are likely to shape water use, availability and management practices of the future in some very significant ways. For example, water professionals are continuing to ignore the implications of globalization, even though within the next 5–15 years, the various forces unleashed by globalization are likely to make radical changes in water use and requirement patterns in numerous countries, ranging from the United States to Spain, and China to Mexico. These types of global forces are already shaping the future water use and availability patterns, and yet such issues have been consistently ignored by the water and development professions, and international and national institutions in the recent past. In addition, the water profession continues to ignore major developments in the areas of biotechnology, desalination, information and communication, etc., even though developments in these areas may influence the water futures of the world, perhaps very significantly.

It is now widely predicted and believed that the world will face a major water crisis in the coming decades because of increasing water scarcities in numerous countries. Many international organizations, ranging from intergovernmental institutions such as the World Bank and the various United Nations agencies, to non-governmental organizations such as the World Water Council, have published world maps in recent years, all somewhat similar, which show that more and more countries of the world will become water-stressed by 2050 because of increasing scarcities.

An important question that needs to be asked and answered is, how reliable are these predictions of an impending global water crisis? An objective assessment of the hypotheses on which the original forecast was based indicates that it contains many fundamental errors which will ensure that it will be not be accurate.

For example, water abstraction is at present widely used as a proxy for water use for such forecasts. This, of course, is totally incorrect. Unlike oil, water is a reusable resource, which can be used and then reused many times. Some scientists currently estimate that each drop of the Colorado River water is used around seven times. Also, globally, water is being increasingly reused more and more, both formally and informally, and all the indications are that the extent of reuse in all the countries will accelerate further in the coming decades. There is no question that with better management practices, the levels of reuse can be further increased very significantly in all parts of the world, which in turn will ensure that more water is available for various uses. Accordingly, the current practice of using water abstraction as a proxy for water available is already erroneous, and thus the forecasts of future water requirements based on such faulty analyses will be equally erroneous. In about a decade, when water reuse becomes even more extensive, the practice of using water abstraction data in such a fashion will be basically meaningless because of very serious underestimation of the quantity of water that will actually be reused. Thus, projecting water availability on this basis to 2050, and then predicting a global crisis, is neither a meaningful exercise nor good science.

Currently, no reasonable estimates exist on the extent of reuse of water, even at the national levels, let alone for the world as a whole. The water profession, regrettably, has not considered reuse as an important factor in global water availability and use assessments, as a result of which the existing forecasts of the magnitudes of future water scarcities are highly suspect, and, for all practical purposes, somewhat meaningless.

In addition, water pricing will most certainly play an increasingly important role as the 21st century progresses. Already, cities like Phnom Penh and Singapore have made very remarkable progress in improving quality of water services provided to its citizens through proper pricing and good management practices. The net result of all these developments would be significant advances in demand management, which currently plays a minor role in most countries of the world, even for domestic water use. This would mean that within a short period of about a decade or so, present projections of future water requirements would have to be revised downwards, most likely quite significantly because of increasing emphasis on demand management, cost recovery and increasing public and political awareness of the seriousness of the water and sanitation situations if the existing business-as-usual approaches continue. Implementation of the European Framework Directive on water within the next decade is likely to further accelerate the global trend to use water pricing as an important instrument for water management.

Any objective and serious analysis will indicate that all the current estimates of the future global water requirements are likely to prove far too high, especially as overall management practices improve, demand management comes to widespread use, and reuse of water receives priority attention. These high estimates will have to be revised significantly downwards during the next decade. This, of course, has also been the historical pattern. For example, all forecasts of future global water use made for the 1950–2000 period have proved to be very serious overestimates. Regrettably, this trend of overestimating the future water requirements is still continuing.

Simultaneously, the amount of water that is available for use at present is seriously underestimated because reuse and recycling are ignored; estimates of global groundwater availability will have to be revised upwards; and technological advances and socio-economic factors are making costs of desalination and other non-conventional sources of water more and more economically attractive. For example, within the past five years, the cost of desalination of sea water has come down to about Euro 0.40 per cubic metre due to technological advances and improved management practices. Hence, given the upward adjustments in water availability and downward revisions in requirements, and the expected improvements in the management practices and the institutions that manage this resource, one can now be cautiously optimistic about the global water future.

The overwhelming conclusion has to be that the threat of a global water crisis because of physical scarcities only, as expected at present, is overstated. The world is not facing a water crisis. However, it is facing a crisis because of poor management of water. The only international institution that has come to this conclusion is the Asian Development Bank. To their credit, they come to this conclusion almost a decade ago.

Poor water quality management

Water quality problems are becoming increasingly serious in all developing countries. Accordingly, 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 equally likely that groundwater is also becoming increasingly contaminated near centres of population.

In spite of poor water quality management practices, national data 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 rosier than the current conditions warrant. These optimistic estimates are accepted at face value by international institutions, and are repeated in their reports without any comments or qualifications. This practice has given these erroneous estimates a legitimacy, which is scientifically and factually unwarranted. This, in turn, has given the world a false sense of security, which is likely to prove highly counterproductive in the future.

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 organizations, less than 10% of wastewater generated in Latin America is properly treated and disposed of in an environmentally acceptable fashion. The situation is likely to be very similar in Asia, and probably worse in Africa. Furthermore, most universities in the developing world do not 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 or Africa to improve wastewater treatment from paltry levels of less than 10% to a reasonably tolerable level of 50–70%. All that can be stated at present with complete confidence is that the total investment costs necessary for proper wastewater treatment, disposal and management are likely to be astronomical, and most developing countries would find it extremely difficult to meet these very high resource requirements in a timely manner.

Recent changes in water management

During the past two decades, the world has witnessed many changes in the fields of science and technology. As noted earlier, all the current trends indicate that the changes during the next 2000 years are likely to be even more extensive than what have been witnessed during the past 20 years. In fact, it is highly likely that a historian of the 22nd century, looking back, will probably consider the 21st century as the century of change.

Past and present experiences are unlikely to shed much light on the expected future turbulent environment. Diversified societal groups, reflecting different ideologies, interests and views, are likely to jockey for power, resources, privileges and visibility, as never before in human history. Issues like globalization, free trade in agricultural and industrial products, rapid technological changes, and continuing information and communication revolution will collapse the borders between scientific disciplines as well as between countries. The challenge facing the human society will be how to harness the potential released by these seemingly disparate forces so that the overall quality of life of the people can be improved, peace and regional stability can be assured, social harmony can be maintained and environment can be preserved.

Water management is an integral component of this global change that is taking place. It is changing in many ways, some of which are predictable but others are not. It is essential that the water profession identifies the main drivers of these changes and then take appropriate steps to anticipate and manage those changes for the overall societal benefit.

Many of the earlier concepts of water management are now disappearing, and these are being replaced by newer concepts. Among these changing concepts are the following.

- Water can no longer be considered to be a free good, but an economic and social good. Consumers will have to pay a realistic price for access to reliable water supply and wastewater treatment systems.

- Historically, the two main areas of water management were restricted to technical and economic considerations. Social, environmental and cultural factors had to be added in recent years. This is making efficient water management an increasingly complex process.

- Quantity and quality were the primary considerations earlier. To this had to be added dialogue between the various interest groups of the society.

- Public sector basically looked after water management and provided the necessary investments. This is now being increasingly restructured to public-private partnership in order that the management talents of the private sector and its fund-raising capacities can be harnessed.

- Earlier, primarily the agricultural water users participated in the planning and decision-making processes. In contrast, currently a significant part of the civil society is getting involved in many different ways.

- Ecological uses of water did not receive much attention before. Now, it is considered to be a legitimate user, and must be provided for in terms of water allocation.

- If properly planned, water developments can act as an engine for regional economic expansion which can contribute to employment generation, poverty alleviation and environmental conservation.

- The world is very heterogeneous, countries are at different stages of development, social, economic and environmental conditions are different, and management capacities and legal institutional frameworks vary widely. Thus, there are no universal solutions to water problems. What works in one place may not work in another. In a complex and multi-polar world, one size does not fit all.

Use of foreign experts

The history of water development is littered with examples of foreign consultants who come to developing countries with only limited knowledge of their economic, climatic and environmental conditions, social and cultural habits, institutional and management capacities, and institutional, legal and environmental frameworks. They invariably come when the weather is most pleasant. For example, all the 5-star hotels in Islamabad or Dhaka are generally full each year, mostly with foreign consultants, between October and February, when the climate is most agreeable. One will be hard-pressed to see many foreign missions during the monsoon season, or the really hot periods in the Indian sub-continent. They stay in the country for a 1-3 weeks (sometimes their first visit to the

country), in 5-star hotels, and move around in air-conditioned cars with several local officers to look after their every whim. After this somewhat artificial and special existence, they often propose solutions that may be relevant for the Western conditions with which they are familiar with and which may work in their own developed countries, but their potential and successful application to very different conditions prevailing in developing countries is, at the very least, questionable. Not surprisingly, these often prove to be wrong and expensive solutions.

Two recent examples will illustrate this point. A very well-known foreign consultant advised Bangladesh that it will save considerable quantity of water if all the bath-tubs in the country were converted into showers. The poor man did not know that nearly all households in Bangladesh use buckets of water to clean themselves! This practice uses even much less water than showers! Thus, the solution obtained at a great cost had absolutely no relevance for Bangladesh. Sadly, no one told the foreigner consultant that his proposed solution was not only useless but also indicated that he had no knowledge and appreciation of the social conditions of Bangladesh. One simply cannot propose realistic and implementable solutions for any country without good knowledge of socio-cultural conditions of a country.

Another example is the establishment of a pollution control research institute in India, for which the UN provided a $7 million grant to ensure it could become a world class, state-of-the-art organisation. A Chief Technical Advisor (CTA) from the United States was recruited to establish this research institute. Technically, he was a very competent person, but he had never worked in a developing country earlier, let alone in India. After his untimely death, I was invited to help the institute. By the time I arrived, more than 80 percent of the external funds had been used, or committed, on unnecessary and even unusable items. For example, a wet scrubber from Germany was bought at a cost of nearly $500,000 to take sulphur out of coal, and another $300,000 was used to buy an automatic water quality monitoring van from The Netherlands.

Equipment-wise, they were excellent. However, the scrubber was of no use to the Indian conditions, since Indian coal, unlike the American or the European coal, contains very little sulphur, but its ash content is extremely high. If the wet scrubber is to be used in India, one would have to add sulphur to the coal first before it can be taken out!

With respect to the automatic monitoring van, it was designed to be used on the smooth European roads and not on the uneven pot-holed roads of India. The first time the van was driven for about 25km from the Institute to monitor certain water quality parameters, it could not be used since the calibrations of all its sophisticated instruments went haywire before it reached the river. No engineer in India could recalibrate them, and a Dutch expert had to be flown in at a great expense to recalibrate them. After this expensive recalibration, the next time the van was sent for another monitoring mission, the same problem reoccurred. In addition, all the instruments in the van were designed for a maximum temperature of 36º C, which is fine for the European conditions. In the very first summer, when the average temperature in that Indian city reached 44ºC, all the resistors blew up like popcorns! Thus, these two instruments, and many others that were bought, though state-of-the-art, were either proved to be totally useless, or of very limited use, for the Indian conditions. This again shows the importance of local knowledge for actual solution of development-related problems of developing countries.

With a US$7 million external support, it should have been possible to establish a very good pollution control research institute in India. However, all this, plus the local counterpart funding, were basically wasted to establish this research institute. The project did not help the country in any visible way, and the institute, not surprisingly, never took off. These are not unique events. I can cite numerous such examples of bungled attempts to help developing countries by the so-called foreign experts whose main contributions have been to create more problems for the countries concerned.

There are two additional points that are worth noting for this Indian case. First, in my report to the UN, I called these instruments "white elephants," and pointed out that the UN funds were simply wasted, as a result of which the Institute had no present or future. While my findings and conclusions could not be disputed, I was under tremendous pressure to tone down my criticisms of what had happened very substantially. This I flatly refused to do. Interestingly, thereafter I have never been invited to advise this particular UN agency again! This is often a standard problem with many international institutions. Many times, they do not want serious and objective evaluations by competent and independent experts. They prefer pseudo-evaluations, where they use their regular so-called independent consultants, who depend on these institutions most to earn their living. Not surprisingly, these so-called "independent" consultants play up the benefits and play down the shortcomings of a project, as a result of which, at least on paper, the project becomes an "outstanding" success. This way all the problems are swept under the carpet, and we do not learn from these experiences.

Second point worth noting is that senior officials from many developing countries often have a complex. They consider mediocre, or even third grade foreigners, as "experts," but often ignore professionals from their own countries whose technical and local knowledge is significantly better than these so-called foreign "experts," who are hired at very high costs. Until and unless the existing mindset of kow-towing to foreign experts, irrespective of their expertise, is changed, the progress will continue to be limited.

True foreign experts, with good knowledge of the local conditions, should be welcomed, since they can make significant contributions to the development of developing countries. However, it is imperative that developing countries stop accepting or listening to mediocre to third grade foreign experts from any external support agency in the future. They should be politely shown the door! It is equally essential to ensure that foreign experts are used only when concomitant local expertise is not available, and the foreign experts selected are fully conversant with the prevailing conditions of the country.

Water issues of the future

A fundamental problem that is facing the water profession at present is its inability to look to the future. An implicit assumption has been that future water availability, use and demand patterns will basically be similar to what have mostly been witnessed in the past, with perhaps only incremental changes. The water profession has been repeating *ad nauseaum* for the last four decades that "business as usual" is not an option but continues to behave as if there is no other option. The only difference that can be noted during the past decade is that the rhetoric of "business as usual" is not an option has

intensified immensely, but it has not resulted in any perceptible change in terms of planning and management actions.

Based on the research carried out at the Third World Centre for Water Management, it can be said with considerable confidence that the future water problems of the world are likely to be very different from what were experienced in the past, and what are being anticipated at present. The future water problems are likely to be of an entirely different character because of rapid changes in the social, economic and technological frameworks within which water is used and managed. Many of these changes will occur because of the forces that will come from outside the water sector, on which the water professionals will have no, or at best very limited, control.

The structures of water availability, use patterns and overall demands are likely to change radically because of many factors, some known but the others mostly unknown. The factors that are mostly being ignored at present are likely to have increasingly more impacts on water-related issues during the next 2-3 decades. Among these factors are radically changing population dynamics (declining population in many countries, population stabilisation in other countries, increasing number of elderly people all over the world, and especially in China during the post-2025 period, etc.), concurrent urbanisation and ruralisation in the developing world, globalisation and free trade in agricultural and industrial products, information and communication revolution, advances in technology (especially in areas like biotechnology and desalination), scramble for energy security by the major nations, and uncertainties associated with climate change. All of these will have major implications for water planning and management in the coming decades. Yet, these issues are not being seriously considered at present, either individually or collectively.

These rapid changes will have many implications. Let us consider one case, inter-basin water transfer projects, where water is transferred from so-called water surplus regions to water deficient areas. These projects often have a gestation periods of 15-20 years, or even more. Thus, unlike in the past, when it was comparatively easy to predict future developments, and thus water requirements, the forecasting process will become exceedingly more and more complex especially as no such new large water project is likely to be operational for at least two decades. When it does become operational, the conditions are likely to be very different from what are being predicted today. If the future water scenarios and demands cannot be predicted with any degree of certainty, it will not be an easy task to analyse the needs, desirability and cost-effectiveness of the proposed water transfer projects.

Let us take another example: the current on-going discussions under the Doha round of negotiations under the World Trade Organisation, and how this activity that is seemingly unrelated to water could have major implications in the future on the water sector. Irrespective of whatever may be the final results of the Doha round, it is now certain that agricultural subsidies and tariffs will be reduced quite significantly within the next 10 to 20 years. The only question is when such reductions may occur, and by how much. By 2020, less than 14 years from now, we can say with certainty that we shall see considerable progress in terms of reduction in agricultural subsidies, even though we cannot say definitively when exactly this will occur in terms of time, or how they will evolve over time. Because of these important changes, the structure of agricultural production in numerous countries, including countries like Brazil, China,

France, Japan, India and Spain, will change very substantially along with their agricultural water requirements, which globally is the largest user of water at present.

When our Centre was requested to undertake an independent review of the Spanish National Hydrological Plan to transfer water from the Ebro River to the southern coastal areas of Spain, our conclusions were that if we consider the conditions that are likely to prevail during the post-2020 period, when the Plan may become operational, it may be difficult to maintain even the existing agricultural water requirements patterns, let alone justify higher water uses. This is because the structure of water demands is likely to change radically in Western Europe because of new global agricultural trade agreements, changing socio-political considerations, economic and technological developments and immigration policies of the European Union. In addition, the officially estimated cost of delivering per cubic metre of the Ebro water to the Levante basins is nearly 50 percent higher than the current cost of desalination of sea water. Accordingly, our conclusion was that the Plan cannot be justified in social, economic and environmental terms. If this water transfer plan is built as it was proposed, it will go down in history as a white elephant and a magnificent monument to bad planning.

The Ebro example, however, should not be construed to mean that in the future no large scale water development projects may be necessary. Rather, each case must be carefully considered and analysed in terms of future water requirements and societal expectations when the projects are expected to be completed, and not on the basis of the prevailing conditions when the planning starts. The two sets of conditions are likely to be very different, a fact that has thus far been mostly ignored by the water professionals. If after objective analyses, it is considered that a major water development project is necessary and can be justified in economic, social and environmental terms, its construction should proceed.

A major problem facing the developing world at present is the knee-jerk reactions of certain activist groups, who vociferously claim that large scale water development projects are no longer necessary, and that the water requirements of the future can be taken care of by small-scale projects like rainwater harvesting. It is difficult to have any sympathy with such dogmatic and one-dimensional views. First, large dams or small projects are not either/or proposition. At a certain location and at a certain time, a large project may prove to be the best solution. Equally, at another place, a small project may be more appropriate. Many times, the two alternatives may even have to co-exist. An objective analysis of past water development projects from different parts of the world indicates that small can be beautiful, but it can also be ugly. Similarly, big can be magnificent, but it can also be a disaster. Each case must be judged by its site-specific conditions and its own merits. Dogmatic views are invariably wrong and socially counterproductive on a long-term basis. For a heterogeneous and rapidly changing world, there is no other alternative but to consider plurality of paradigms. One size simply does not fit all.

In addition, vast majority of water professionals do not understand the water problems of developing countries, all of which are in tropical and semi-tropical climates with pronounced seasonality in precipitation patterns. This is in sharp contrast to developed countries, all of which (except Australia) are in temperate climates with a much more even distribution of precipitation within the year, and also between the years.

Let us take the case of India, much of which receives its annual rainfall in less than 100 hours (not necessarily consecutive). The main water problem of India thus is how to store this immense amount of rainfall over such a short period so that water is available for various uses throughout the year. For the large Indian cities, there is simply no other alternative but to build large dams so that water is available on a reliable basis throughout the year. In other parts of India, depending upon the local conditions, rainwater harvesting may prove to be the best solution. Thus, the main questions with large dams is not whether they should be built, since there may not be any alternative to them under certain conditions, but to ensure that they are built and managed in a way that is economically efficient, socially desirable and environmentally acceptable.

Concluding Remarks

The world is heterogeneous, with different cultures, social norms, and physical, climatic and environmental conditions, skewed availability of natural resources and investments funds, and differing management and technical capacities and institutional arrangements. The systems of governance, legal frameworks, decision-making processes, historical backgrounds, and types and effectiveness of institutions often differ significantly from one country to another. Furthermore, countries are at different stages of development, and thus their needs and requirements, which often vary with time, are also different. Under such diverse conditions, it is essential that solutions to specific water problems be sought under the prevailing and expected future conditions of a specific country. Past experience in water management has consistently shown us that "one size does not fit all". No single solution to a water problem can be equally valid for the entire world, ranging from technologically advanced countries like the United States and Japan, emerging economic giants like China and India, and countries as diverse as Cambodia and Cameroon.

The point of departure for water management process is generally different from one country to another because of technical, economic, social, historical, cultural, environmental and other associated reasons. Thus, countries like Cambodia should formulate and implement their own water development strategies based on their own country- specific conditions, as well as requirements and the future expectations of their people. It is important, however, that the solutions are sought based upon identifications and realistic analyses of the present and the future problems, which mostly cannot be resolved with the past experience and mindsets. National water-related institutions must endeavour to address and solve the water problems of the present and the future with full recognition of the expectations of the people and after extensive consultations with the stakeholders. It will not be an easy task, but it is a doable task.

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 or dogmatic beliefs, that will be most important in solving future water issues. Problems and potential solutions must be considered objectively in order to address them efficiently and in a timely manner. Past forecasts and recent trends can no longer shed any meaningful light on the coming, new, turbulent environment of the world of water, which is likely to have diversified requirements reflecting the different needs and interests of the various stakeholders,

rapid technological changes, globalization, relentless economic competition, and societal requirements like poverty alleviation and environmental conservation.

As the world moves into the 21st century, a clear water 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 are not aware of it. In the wake of this revolution, long-held concepts and models of water management, like integrated river basin management and integrated water resources management, are likely to evolve further in an accelerated manner, and some may even disappear completely. Never before in human history have such profound changes taken place within such a short period of time as are likely to be witnessed during the coming two to three decades as to how best the water resources systems may be efficiently planned, managed and operated. It is essential that the water profession not only identifies the expected changes as early as possible, but also take timely, cost-effective and socially acceptable countermeasures to meet these expected challenges. It will not be an easy task. Nevertheless, it is a task that must be accomplished since there is simply no other option.