Water for a Thirsty Urban World

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> The great city is that which has the greatest men or women,
> If it be a few ragged huts it is still the greatest city in the world.
> – Walt Whitman, *Song of the Broad-Axe*

WATER HAS STEADILY CLIMBED the global political agenda during the first decade of the twenty-first century. During the 1980s and 1990s, water was not an important resource issue in international environmental and humanitarian dialogue. Issues like climate change and biodiversity took center stage: water was at best a bit player. All heads of state completely ignored the fact that water scarcity was a problem and could become an even more serious problem in the coming years. Even at present, most member countries of the Organization for Economic Cooperation and Development (OECD) do not consider water to be an important issue, mistakenly believing that developed countries have resolved all their water-related problems.[1] This, unfortunately, is not the case. Developed countries have different types of water problems compared to developing countries, especially with regards to modernizing their infrastructure (some of which were laid more than a century ago and are well past their functional lives) and improving the efficiencies of water delivery and use.

The fact is that for nearly all countries of the world, water continues to be a problem. However, the types of water problems faced by different countries are not similar. The magnitude and extent of these problems differ, and their solutions are similarly likely to vary, even within national borders. This is to be expected since countries are not homogenous—they differ in respect to the level of economic and social development; climatic patterns (even when annual average rainfalls are similar); technical, management, and administrative capacities; and strength and effectiveness of institutional arrangements for managing water. While the type, magnitude, and extent of water problems may vary from one country to another, the primary reason why nearly all countries are facing them is the poor water management practices of the past and the present. There are signs of rapid improvements in some select locations of the world, but in many other areas the improvements have been, at best, incremental, and sometimes even illusory.

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Water Availability and Scarcity

While much has been written on global water scarcity, it should be noted that how much available water for use at any specific time period is unknown at present for several reasons.[2] Most books, papers, and media reports in recent years claim that less than 1 percent of the world's freshwater can be used for human purposes. Such statements convey a misleading picture of the situation and an erroneous understanding of water-related issues. Equally misleading and erroneous is the widely promoted and generally accepted "fact" that by 2025, two-thirds of the world's population will face water stress, and that the situation will become even worse by 2050. The amorphousness of the concept of water stress will be discussed below.

The water sector is full of such misconceptions and "facts" that have been incessantly proclaimed by many professionals and international organizations, and repeated by many water experts, policy makers, and media reports *ad nauseum* without any serious scrutiny. They are based on false understanding, use of non-existent or unreliable data, faulty reasoning, and the implicit assumption that the world will change very little during the coming decades.

Let us consider two of the misconceptions noted above. First, as any schoolchild should know, water is a renewable resource. Unlike oil and coal, which are non-renewable resources, water can be used, treated, and reused with good management practices. Some have estimated that every drop of Colorado River water is used nearly seven times. Whatever may be the actual reuse of this river water, or of any other for that matter, the fact remains that with better management practices, such water resources can be reused significantly more times than they are currently. It is fundamentally wrong to consider water as a non-renewable resource like oil or coal. Thus, conceptually, it is difficult to estimate how much water may be available for use at any given time, because it would depend on the management of the water and its reuse potential. At present, there is not even a reliable methodology available to calculate the amount of water available at any given time for human use due to conceptual problems as well as data inadequacy and unreliability.

Second, there is absolutely no scientific rationale as to the way water stress is estimated at present. Any consideration of water stress would depend on not only the physical availability of water, but also on a multitude of factors, like climatic and cultural conditions; how that water is being managed at present, including economic instruments and the technologies being utilized; and water quality conditions and efficiency of water management institutions. At present, there is no agreed upon definition of what constitutes water stress, or how it can be reliably estimated. Some international institutions and certain water professionals have arbitrarily decided that water stress is automatically created if per capita water availability falls below 1,700 m^3 per year. Others use a round number of 1,000 m^3 per year. The two figures differ by 70 percent, and the fact remains that both are arbitrary, with no scientific rationale to justify them. One could select other equally arbitrary numbers anywhere between 500 to 2,000 m^3 per year and claim this would constitute the threshold of water stress for the entire world, no matter the location, prevailing local water management conditions, or technology being used. These unjustified standards are at best pseudo-science, and at worst voodoo science.

Regardless of which figure is used, 1,700 or 1,000 m^3 per year, the fact remains that there are places in the world where local inhabitants use less than half of the lower 1,000

m^3 per year marker, yet still have regular access to water and do not feel any "water stress," however it is defined, because of good management practices. The World Commission on Water, of which I was a member, decided in one of its early meetings not to use such arbitrary definitions because they are becoming increasingly misleading and meaningless due to a lack of logic and accelerated reuse of water. Thus, its report deliberately did not refer to water availability and scarcity issues because of conceptual and definitional problems as well as a lack of reliable data on which any definitive analysis could be based.[3]

Third, it should be noted that nearly all regional, national, and global data in the water sector are very unreliable. For example, no one has any definitive idea what quantities of groundwater are available for use in individual countries like Brazil, Canada, China, or India, let alone on a global basis.[4] Accordingly, all the current estimates on global water availability, even disregarding water reuse, are at best very poor guesses. Furthermore, all the currently available estimates on global water availability are very large figures, whose magnitudes, relevance, and usefulness nearly all people, including water experts, would find difficult to comprehend. Even though no one has a clue as to how reliable these statistics are, such national and global estimates are circulated by water professionals, international institutions, well-known politicians, and the media. As Vladimir Lenin once noted, "A lie told often enough becomes the truth[5]." Sadly, very few people in the water sector have questioned such misleading and mostly meaningless figures, leaving the water sector with more than its fair share of untested and often erroneous paradigms.

Fourth, all the water scarcity studies implicitly assume that global developments will remain somewhat similar for the next several decades, with only incremental improvements. In stark contrast to this assumption, it can be safely predicted that there will most certainly be major and very significant changes during the coming decades because of improvements in governance practices and rapid advances in technology. Some of these changes are predictable with some degree of accuracy, but others may be basically unknown at present. As the world undergoes rapid changes, it is axiomatic that with it the water sector will change as well. In fact, all the emerging and likely future trends indicate that the world of water is likely to change more during the next 20 years than it has in the past 2,000 years. Based on the research carried out at the Third World Center for Water Management, there is absolutely no question that the current projection of water requirements for the next 20 to 50 years will prove to be a gross overestimate.[6]

Viewed in a historical context, this overestimate will not be a new phenomenon. In fact, any serious assessment of past estimates of world water requirement made between 1950 and 1970 for the year up to 2000 have proved to be gross overestimates. There is no doubt that the current mainstream estimates of world water requirements even to 2030—let alone to 2050—will also equally prove to be significantly higher than in actuality. The only question that needs to be answered is by how much.

Fifth, the water professionals, not surprisingly, consider water to be one of the most, if not the most, important issue in the world. However, while water is an important issue, so are energy, food, the environment, health, education, employment, housing, and poverty. From the perspectives of policy makers and society as a whole, these issues are important, and many are considered to be more, or at the very least, as important as water. Their relative importance varies with space, time, culture, levels of economic development, and a variety of other associated factors. In fact, all the current indications show that once

people have 24-hour access to clean water, its supply is mostly taken for granted. Only when the supply is interrupted for whatever reason do people realize how important and essential water is to maintaining a healthy lifestyle. In addition, those in the water profession, for the most part, remain and work exclusively in the water sector and continue to preach integration and coordination with other sectors like agriculture, energy or environment, which is seldom followed in practice. Herein lies one of the serious conundrums of the water sector.

Based on an analysis of current and emerging trends that has been carried out by the Third World Center for Water Management beyond 2020, there is no question that the world of water management will change very significantly within a decade, and more so thereafter.[7] There will be profound changes in the water sector due to globalization, urbanization, ruralization, population changes (both total and in terms of age distribution), information and communication revolutions, technological developments, quests for energy, food, and environmental securities, migration within and between countries, and host of other factors—all of which will have major impacts on water use and availability.[8] Many of these factors, such as free trade, globalization, or migration, are not being considered at all by water professionals at present, even though they will profoundly affect the water sector in the future in a variety of ways. Because of these and many other associated reasons, the current wisdom on global water scarcity due to physical availability has to be seriously challenged.

This paper will primarily discuss the current status and the future prospects for urban water and wastewater management in both developed and developing countries. It is an objective critique of current urban water and wastewater management practices in the world.

Urbanization and Water Management

A logical discussion of urbanization should begin with a clear understanding and definition of what is "urban." Unfortunately, there is no agreed upon international definition of what constitutes an urban area. The definitional problem is an important and challenging consideration. Countries mostly define urban areas based on one or more criteria. These criteria include population size and density, social and economic factors like percentage of people involved in non-agricultural activities, administrative or political status of a settlement, or census designations. For example, the 1996 Revision of the UN World Urbanization Prospects noted that 46 percent of the countries defined urban on the basis of administrative criteria, while 22 percent used population numbers and sometimes population densities, 17 percent used other criteria, 10 percent had no definition, and 4 percent considered their countries entirely urban or rural.[9] Because of this fundamental problem of what constitutes an urban area, use of global macrostatistics, which are primarily aggregations of national data, is problematic and often misleading.

It is generally accepted that settlements having more than 20,000 inhabitants should be considered urban. However, some countries consider areas having more than 5,000 people to be urban as well. In the absence of a universally agreed definition, analyzing global urbanization data is fraught with danger. For example, if the Indian Government considered settlements of more than 5,000 people to be urban areas, as some countries do,

India would already rank as a country having predominantly an urban population, which is not the case at present.

A major trend during the last half of the 20th century was that the world became increasingly urban. Water is not only needed to provide the domestic requirements of this urban population, but also to meet their food, energy and environmental needs. In addition, industrial and commercial activities require water, as do electricity generation and transportation requirements. No large-scale electricity can be generated without water, and transportation will come to a standstill without water. Depending in the physical conditions and the maturity of an oil field, it may take up to 40 barrels of water to extract one barrel of oil. Thus, as the world becomes more and more urbanized, the water requirements of the urban population continue to increase as well, not only directly but also indirectly through industrial and commercial activities and food, energy and environmental requirements.

Historically, human societies had a predominantly rural lifestyle. Even as late as 1800, only three percent of the global population lived in urban areas. The global urban population increased to around 14 percent during the next century. By 1900, the world had 12 cities of more than one million people. The urbanization process accelerated dramatically during the next 50 years. By 1950, the world had become 30 percent urbanized, and the number of cities having more than one million people had increased almost sevenfold, to 83.[10]

Between 1950–2000, the growth rates of the urban population were higher than those of the rural population in almost all countries. The growth rates, however, were not uniform. For example, if the growth rates of the 524 urban centers that had more than 750,000 people in 2000 are considered, six had negative growth rates, and 41 grew by less than one percent during 1950–1975.[11]

Overall, historical experience has been that as the population of a city increases, after a certain point its population growth rate starts to decline. Generally, urban centers that grow at higher rates tend to have comparatively small populations. For example, among all the major urban centers today, only Dhaka and Lagos are expected to grow by around 4 percent in the foreseeable future. Eight other megacities are estimated to grow by less than 1 percent.[12]

There have been exceptions, however. For example, in 1950, the population of Mexico City was 2.9 million and the population of Sao Paulo was 2.5 million. Even with such high populations by the 1950 standard, their population growth rates were over 5 percent. Consequently, their population increased by around four times by 1975, making them the first two megacities of Latin America to have more than 10 million people.[13]

In 1950, the world had only two megacities. By 2009, the number had increased to 19. By 2025, this number is expected to increase to 29. The evolution of the world's megacities is shown in Table 1. Equally, in 1950, the only two megacities of the world were in the developed world. By 2009, developed world megacities had increased to four, but 15 megacities joined them from the developing world as well. By 2025, only five megacities are likely to be from the developed world. However, 24 others from developing countries are expected to join their ranks.[14]

The rapid urbanization and the growth of megacities in the developing world have fascinated most development and academic experts as well as the popular media. From a logical and scientific perspective, it could be argued that they have received a lion's share

of national and international interest and resources, especially if the overall global situation is considered. Only 3.7 percent of the global population lived in such large urban agglomerations in 2000. Even with increasing urbanization and growth of new megacities, by 2015, they will still account for only a small percentage of global population, around 4.7 percent. The percentage of people living in cities with populations range from 5 to 10 million is even less than the percentage living in megacities: 2.8 percent in 2000 and is projected to increase to 3.7 percent in 2015. In other words, the percentage of people living in cities of more than 5 million will increase from 6.5 percent in 2000 to about 8.4 percent in 2015.

There is no question that these large urban agglomerations have presented, and will continue to present, tremendous planning, management and resource challenges. However, what is often not realized is that much of the recent urban growth is occurring in small-to-medium sized cities in developing countries. This trend is likely to continue, and may even accelerate, in the coming years. In 2000, cities with a population of less than 500,000 accounted for 24.8 percent of the global population (nearly seven times that of megacities). This percentage is expected to rise to 27 percent in 2015.[15]

Urbanization and the formation of large urban metropolises are not new phenomena. For example, cities such as London or New York started to grow significantly in the nineteenth century. However, there are some major differences between the growth rates and management of these cities in the past and that of new urban centers in the developing world nearly a century later, especially in respect to the provision of clean water and wastewater management services.

The first major difference is the rate of growth. The formation of the urban centers of London and New York was a gradual process, which occurred over nearly a century. This gradual growth enabled these cities to progressively and effectively develop the necessary infrastructure and the capacities to manage their water supply and wastewater management services properly. It was possible to develop and manage support services as development took place.

In contrast, much of the urbanization of the large cities in the developing world, such as Dhaka, Jakarta, Mexico City, and Sao Paulo, occurred during the post-1950 period, with explosive growth occurring after 1960. For example, the populations of Mexico City and Sao Paulo in 1950 were 2.9 million and 2.5 million respectively. Even with such significant populations, the two cities had annual growth rates of 5.2 percent and 5.6 percent resulting in a population increase of more than four-fold by 1975, making them the first two megacities of Latin America. These developing country's cities simply could not cope with such explosive growth rates. They were not only unprepared to manage such high growth rates, but also did not have the necessary financial, technical or managerial capacities to do so. Such high rates of urban concentration were not witnessed ever before in the entirety of human history, and these cities fell behind in constructing and properly managing water supply and wastewater treatment systems. Cities of the developed world did not have to face this problem.

Table 1. Evolution of megacities, 1950–2025 (population in millions)

1950		1975		2009		2025 (projected)	
City	**Population**	**City**	**Population**	**City**	**Population**	**City**	**Population**
New York	12.3	Tokyo	26.6	Tokyo	36.5	Tokyo	37.1
Tokyo	11.3	New York	15.9	Delhi	21.7	Delhi	28.6
		Mexico City	10.7	Sao Paulo	20.0	Mumbai	25.8
				Mumbai	19.7	Sao Paulo	21.7
				Mexico City	19.3	Dhaka	20.9
				New York	19.3	Mexico City	20.7
				Shanghai	16.3	New York	20.6
				Kolkata	15.3	Kolkata	20.1
				Dhaka	14.3	Shanghai	20.0
				Buenos Aires	12.8	Karachi	18.7
				Los Angeles	12.7	Lagos	15.8
				Beijing	12.2	Kinshasa	15.0
				Rio de Janeiro	11.8	Beijing	15.0
				Manila	11.4	Manila	14.9
				Osaka	11.3	Buenos Aires	13.7
				Cairo	10.9	Los Angeles	13.7
				Moscow	10.5	Cairo	13.5
				Istanbul	10.4	Rio de Janeiro	12.7
				Lagos	10.2	Istanbul	12.1
						Osaka	11.4
						Shenzen	11.1
						Chongking	11.1
						Guangzhou	11.0
						Paris	10.9
						Jakarta	10.8
						Moscow	10.7
						Bogota	10.5
						Lima	10.5
						Lahore	10.5

As the population of megacities has increased with time, and more megacities have formed, the definition of what constitutes a megacity has changed as well. Originally, a megacity had to have five million residents, increasing to eight million later on, and now it is generally accepted that megacities have to have more than ten million inhabitants. During the next five to ten years, as their numbers steadily increase, megacities may have to be re-defined again to have more than 15 million people.
Source: Compiled from UN Population data, 2010[16]

Second, as the urban centers of the industrialized countries expanded steadily, their economies were improving concomitantly as well. Consequently, these centers were able to harness the financial resources to provide their citizens a proper water supply and

wastewater treatment services as well. Japan, for example, could invest heavily in constructing urban water infrastructure, including water supply, flood control, and wastewater management services after World War II because its economy expanded significantly during the post-1950 period. Such extensive infrastructural development and improvements in management practices dramatically reduced Tokyo's water losses from leakages and other sources of waste from a post-war estimate of around 90 percent to about 5 percent, which is at present one of the lowest rates of wastage in the world.

In stark contrast to Tokyo's situation, during the past four decades, the economies of most developing countries have not performed very well. Issues like high public debts, poor governance, and inefficient resource allocation have led to a lack of critical investments needed to construct and operate new urban water and wastewater-related infrastructure. Lack of proper planning, poor management practices, pervasive corruption, public apathy, and lack of political will have further aggravated the situations in many urban centers.

Considerable progress has been made in recent years in providing water to the urban areas of the developing world, but the quality of water provided remains a serious, critical, and somewhat neglected issue. Equally, wastewater management has proved to be a poor cousin to water supply. Regrettably, the Millennium Development Goals took into consideration water supply, but not wastewater management. This is in spite of the fact that nearly 99 percent of water that is supplied to an urban household is returned as wastewater.

Even in a developed country like the United States, a lack of adequate investment in water and sewer infrastructure over past decades has meant that when there are intense rainfalls, rainwater can overwhelm the old sewer systems of many cities. Accordingly, untreated or partially treated wastewater is flushed through the wastewater treatment plants and ends up in river systems. For example, even in Washington, D.C., the nation's capital, heavy rains cause untreated sewage to flow into the Potomac and the Anacostia Rivers.[17] Unfortunately, this is not an uncommon occurrence in many US cities.

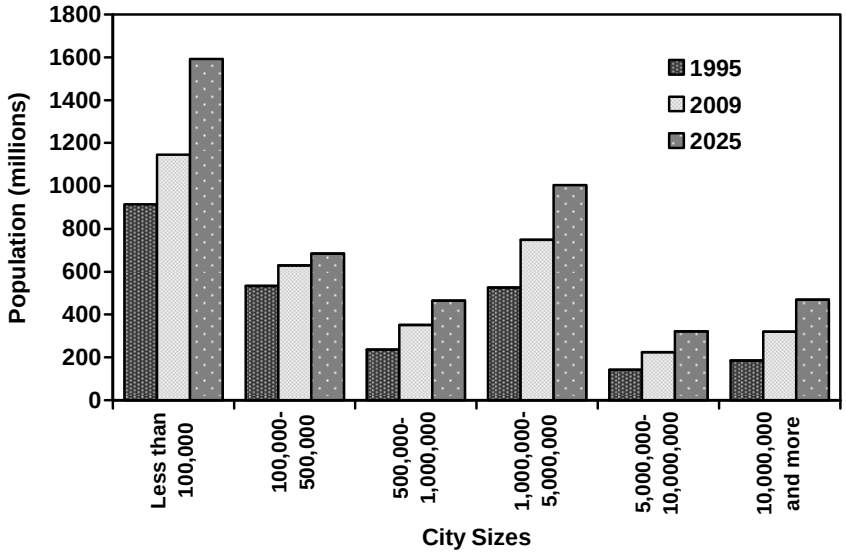
Consequently, a major problem the world will face in the coming decades is not physical water scarcity per se, but continued deterioration of water quality, which may restrict the amount of water that will be available in the future for human consumption. At present, the discharge of untreated or partially treated wastewater has grossly contaminated water sources in and around urban centers of the developing world, ranging from Delhi, Lagos, and Cairo to Mexico City. In the absence of adequate water quality management practices, the real water crisis the world is likely to face in the coming decades will not come from absolute physical scarcity, but rather from widespread water contamination.

A major problem for the major urban centers of the developing world stems from the fact that rates of urbanization have generally far exceeded the capacities of national and local governments to soundly plan and manage the demographic transition processes efficiently, equitably and sustainably. Accelerated urban growth rates have generally overwhelmed the limited management capacities and resources in all levels of government. Without question, unplanned and poorly managed urbanization processes have been an important source of social and environmental stress in all developing countries.[18] These processes have seriously impacted the provision of safe water supplies and wastewater management services.

The problem is compounded by a sudden fast rate of vertical growth (e.g., skyscrapers), after decades, or even centuries, of primarily horizontal expansion, especially in the downtown areas.[19] This shift contributed to a sudden surge in the population densities of these areas, which, in turn, drove up water requirements and the need for wastewater generation per unit area. While much attention is given by national and international institutions as well as academia to the water and wastewater problems of megacities and large urban agglomerations, the real problems of the future will not be from such areas for two reasons. First, as noted earlier, most of the urban population growth of the future will not occur in large urban areas, but rather in areas with populations of less than 500,000. In fact, as shown in Figure 1, the maximum growth will occur in areas having less than a population of 100,000.

Second, megacities and large urban centers have one very important advantage that is now totally neglected in water-related discussion. They are located where the elites, important politicians, and business people of the countries live. Hence, these cities have good access to funds and management and technical capacities, which their smaller counterparts do not have. Even though they may not receive clean water and wastewater management services, these larger urban centers will manage somehow.

Figure 1. Populations (millions) by city sizes, 1995, 2010 and 2025 (Source: UN Population Division, 2010).



In contrast, smaller urban areas have no political power, very limited access to funds, no media coverage of the problems they face, and very limited technical and management capacities.

Thus, contrary to the present wisdom, it is small to medium-size urban centers of less than 200,000 people that will encounter serious water supply and wastewater disposal problems in the future. Regrettably, such urban centers and their problems are not receiving much attention either from their governments or international institutions. Herein lies one of the most serious problems for the near future.

Much global attention has been focused on urbanization in recent years because of the magnitude and the extent of the phenomenon. Just as megacities have stolen the spotlight from the problems of medium-to-small-size cities, near-exclusive focus on urbanization has masked another serious problem that is facing the developing world, which is the reverse of urbanization. The Third World Center has termed it "ruralization," the rapid growth in the number of hamlets with less than 2,500 in population size. Based on data available from countries like Mexico and Morocco, the world is now witnessing rapid growth in the number of such small hamlets. They are mushrooming in areas that do not have good access to most services, including transportation, education, health, communication, and also water supply and wastewater management. The question of how these hamlets will receive reasonable services in the future is neglected by the national governments, international organizations, and NGOs. No government, national, or international institution has identified this phenomenon as a real problem, let alone considered policies that could address it. People in such hamlets are invariably poor and have no political or financial power, so their plights are ignored by national and international institutions and the media. Yet, provision of clean water and wastewater to such hamlets will be an important issue of the future.

Evolution of Global Developments in Urban Water Management

Though the importance of potable water to human life is universally understood, domestic water requirements did not become a part of the global social and political agenda until about the mid-1970s. The situation started to change during the UN World Conference on Human Settlement held in Vancouver in 1976, where, for the first time ever, domestic water use was formally discussed and placed on the world's social and political agenda. Further progress was made during the run up to the UN Water Conference, which was held in Mar del Plata, Argentina in 1977. It should be noted that this has been the only UN World Conference on water that has ever been attended by the vast majority of member states.

The Vancouver and the Mar del Plata Conferences were only two of several world conferences that the UN organized for priority global issues during the 1970s. This set of conferences started with the Environment (Stockholm, 1972), and was rapidly followed by Population (Bucharest, 1974), Food (Rome, 1974), Women (Mexico City, 1975), Human Settlements (Vancouver, 1976), and Water (Mar del Plata, 1977). Unfortunately, while the UN revisited all other critical issues exactly two decades later through follow-up global meetings, water has been consistently ignored. Thus, even though water for human consumption was placed firmly onto the global agenda at the Mar del Plata Conference, it has not received a similar level of attention as issues of environment, population, food, women, habitat, or desertification.[20] This shows, in a sense, the continuing "orphan" status of water in the international arena.

In retrospect, the Mar del Plata Conference nonetheless proved to be an important landmark. It is now firmly believed by water and development professionals all over the world that this conference has had an significant impact on water-related issues of the world, including water for domestic consumption, certainly more than any other global mega conference on water that has ever been held in human history.[21] The Mar del Plata Conference proposed that the 1980s be designated as the International Water Supply and

Sanitation Decade. It further recommended that its goal should be to provide access to clean water and adequate sanitation for all the citizens of the world by the end of the decade. Following the recommendation of the conference, the UN General Assembly officially endorsed the Decade and urged all countries to make its goals a reality.

While millions of people have received increased access to water and sanitation because of this renewed attention to water management, the Decade's ambitious targets proved impossible to achieve. A decade later, the United Nations came out with the Millennium Development Goals (MDGs), which adopted only one of the objectives of the Decade: to increase the number of people who have access to clean water. The new goal is to reduce the number of people lacking access to clean drinking water within the period between 1990 and 2015. This goal is much less ambitious than that of the Decade, but even this modest goal, according to the present evidence, will be missed by a wide margin.

It should be noted that for whatever reasons, the MDGs did not include any sanitation targets. The sanitation objective was added later, in 2002, during the Johannesburg Summit on the environment. Additionally, whereas the United Nations proclaimed a World Water Day that has been regularly observed on March 22 since 1993, there has not been a corresponding day for sanitation. At previous count, the UN system has designated 65 issues worthy enough of a World Day. These currently include issues like television, mountains, and South-South Cooperation, but sanitation has not been considered important enough to have a World Day. Some 15 years later, the sanitation issue received some belated recognition when 2008 was proclaimed the International Year of Sanitation. The fact that the sanitation goal was added as an afterthought in the MDGs, and that there has been a day devoted to water but not to sanitation, clearly indicates that sanitation has not received the same level of attention from the national and international institutions and policy makers as water has.

There are other factors within the UN system that seriously undermine its rhetoric on the importance of water and sanitation-related issues in the developing world. When the idea of the UN Water Supply and Sanitation Decade was first discussed within the Secretariat of the UN Water Conference in 1976, its goals and objectives were very clear.[22] In terms of water supply, the objective was simple, straight forward, and unambiguous: people should have access to clean water, which can be consumed without any adverse health impacts. Equally, they should have access to an adequate quantity of clean water for hygienic purposes. The goal of addressing sanitation meant that wastewater could be collected from all households, especially from the urban areas, taken to a treatment plant, treated adequately, and then discharged into the environment without any harm to nature.

Unfortunately, the international institutions associated with drinking water and sanitation-related issues changed these objectives without any open discussion or consultation. In respect to water supply, the focus in recent years has been on the assertion that water should be supplied from "improved sources" of water. This distinction is important since this change effectively supplanted the concept of providing clean water which could be consumed without any adverse health impact. Thus, even if the water quality of the source that water is extracted from actually remains the same, or even has deteriorated, institutions like the World Health Organization (WHO) will consider that source to be an improved source of water. In my view, if an example of

"improved sources" of water can be considered to be a standpipe one kilometer or more from households that delivers water of poor quality, the world has made only limited progress in terms of achieving the goal of providing access to clean water.

By leaving the definition of "improved sources" flexible and ambiguous and not relating it to water quality, countries are showing remarkable statistical progress in terms of improving their water supplies. When the WHO and United Nations Children Fund (UNICEF) aggregates national data sets, without any consideration for their reliability and appropriateness, the resulting macro data need to be interpreted with considerable caution. There are several major urban centers in the world, including megacities, where the quality of water supplied has deteriorated significantly in recent years, as well as the quality of services provided (e.g., the number of hours that citizens receive water), and yet the people are considered to have access to "improved sources" of water. Such statistics give an erroneous view of the magnitude of the current problem, yet these data are being extensively used by most water professionals, political figures, national and international institutions. These inaccurate statistics are being widely used to show the extent to which MDGs relating to safe drinking water are being fulfilled.

It is worth emphasizing that access to water has never been a real issue for the world. If people did not have access to water, they would have been long dead! The important issue thus is not simply access to water, but rather ready access to clean water that can be consumed without any adverse health impacts. Sadly, most of the international and national attention is now firmly focused on the achievement of the numerical targets of the MDG on water supply and the Johannesburg target on sanitation. However, the real objectives and philosophy behind the two targets, which were the main objectives of the earlier Decade, are being lost in a sea of numbers.

By ignoring the objectives of these two targets, the world now faces serious problems, beginning with the fact that the problem is grossly underestimated. For example, a 2008 WHO-UNICEF report estimated that some 884 million people in the world do not have access to "improved sources" of drinking water.[23] Unfortunately, the vast majority of people, who do not read this assessment very carefully, believe that "improved sources" of water means access to clean drinking. Nothing is further from the truth.

Table 2. Access to improved sources of water according to WHO and UNICEF

Country	Percentage of urban people having access to water, 2008
Bangladesh	85
Brazil	99
China	98
Congo	90
Egypt	100
India	96
Iraq	91
Mexico	96
South Africa	99
Thailand	99
Turkey	100
Zimbabwe	99

As a result of these misleading statistics, the world at present has no idea how many people do not have access to clean drinking water.

The figure, most likely, is closer to 2 to 2.5 times greater than the figure that is now widely touted. Based on anecdotal evidence, it is safe to assume that close to 2 billion people do not have access to clean water. It may even be higher!

Let us consider the latest assessment that the WHO and UNICEF released in 2010. Table 2 indicates their assessment for a few selected countries.[24] Any person living in the urban centers of the above countries will find it impossible to believe that nearly all of them have access to "safe" water. It is indeed a very sad and cruel commentary to claim that countries like Zimbabwe, Turkey, Thailand, South Africa, and Brazil are providing more than 99 percent of their urban residents' access to safe water. Nothing is further from the truth.

Let us consider the actual facts. In cities like Delhi, Dhaka, Cairo, or Mexico City, each household, or block of flats, now acts as a mini-utility. Water of undetermined quality is collected, stored in underground tanks, and then pumped to overhead tanks by individual families. This water is then treated, mostly with filters (and sometimes even with membranes like the ones used for sea water desalination) before it is consumed. The main utilities supply water intermittently (often two to five hours per day), which is supplemented by the mini-utilities at each household to yield a 24-hour supply that still requires treatment at high economic costs.[25] Considering this situation, it is really a charade to claim all these urban inhabitants have access to safe water.

Detailed analyses by independent water experts show the fallacy and inaccuracy of these data and claims from official national and international sources.[26] However, it does not take a rocket scientist to disprove the current claims. Any visitor to Delhi, Mexico City, Cairo, Kolkata, Lagos, or Nairobi would know in a day or two their ludicrousness. Independent studies in Bangkok show that at present only 2.4 percent of the residents drink directly from the tap, and 71.8 percent either boil or use filters before drinking, while another 25.8 percent drink bottled water.[27] The situation is similar in many urban centers of the developing world.

With respect to the sanitation statistics, the problems are equally serious. Wastewater may now be collected from urban areas, but is usually either not treated or only partially treated before being discharged into rivers, lakes, and oceans. Thus, the contamination and health problems are simply being transferred from the urban areas where the wastewater originates to another location where fewer people may be affected. These contaminants from urban areas are frequently dumped in large bodies of water resulting in serious adverse health, social, economic, and environmental impacts. If the present trend continues, within one or two decades most developing countries are likely to face a very serious crisis in terms of water quality—on a scale unprecedented in history.

Studies carried out by the Third World Center for Water Management indicate that about 11 percent of municipal and industrial sources of wastewater are now being adequately treated and then disposed of in an environmentally-safe manner in Latin America. It is likely that the situation is similar in the Asian developing countries, and probably somewhat worse in Africa. Most cities retain poor practices; Delhi discharges its untreated wastewater into the Yamuna River, Mexico City into the Mezquital Valley, and Ahmedabad into the Sabarmati River. The irony is that all three cities claim that their residents have full access to proper water sanitation services. Thus, the real water crisis of

the future, unless the present trends are reversed, will come not from physical scarcity of water, as it is widely predicted at present, but poor water quality due to continued disregard and mismanagement of wastewater.

Future of Urban Water Management

Based on the current knowledge and experience available, the world's urban water problems are solvable. There is absolutely no reason to believe that the urban residents of any developing country with a population of more than 200,000 people cannot receive clean and safe drinking water on a 24-hour basis. We have the knowledge, experience, technology, and investment funds available at present to make this dream a reality.

A good example of what is possible is the case of the city of Phnom Penh in Cambodia. In 1993, it had a dismal water supply situation. Some 83 percent of water was lost due to leakages and unauthorized connections. The Phnom Penh Water Supply Authority (PPWSA) was corrupt, incompetent, and bankrupt. With enlightened leadership, by 2000, water losses were reduced to about 35 percent, and by 2009 to about 6 percent. Everyone pays for the water consumed, and, since 1997, the Authority's profit each year has increased significantly.[28] Donors are fighting with each other to lend PPWSA funds. The company is also able to pay the Cambodian government increasingly higher taxes from its profits each year. At present, the performance of PPWSA is better than most utilities in North America or Europe.

Among the major problems of urban water management in developing countries are pervasive corruption and lack of transparency in terms of functioning of the water utilities. It is important to note that Phnom Penh has optimized its urban water management in a country like Cambodia, which, in 2009, in terms of corruption perception index of Transparency International, ranked 158 in the world. PPWSA has successfully eliminated corruption and made its governance system as transparent as in London or New York. In addition, it has less management and technical expertise than many other developing countries like Brazil, Egypt or India, and no private sector to which specific activities can be outsourced. Yet, it has accomplished its goals for providing clean water to all its inhabitants, rich or poor, and affordable prices. If clean water is possible in Phnom Penh, it is possible throughout the developing world.

There are no economic or technical reasons why reasonably sized urban centers in developing countries cannot have 24-hour access to clean and safe water within a period of 10 years. This will, however, require a new mindset for national institutions, political leaders, international organizations, and the general public that must demand clean water supply and wastewater management. For such systems to be sustainable on a long-term basis, people must be prepared and willing to pay a reasonable amount, probably no more than about 2 percent of their household income. It will undoubtedly require very substantial improvements to existing governance practices, which continue to be very poor.[29] Water utilities must be run by competent professionals, and there should be a firewall between the managers who should run them and the politicians of the developing world who often constantly interfere with their efficiency. Policy makers should set the overall policy framework within which the utilities should operate and then leave the professional managers to get on with the task.

Even though there have been heated debates as to whether the public or private sector should run such utilities, in the final analysis it really does not matter so long as they are efficient, cost-effective, and available to everyone at a reasonable price. By 2030, it is almost certain that at least 85 percent of the world's population will still be receiving water from the public sector. Thus, the most important question facing the world now is how to make public sector utilities as efficient as their counterparts in Phnom Penh, Zaragoza, or Singapore within the next decade, and not engage in the irrelevant heated debate of recent years as to who should manage the water utilities, private or public sector.[30]

The developing world's urban water problems are solvable. If they are not, as William Shakespeare said, "The fault, dear Brutus, is not in our stars, / But in ourselves that we are underlings[31]."

Notes

[1] Asit K. Biswas and Cecilia Tortajada, "Water and the OECD: Towards a Symbiotic Relationship," *OECD Observer* (May-June 2008): 36–37.

[2] At least 10 books can be identified in the English language only during in just the past five years which discusses the water crisis or scarcity; most of which are based on erroneous understanding of the issues and faulty and unreliable data.

[3] World Commission on Water, "Report of the World Commission on Water," *International Journal of Water Resources Development* 16, no. 3 (September 2000): 289–320.

[4] Asit K. Biswas and Cecilia Tortajada, Changing Global Water Management Landscape, in Asit K. Biswas, Cecilia Tortajada and Rafael Izquierdo, *Water Management in 2020 and Beyond* (Berlin: Springer, 2009), 1–34.

[5] Available at www.quotationspage.com

[6] Asit K. Biswas, "Water Management: Some Personal Reflections", *Water International* 34, No. 4 (December 2009): 402–408.

[7] Asit K. Biswas, Cecilia Tortajada and Rafael Izquierdo, *Water Management in 2020 and Beyond* (Berlin: Springer, 2009).

[8] Ibid.

[9] United Nations Population Division, *World Urbanization Prospects: The 2001 Revision*, Publication ESA/P/WP.173 (New York: United Nations Secretariat, 2002).

[10] Asit K. Biswas, "Water Management for Major Urban Centres", *International Journal of Water Resources Development* 22, No. 2 (June 2006): 183–197.

[11] Ibid.

[12] Ibid.

[13] Ibid.

[14] United Nations Population Division (2002), Op. cit.

[15] United Nations Population Division (2002), Op. cit.

[16] United Nations Population Division, "World Urbanization Prospects: The 2009 Revision," Department of Economic and Social Affairs, United Nations, http://esa.un.org/unpd/wup/ index.htm.

[17] Charles Duhigg, "Saving US Water and Sewer Systems would be Costly," *New York Times*, March 14, 2010.

[18] Asit K. Biswas, "Water Management for Major Urban Centers," *International Journal of Water Resources Development* 22, no. 2 (June 2006): 183–197.

[19] Olli Varis, "Megacities, Development and Water," *International Journal of Water Resources Development* 22, no. 2 (June 2006): 199–225.

[20] Asit K. Biswas, ed., *United Nations Water Conference: Summary and Main Documents* (Oxford: Pergamon Press, 1978); Water is not only essential for human consumption, but also for industrial and agricultural development, energy generation, environmental use, navigation and water quality management—all of which are important and critical issues.

[21] Asit K. Biswas and Cecilia Tortajada, "Evaluation of Global Megaconferences on Water," in Impacts of Megaconferences on the Water Sector, ed. Asit K. Biswas and Cecilia Tortajada (Berlin: Springer, 2009), 145-159.

[22] I was senior advisor to the Secretary General of the UN Water Conference and thus intimately associated with the Decade discussions and negotiations.

[23] WHO/UNICEF Joint Monitoring Programme on Water Supply and Sanitation, "Progress in Sanitation and Drinking Water: 2010 Update," WHO and UNICEF, Geneva, 2010.

[24] Ibid.

[25] Asit K. Biswas and K. E. Seetharam, "Asian Water Development Outlook, 2007: Achieving Water Security for Asia," *International Journal of Water Resources Development* 24, no. 1 (March 2008): 145–176.

[26] Jorge Guardiola, Francisco Gonzalez-Gomez, and Angel Lendechy Grajales, "Is Access to Water as Good as the Data Claim? Cases Study of Yucatán," *International Journal of Water Resources Development* 26, no. 2 (June 2010): 219–233; Mukand S. Babel, Aldrin A. Rivas, and Seetharam Kallidaikurichi, "Municipal Water Supply Management in Bangkok: Achievements and Lessons," *International Journal of Water Resources Development* 26, no. 2 (June 2010): 193–217; Cecilia Tortajada, "Water Management in Mexico City Metropolitan Area," *International Journal of Water Resources Development* 22, no. 2 (June 2006): 353–375.

[27] Mukand S. Babel (2010) Personal Communication.

[28] Asit K. Biswas and Cecilia Tortajada, Water Supply of Phnom Penh: An Example of Good Governance," *International Journal of Water Resources Development* 26, no. 2 (June 2010): 157–171.

[29] Asit K. Biswas and Cecilia Tortajada, "Future Water Governance: Problems and Perspectives," *International Journal of Water Resources Development* 26, no. 2 (June 2010): 129–139; Cecilia Tortajada, "Water Governance: Some Critical Issues," *International Journal of Water Resources* Development 26, no. 2 (June 2010): 297–307; Cecilia Tortajada, "Water Governance: A Research Agenda," *International Journal of Water Resources Development* 26, no. 2 (June 2010): 309–316.

[30] Cecilia Tortajada, "Water Management in Singapore," *International Journal of Water Resources Development* 26, no. 2 (June 2010): 227–239.

[31] William Shakespeare, Julius Caesar, (1559) act I, sc. 2, l.134