

Water Management in Latin America and the Caribbean

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ABSTRACT *During the 21st century, water and wastewater management is likely to be one of the most critical resource issues that the Latin American and the Caribbean countries will have to face. All the countries of the region are already facing serious problems in terms of how best to provide a reliable water supply for all uses, and then how to treat the resulting wastewaters adequately. With increasing population growth and accelerating human activities, the regions' water problems are likely to get worse, unless the existing water management processes are significantly improved within a short period of time. There are, however, signs of hope since countries like Brazil are making major advances. Developing countries need to learn from such success stories, instead of relying exclusively on western experiences and technology to solve their water and wastewater management problems promptly and cost-effectively.*

Introduction

Efficient water management is an absolute prerequisite for the long-term sustainable development of the Latin American and the Caribbean countries. Current efforts at poverty alleviation and employment generation in all the countries of the region to improve the existing lifestyles of the people can at best be a partial success without adequate emphasis on managing the limited water resources of the individual countries efficiently and equitably. Such development efforts are likely to fail, or at the very least not be cost-effective and/or take a very long time to achieve their stipulated goals, certainly significantly longer than planners originally anticipated, unless explicit steps are taken to improve the various water management processes.

Management of water resources must receive higher levels of political interest in nearly all the countries of the region. Otherwise, improvements in water management and development practices will not take place in a timely manner, and without such improvements, regional economic development and regional income distribution are likely to be much slower, less effective and sustainable, than the people and politicians expect at present. Under such a scenario, when the people's expectations, which the politicians have led them to believe could be achieved within a reasonable period of time, are not met, there could be considerable social unrest and strife in the foreseeable future.

Equally, if the governments in power forget the elementary fact that clean water and adequate sanitation are essential for human survival and continued human development, they will face increasing social and political turbulence in

the coming years. Better communication and increasing political awareness mean that people are no longer willing to live under unsatisfactory conditions that preceding generations may have passively accepted in earlier times. The potential consequences of this change in the current sociopolitical landscape can no longer be considered to be a hypothesis since many social unrests have already occurred due to the unavailability of adequate quantities of clean water in certain parts of the Latin American and the Caribbean countries, as well as in many other parts of the developing world.

A good example of what is likely to happen increasingly in the future is the sociopolitical problems that were created by an inefficient water distribution system in an important medium-size city such as Monterrey, Mexico. Interrupted and uncertain water supply to the urban dwellers became a serious problem due to poor planning and inefficient management. Neither the politicians nor the media were initially interested in the plight of the people until women from the lower to lower-middle class areas, who had to face most of the burdens imposed by the poor and uncertain water supplies, became fed up with the situation, and challenged officialdom head on. They blocked the main roads, and 'kidnapped' vehicles and personnel related to water services. The Mexican media picked up the story of their plight, which made hardships due to a poorly managed water supply system a major national political issue. The significantly higher level of visibility of the issue at regional and national levels made release of new investment funds possible, and the senior water managers were forced to give increasing attention to the Monterrey problem, which led to its speedy resolution. This indicates that unless water issues receive the priority sociopolitical attention they deserve, incidents like the one in Monterrey are a foretaste of what is likely to become the norm rather than an exception in the future.

Water and Increasing Human Activities

With increasing population in the Latin American and the Caribbean countries, the total human activities are unquestionably increasing in the region even faster. While the levels and types of such increases may vary from one country of the region to another, the fact remains that such accelerations undoubtedly have serious implications in terms of total water use, qualities of national, regional and local water bodies, and social, economic, environmental, health and political issues. In addition, social norms and thinking are rapidly changing, which, in their wake, are bringing rapid changes as to how the society views water and its management practices, and the importance of having a good water supply and sanitation facilities. Some of these changes are already visible, some can be predicted for the foreseeable future with reasonable certainty, and a few are likely to be unexpected for a variety of reasons, and thus are likely to be identified only after they have occurred.

A good example of the changing mind-set is the environmental aspects of water development. Only three decades ago, these were considered to be of minor importance, and thus received inadequate attention in all parts of the world. However, as environmental considerations progressively climbed higher and higher on the national and international political agenda, they became a priority issue in many countries in terms of the construction of new water development projects and the management of existing ones. Based on current and foreseeable trends, it is highly likely that within a decade or so ecosystem

Table 1. Population of the six most populous countries of Latin America and the Caribbean in millions, 1990–2030

Country	1990	2000	2010	2020	2030
Total, Latin America and Caribbean	434.58	512.25	584.73	644.33	751.06
Argentina	32.32	35.77	38.90	42.05	44.6
Brazil	149.02	172.23	194.10	214.95	231.45
Colombia	32.30	37.47	42.17	46.82	50.67
Mexico	81.72	98.79	114.02	128.46	142.33
Peru	21.51	25.92	30.03	33.79	37.26
Venezuela	19.33	24.24	28.20	31.83	35.24

needs for water will be considered to be a legitimate user of water, and thus would have to be explicitly considered within the water allocation process. Accordingly, ecosystem needs for water would most likely be a direct competitor for other existing traditional water uses. This 'new' need would in turn make conflicts between the various water uses more intense, especially in those regions where water is already scarce. Regrettably, however, senior water managers in many developing countries, irrespective of the official rhetoric, still continue to believe environmental protection is a luxury that developing countries cannot afford. This irrational thinking, and continued inadequate attention to the appropriate environmental factors associated with water management, are likely to increase the intensity and magnitude of the future conflicts between the various types of uses and their respective stakeholders.

Introduction of a new category of water use, however justified such a use may be, would make the water management process significantly more complex than it is at present. This is because water requirements, at least during the next 3–5 decades, will continue to increase for two very important reasons: population growth and per capita increase in water requirements. If there is already a water scarcity in a region at present, the situation is likely to get worse in the future as a result of all these new, additional demands, unless the current trends can be reversed.

In terms of population growth, and according to recent World Bank estimates (Bos *et al.*, 1994), the total population of the Latin American and Caribbean countries is likely to increase from 435 million in 1990, to 585 million in 2010, and to 751 million in 2030. This means within the 40-year period from 1990 to 2030, the population of the region is expected to increase by 316 million, or by 73%. There would of course be wide regional variations. For example, during this period, the population of Bolivia is expected to increase by 106%, Guatemala by 138%, El Salvador by 83% and Venezuela by 82%. In contrast, the population of Cuba is expected to increase by only 21%. Table 1 shows the estimated population increase for the region, as well for its five most populous countries.

The demand for water is also expected to increase due to increasing living standards of the people, and also their changing lifestyles. As more and more people in the Latin American and the Caribbean region attain higher living standards, their per capita water requirements will increase as well. Historically this has been a fact in the developed world, and it appears to have been occurring in the developing countries in recent years. For example, per capita water use exactly doubled in Japan during the 26-year period from 1965 to 1991,

from 169 to 338 litres. Similarly, if current trends continue, the total water requirement in England and Wales is likely to increase by more than 20% by the year 2020, even though the total population increase is likely to be modest. Lifestyle changes, primarily in terms of significant increases in the use of dishwashers and washing machines, would primarily account for this increase.

All the anecdotal evidence indicates that the per capita water requirements of the affluent are increasing in the developing world. Thus, as the poverty alleviation programmes succeed in improving the lifestyles of the poor, one of the direct impacts of the success would be higher water demands from an increasing number of people, as they become more and more affluent. None of the Latin American and the Caribbean countries have factored in the increasing per capita water requirements for their richer inhabitants in their national, regional or local water management plans.

Clearly all these increases will mean that more and more water will be required in the future to meet the additional demands for drinking, agricultural and industrial production, energy generation, recreation and ecosystem preservation. Since human activities generally degrade the quality of the water used, wastewater treatment must receive a much higher emphasis than at present. Overall, currently around 6% of the wastewater generated in Latin America is treated properly. Thus, adequate treatment has to be provided for not only the wastewater that is currently not being treated properly but also for the additional wastewater generated in the future. This will not be an easy task since investments required to treat efficiently all the wastewaters generated would be extremely high. Currently, no reliable estimates are available as to the level of investment needed at the national and regional levels but the total is likely to be in hundreds of billions of dollars. It is hard to see how such large capital investments could be generated internally in most countries, when they need similar high investments for other sectors such as education, transportation, social services and environmental protection.

In addition to the very high levels of capital investment necessary, the national water authorities in the entire region do not have adequate expertise in water quality monitoring and management, or the technical capacities necessary to operate all the wastewater treatment plants that would be necessary. Privatization may help, but then the countries are likely to become increasingly dependent on foreign companies, which may be more interested in their net profits rather than providing a reliable and affordable service to the poor. Generally the private sector has not been very enthusiastic in supplying water to low-income districts because of the low returns on the capital invested. New checks and balances have to be devised to ensure that the private sector gets a reasonable profit but simultaneously all people get a proper water supply and waste treatment facilities at reasonable costs, especially those living in underprivileged districts. Equally, the national capacities on all aspects of water quality management need to be enhanced very significantly within a short period of time. Unfortunately, for the most part, even the universities are not equipped to face this mammoth challenge of capacity building. Prolonged periods of historical neglect of this area mean that it would be a very difficult task to accomplish satisfactorily within the near to medium term.

If environmental and water quality management do not receive the priority attention they deserve, the cost to the nations concerned in terms of health and sustainable development are likely to be extremely high on a long-term basis.

Water Management in Latin America

Tremendous advances have been made in Latin America in recent years in water management, much of which not only the rest of the world but also most of the Latin American water professionals are basically unaware of. Equally, water is much higher on the political agenda in Latin America than in the other regions of the world. For example, at the Summit of the Americas, held in Santa Cruz, Bolivia, in December 1996, the leaders categorically declared that:

Despite extensive efforts by countries in the Americas to improve water use and management, demand continues to rise while contamination has seriously degraded the quality of freshwater, spreading disease and causing economic losses.

Poor management structure and pricing, as well as lack of stakeholder commitment to water management and conservation, are important factors contributing to growing scarcity. Particularly troublesome are the projected demands for drinking water by urban populations, and potential conflicts among sectors, regions, and countries that share water resources.

The Latin American leaders then went on to identify five priority areas:

- management and use;
- access and availability;
- stakeholder participation;
- transboundary water conflicts; and
- economic valuation of water resources.

The differences between the rambling Chapter 18 of Agenda 21 of the UN Conference on Environment and Development (UNCED), held at Rio de Janeiro in June 1992, and the succinct statement on water during the Summit of the Americas and its prioritization of action areas are indeed remarkable.

Similarly, if one compares the vague Dublin principles with the principles outlined by the Brazilian water law of 1997, it has to be admitted that the Brazilians are light years ahead of the Dublin results, even though certain international organizations are still erroneously continuing (at least in public) to claim that the Dublin recommendation would ensure sustainable water development. An objective analysis of the Dublin and the Brazilian principles will indicate the fundamental differences that are inherent between these two sets of principles. These are given below.

Dublin

1. Freshwater is a finite and vulnerable resource.
2. Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels.
3. Women should play a central part in the provision, management and safeguarding of water.

Brazil

Water is a limited natural resource, essential to sustain life, development and the environment.

The management of water resources should involve participation by the government, the users and the communities.

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| 4. Water has an economic value in all its uses, and should be recognized as an economic good. | Water has economic value. |
| 5. – | Water is public property. |
| 6. – | When there is shortage, priority in the use of water resources is given to human consumption and the watering of animals. |
| 7. – | The management of water resources should always allow for multiple uses of water. |
| 8. – | The river basin is the territorial unit for the implementation of the National Water Resources Policy and the actions of the National Water Resources Management System. |

In addition to the above principles, the Brazilian law also specifically stipulates the following conditions as 'General Guidelines for Action':

- integration of water resources management with environmental management;
- coordination of water resources planning with that of the user sectors and with planning at the regional, state and national levels;
- coordination of water resources management with that of land use; and
- integration of river basin management with that of estuary systems, and coastal management.

Accordingly, those developing countries that are contemplating the development of new water laws, or amendment of the existing ones, would do well to study the legal regimes for water management in certain specific Latin American countries such as Argentina, Brazil, Chile and Mexico, and review the status of the implementation of the relevant laws and the reasons therefor. Such a step is highly likely to contribute to the formulation of more appropriate and implementable laws, compared with almost exclusive reliance in terms of blindly following the legal regimes of the industrialized countries, which for the most part cannot be properly implemented because of various major constraints.

Water and Peace

With the end of the Cold War, a new type of international, regional and national security issue is becoming an increasing concern. The conventional military dimensions of peace and security issues still persist, though at a much lower level of importance than before. This lowering, however, has been more than compensated for by increasing unconventional security threats from new factors such as population growth and the associated impacts such as depletion and degradation of natural resources, especially water, and environmental deterioration.

The central role water plays in sustaining all life on earth and preserving the different ecosystems is beyond dispute. As the population of the Latin American and Caribbean countries continues to increase and the lifestyles of millions of people continue to improve, more and more water will be necessary for

domestic consumption, industrial expansion, agricultural production, energy generation and ecosystem preservation. Water is already a scarce commodity in much of the inhabited parts of the region, and managing the continuous cycle of floods and droughts successfully has become a very difficult task owing to higher water needs and significant changes in land use. As the demands for fresh water continue to increase in the future in all the countries of the region, tensions within nations, as well as between nations, over the use of water sources that could be economically and environmentally exploited could become more and more intense, unless proper countermeasures are formulated and then implemented in the coming years.

Specifically, the problems associated with the use of the international water bodies, that is those rivers, lakes and aquifers that are shared by two or more countries, could become increasingly complex, acute and fraught with danger. The ever-increasing competition for limited supplies of fresh water between the co-basin countries could lead to war under certain special conditions. This is an important factor to consider for the South American countries, since 60% of the area of the continent is accounted for by international river and lake basins (Biswas *et al.*, 1998).

Tensions over the use of international water bodies have been serious in the past. For example, an important contributory cause for the Arab–Israeli War of 1967 was the struggle over the control of the Jordan River and the other water bodies of the region. A long simmering dispute over the water use of the Rio Lauca led Bolivia to sever diplomatic relations with Chile. Similarly, political hot spots have been observed in recent years in Bangladesh, India and Nepal over the use of the River Ganges; Iraq, Syria and Turkey on the use of Euphrates–Tigris rivers; Egypt, Ethiopia and Sudan on the River Nile. Boutros Boutros-Ghali, former Foreign Minister of Egypt, and who later became the Secretary-General of the United Nations, has said categorically that the “next war in our region will be over the waters of the Nile, not politics”.

There are 36 international river basins in South America, 18 in Central America and 43 between the United States and Mexico. In the vast majority of these international rivers, problems have still not reached critical dimensions as yet. By raising the spectre of possible major conflicts over some of these river basins in a constructive and forceful manner, it is possible to increase the awareness of the respective governments, people living in the river basins concerned, and appropriate international organizations, in terms of the importance, relevance and urgent nature of the problems involved. Such a process, if carefully planned, could contribute to the emergence of the necessary political will in the nations concerned so that the problems could be analysed and resolved between the countries in an amicable manner, long before they become increasingly complex, critical and entrenched. It is indeed a good sign that the leaders of the continent identified transboundary water conflicts as a priority area during their Santa Cruz Summit in December 1996.

In spite of the recent developments, very few people have realized the importance of the new and emerging factors such as water availability and use as a serious threat to future national, regional and global peace, and even fewer have a clearer understanding of where, how and when such threats could affect peace and security issues. To the extent these non-conventional concerns have received some attention in recent years, they have generally tended to concentrate on only one issue: global warming and climate change. And yet, the most

immediate and most serious threat to national and regional peace is likely to come *not* from climate change, though it is an important issue, but from the lack of good quality freshwater for various human uses. Unfortunately this is a fact that has been mostly neglected in recent global discussions.

South–South and North–South Knowledge Transfer

While much lip-service has been given to this subject in the past by both national and international organizations, it has to be admitted that very limited progress has been made thus far. It is an established fact that, with a few exceptions, major water developments have not occurred in Western Europe or in North America (excluding Mexico) during the past 25 years. These developments have mostly taken place in developing countries such as Brazil, China, India, and Turkey. Regrettably, nationally and internationally, very limited information is available on these developments. Currently, water professionals in Brazil or Mexico know much more about the water developments that have taken place in the United States or England, compared with the extent and nature of the progress made in their own countries, or in the other nearby developing countries. And yet, in many instances, countries like Brazil or Turkey have made significantly more progress, at least in terms of operation and implementation, compared with what has been achieved by their counterparts in the developed countries. For example, as mentioned earlier, Brazil has enumerated the principles of sustainable water management in operational terms which are significantly more comprehensive than the so-called Dublin principles. Currently one needs to visit Turkey or Mexico to observe the latest advances in the area of transfer of irrigation districts; Egypt for the control of schistosomiasis; Bangladesh to see the actual functioning of groundwater markets; and Turkey for private sector participation in the construction of large dams.

The water professionals from developing countries are often encouraged by many international organizations to make study tours to the industrialized countries, even when the best implementable and the most appropriate practices from their viewpoints can probably be observed in the developing world. Many bilateral aid organizations often organize study tours for the water professionals from the developing countries to their own countries, ostensibly to provide education and training, but frequently the main item on their hidden agenda is primarily to sell their countries' consulting services, equipment, etc., to the developing world. It is not unusual to find that education and training, for all practical purposes, is used as a carrot to further advance the commercial interests of the donor countries. During this process, the commercial interests often drive the final arrangements, and appropriate training of developing country water professionals becomes a secondary consideration.

Equally important is the question of inappropriate technology and experience transfer from developed to developing countries. The economic, institutional, legal, environmental and cultural conditions are vastly different between the two groups of countries. For example, legal frameworks for water management in the Latin American countries are vastly different from those of the UK, France, Germany, Canada or the USA. The legal and institutional frameworks of the latter group of countries are primarily based on Anglo-Saxon practices, whereas the former group of countries relies more on their Spanish background. Similarly, there are some fundamental differences between the Islamic and the

Anglo-Saxon laws. The sociocultural conditions are also often vastly different. Thus, direct experience transfer from one group of countries to another would be realistic only if this is done sensitively, and with appropriate modifications to suit the technical, social and legal conditions prevalent in the recipient countries. Blind acceptance and transfer of knowledge and practices from the developed nations to the developing countries could often prove to be a very expensive practice, and may even be counter-productive since it may create more problems than it solves. The world is full of examples where direct knowledge and experience transfer from the North to the South have proved to be a very complex and expensive process, not only in the water area but also in many other fields as well. The stated intentions were often honourable, even though the results later may not have been satisfactory.

A good example is water quality management. One of the main reasons why water quality management is somewhat poor in developing countries is because monitoring networks, water quality standards, and design practices are often directly based on the US, Canadian or French norms, which are not necessarily the most practical solution that could be implemented in the developing countries because of a variety of interrelated constraints. Direct transfer of western standards and legal procedures for water quality management in developing countries has not worked in the past, and is highly unlikely to work in the foreseeable future because of inherent economic, institutional, technical, climatic and cultural differences. Very often, not surprisingly, the western experts propose solutions that work in their own countries and with which they are familiar. In addition, most of these experts have only limited knowledge of the conditions and constraints that prevail in developing countries, which are not all homogenous in terms of expertise available or development potential. It should be clearly noted and understood that what works in the United States may not work in Mexico or Brazil for a variety of valid reasons. Furthermore, what works in Brazil may not work in El Salvador. Equally unsurprisingly, when the solutions do not work efficiently, the experts and the external institutions concerned often blame the developing countries for not operating and maintaining the systems properly, when the solutions proposed in the first place were inappropriate. Accordingly, in numerous instances, the foreign experts have become part of the problem rather than part of the solution.

In many ways, decision makers and planners from developing countries must accept part of the blame. It is not unusual to find that they would often accept recommendations from a second- or third-grade foreign professional compared with a first-grade national expert, who also has the added advantage of knowing the national conditions and institutions far better than any foreigner. In a way, it is reverse racism, which most practitioners do not even realize or appreciate.

This, however, does not mean that the good foreign experts are not needed. On the contrary, there are many areas where the assistance of knowledgeable foreign experts could be most beneficial, and thus invaluable. The emphasis must be placed on choosing the right professionals who not only are experts in the appropriate technical areas but also are fully familiar with the conditions prevailing in the countries concerned. Only when these two conditions are satisfied (technical knowledge and country experience) can good foreign experts recommend implementable and cost-effective solutions. However, it is fairly common to find that the expertise of the foreigners does not match the types and complexities of the problems that are to be solved, and/or their knowledge of

the prevailing national conditions leaves much to be desired. Accordingly, the selection process of foreign experts is the most critical consideration. A good expert can make a tremendous difference. Equally, a mediocre or poor expert could leave a legacy for which the country would continue to pay long after the expert is gone.

Instead of relying on foreign experts for magic solutions, developing countries need to give significantly more attention to nurturing their own professionals so that appropriate solutions could be formulated and then implemented, based on their own economic, technical and institutional strengths and weaknesses. Such a process would not only be economically efficient but also could ensure continuity, which the foreign experts cannot. Voltaire's philosophy that 'best is often the enemy of good' is a good dictum to follow, especially when the 'best' solution cannot be implemented for a variety of reasons, whereas the 'good' could be the most feasible and implementable proposition.

Thus, South-South knowledge, experience and technology transfer should receive significantly more emphasis than it has received thus far. This is especially relevant for the Latin American region because of the linguistic, cultural, legal and economic similarities between the countries concerned. Irrespective of the rhetoric in the past, this has basically been a neglected area which must now receive priority attention in coming years.

Water professionals and decision makers thus need to change their mind-sets, and give more emphasis to learning from the rapid advances made in many areas of water management by certain countries of the South, especially during the past decade or two. Furthermore, similarities in climatic, economic, social and environmental conditions often mean that South-South experience transfer between a homogeneous group of developing countries could often provide better results within a shorter time period in an economically efficient manner, compared with the existing almost exclusive reliance on the North-South knowledge transfer process.

Concluding Remarks

On the basis of the above review, it is clear that the water management profession is likely to face a problem during the early decades of the twenty-first century, the magnitude and complexity of which no earlier generation has ever had to face. In the run-up to the millennium, the water profession really has two choices: to carry on as before with a 'business-as-usual' approach which contributes primarily to only incremental changes as have been witnessed in the past, and which would endow our future generations with a legacy of suboptimal water management processes, or continue in earnest an accelerated effort to plan, manage and use the world's limited water resources sustainably and equitably.

All the major issues facing the world are interrelated, and the dynamics of the future will be determined not by any one single individual issue but by the interactions of a multitude of issues. An increase in population means more food, energy and other raw materials. Augmenting food and energy supplies necessitates sustainable water management. The common requirements in all practical responses to the solution of any of these major problems must include greater investment, more technology and expertise, and intensified cooperation. The interrelationships are global in character, and hence they can be best

understood and then resolved within a global framework. While the framework could be global, within this there must be a wide variety of integrated regional, national and local responses. Within this overall context, decision makers, concerned professionals and the society as a whole must make a determined attempt to resolve the water-related problems that are intensifying in nearly all parts of the world. Without such a concerted effort, the problems are likely to intensify further, in terms of magnitude, complexity and spatial distribution. If we cannot be the victors of these problems, we shall most certainly be their victims.

Mankind has a common future: we shall survive or perish together, North and South, East and West! Should we ignore that salutary exhortation, we can only be reminded of the warning of William Shakespeare that: "men at some time are masters of their fates. The fault, dear friends, is not in our stars but in ourselves that we are underlings."

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