

THIRSTY CITIES



Water. Next to oxygen it is the most important natural substance keeping us alive.

To many, it seems to be a free and seemingly endless source of life. But it is not endless.

The relentless demand of an increasing global population is placing an incredible strain on existing water resources. This strain has become critical in the larger urban centres of many developing countries. Here, water supplies are not only subject to overuse but contamination as well. Many cities are having problems with both the availability and the quality of water.

A combination of limited resources and poor water management have resulted in widespread pollution, scarcity, and even land subsidence — the actual sinking of cities caused by excessive groundwater extraction.

The larger cities of the developing world show the most visible signs of these problems.

One of the main features of global evolution in the past 50 years has been, and will continue to be, the phenomenal growth of huge urban centres. There are currently as many as 45 cities throughout the Third World with populations nearing, or in excess of, 3 million people.

Eight Third World cities have already exceeded the 10 million mark: Mexico, Sao Paulo, Buenos Aires, Calcutta, Bombay, Cairo, Shanghai, and Seoul. The average growth rates in these cities between 1950 and 1980 was 3.5–4.5% a year. Urban population growth is still very high, placing an extreme burden on water resources.

Population is one of the major causes of water contamination. The water on which cities rely is often polluted by enormous amounts of human waste, sometimes channelled untreated into open bodies of water. Other cities depend on reservoirs that cannot provide enough water for their mushrooming populations forcing people to find alternative, unregulated sources of water.

Urban areas also use large amounts of water for industrial purposes. Once used, these waters suffer significant quality degradation. The polluted waters are then dumped into rivers, lakes, and coastal waters hitting the environment with the double blow of reduced quantity and quality of water. Regrettably, antipollution legislation in developing countries is often vague or nonexistent. Where it does exist, it can be easily circumvented.

In most Third World countries, the economy and environment are caught in a negative cycle. To meet their financial obligations, many countries have concentrated on the production of cheap export goods. This prevalence of industry in urban areas — much of it in the form of multinational companies — is bringing about considerable damage to the environment.

But polluted water can, and in fact has, found its way into the underground reservoirs. Few notice this invisible pollution. But it exists and it is almost impossible to clean up.

Meanwhile, government funding for programs, such as environmental protection, is often unavailable or way down on the priority list. Many national and urban governments do not have the money, or the will, to make a long-term commitment to their natural resources.

The environment is, in essence, being sold along with the cheap exports. There is an unfortunate string of examples.

Coffee-production wastes are ruining the freshwater environment in the Magdalena and Cauca basins in Colombia, in the Tiete basin in Brazil, in the Eldoret region in Kenya, and in Northeastern Tanzania.

Tanning-industry wastes have completely killed the natural fauna and flora of many streams in the province of Buenos Aires, in Southern Uruguay, in India, and in many other leather-producing countries.

Gold-extraction operations (using cyanide or mercury) are destroying the water environment in many developing countries, such as Brazil, Colombia, and Papua New Guinea.

Some heavily industrialized, large urban centres like Sao Paulo, Calcutta, Mexico City, and Cairo have a particularly poor record of environmental protection of their water resources.

Cities, through their expanding populations and industrial exploitation, are damaging or even destroying their life-giving water resources. These urban areas are only beginning to realize that they cannot keep going to the same well.

Where Water Comes From

There are two types of water resources used for urban water supply — surface water (rivers and lakes) and groundwater (underground wells and springs). Surface waters are often the easiest source of water and their use can be very straightforward.

These waters, however, are also easily polluted. In most cases, the small- and medium-size streams of Third World cities have become highly contaminated acting as little more than open sewers. Small lakes located near cities have suffered the same fate.

There are scores of cities that have damaged their neighbouring water bodies. Some examples include the Chao Phraya river in Bangkok, the Hooghly river in Calcutta, the Laguna de Bay in Manila, the Tiete river in Sao Paulo, the Bogota river in Bogota, the Xolotlan lake in Managua, and the Amatitlan lake in Guatemala. The list goes on.

Larger bodies of water, like rivers or lakes, are slightly less vulnerable. They can, however, gradually become polluted and unusable because of increasing demand and a lack of restrictions on usage. Once these



Aboveground pipe carrying drinking water in Mexico: subject to the abuse of the urban environment.

sources of water are polluted, the clean-up task is difficult and expensive. The Nile river downstream of Cairo and the Plate river of Buenos Aires are facing serious and expensive pollution problems.

If current urban growth and environmental degradation trends continue unchecked, it is expected that soon very few, if any, rivers in the developing world will be able to be used for water supply without heavy and expensive treatment procedures.

During the latter half of this century, cities have increasingly used groundwater resources to compensate for the gradual loss of surface water. Many of the 20 larger cities in the developing world pump water from the ground to meet the needs of their populations: Mexico City, Bangkok, Calcutta, Manila, Jakarta, Sao Paulo, Buenos Aires, Beijing, and Shanghai.

Underground water reservoirs are contained in the voids of the sediment and rock underneath the earth's surface. These "aquifers," as they are known to geologists, range from relatively thin and shallow pools to huge volumes hundreds of metres beneath the surface.

This water stored under the ground is often abundant and of high quality. It is also significantly less vulnerable to contamination because it is more or less protected by layers of sediment and rock.

But polluted water can, and in fact has, found its way into the underground reservoirs. Few notice this invisible pollution, but it exists, and it is almost impossible to clean up.

Aquifers, although containing abundant volumes of water, are also finite and cannot accept indefinite extraction beyond their renewal potential.

Unfortunately, not many countries have a clear idea of the renewal potential or the vulnerability of their groundwater resources. Most cities using groundwater — Lima, Beijing, and Manila to name a few — are overpumping their aquifers beyond their renewal possibilities.

Water levels in Third World urban areas have been dropping consistently. In Manila, water levels have decreased during the last two decades by about 4–10 m a year; in Beijing the drop in the city's 40,000 wells has ranged from 1 to 3 m every year. Similar figures have been registered in Mexico City and Lima.

In some coastal cities, overpumping has drawn salty sea water inland, a phenomenon that is called saline intrusion. This is the case in Dakar, Jakarta, Lima, and Manila.

Another negative aspect of overpumping is the dewatering of parts of the aquifer. When water is taken out of the aquifer some moisture also leaves the surrounding layers of sediment. The result is a compaction of the overlying land and a dangerous sinking phenomenon called land subsidence. This has occurred in Mexico City and Bangkok.

Expensive Alternatives

The net effect of this deterioration in both ground and surface water resources is increasing costs in finding alternative water supplies. A basic trend of water resource development is that the most accessible water sources are developed first — and often they are contaminated first. New sources of water are difficult to find and more expensive.

Many cities have actually dropped their standards of water quality, allowing consumption of water that would not normally be considered safe. Although information is scant, there is evidence showing that waterborne sicknesses such as diarrhea, hepatitis, and cholera have become commonplace in many cities.

Other cities have rationed the supply, with water cuts becoming a part of daily life. But this problem is even more pronounced in the poor and slum sections of large cities. It is estimated that about 200 million urban dwellers in the Third World lack the benefits of safe running water. When urban growth and lack of financial resources force governments to reduce their water service, these neighbourhoods usually feel it the most.

Water resource management in developing cities is not getting better. The costs of water supply schemes are booming and many Third World cities are finding it increasingly difficult to afford them.

International loans are drying up because of the growing foreign debt crisis. Infrastructural projects are being postponed or abandoned. Lima will not be able to bring more water from the Amazonian basin — a project estimated at US\$500 million — because of the current deficit situation of Peru. Dakar is still waiting for the construction of the long aqueduct conducting water from the Lac de Guiers to the city site.

In the developing world, where there is a lack of resources and a rapidly expanding population, the current attitude toward water resources can at best be seen as short-sighted. At worst, it is potentially disastrous.

The solution to the problem is twofold, but there are no easy or simple answers. Adequate and responsible water management must be based on a more in-depth knowledge of the surrounding natural and social environment of each particular city. Research and awareness on the availability of water resources (including underground resources) must become a priority in these large cities. In addition, the consequences of overuse and careless disposal of human and industrial waste should be examined in relation to water availability.

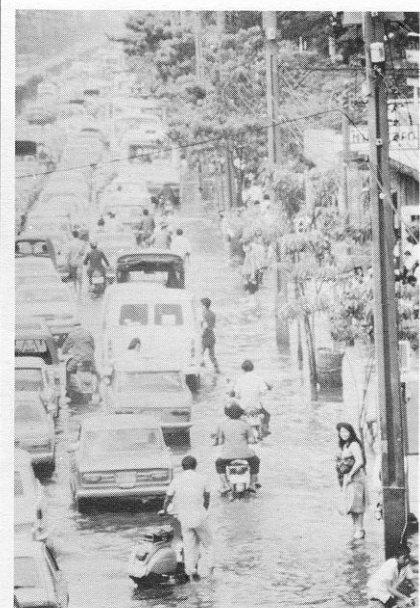
Governments and international development agencies must also recognize the importance of water through increased funding.

Recently, there has been a widespread decrease in funds for urban water supply purposes. The World Bank's financing of water projects in Latin America is the most obvious example. The share of the Bank's funding for water projects in relation to total funding has decreased from 7.2% in 1976–80 to 3.9% in 1986–89. A similar trend can be observed in other areas of the developing world and in other financial institutions. This tendency cannot continue if the large cities of the Third World are expected to have safer and sufficient water supplies.

During the last few years there have been some positive signs. Many international lending institutions, including the World Bank and the Inter-American Development Bank, have included environmental sustainability as a key element in their project-development policies. There is increasing awareness of the problems among the people in developing countries. Governments are being pressed to listen, and some measures to improve the situation have been taken.

If this positive trend does not accelerate soon, however, it may be too late for many millions of urban dwellers trapped in this growing environmental catastrophe.

By Danilo Anton, an IDRC regional program officer based in Montevideo, Uruguay.



Going to work in Bangkok.



It happens all the time in the city of Bangkok, but people only notice the symptoms. Gaps in the concrete appear in roads, bridges have bone-jarring

humps at their approaches, and ground floors in hundreds of houses have turned into semibasements. Far beneath the cracks in roads and buildings there is a gradual and almost imperceptible process at work threatening everyone in the city.

Bangkok is sinking — slowly yet inexorably — into the Coastal waters that surround it. Some central areas have sunk by as much as 160 cm in the past half century. The original city limits are now 500 m out at sea.

Annual floods, a constant threat to the city's inhabitants, may only be a warning of worse things to come.

A rapidly growing city of 6 million people, Bangkok suffers from many of the same headaches as other urban centres — traffic congestion, low-cost housing problems, environmental pollution, and waste management problems. But, according to a recent study by Prinya Nutalaya of the Asian Institute of Technology and McGill University Professor Raymond Yong, the coastal metropolis has a much larger problem.

The IDRC-sponsored report, entitled *Land Subsidence and Flooding in Bangkok*, concluded that Bangkok's immense demand for water, coupled



Urban Environments and Water in Latin America With Particular Emphasis on Groundwater
by Danilo Anton, IDRC-MR266e.