

Fresh water

Global fresh water consumption rose sixfold between 1900 and 1995 – more than twice the rate of population growth. About one-third of the world's population already lives in countries with moderate to high water stress (that is, where water consumption is more than 10 per cent of the renewable fresh water supply). The problems are most acute in Africa and West Asia, but lack of water is already a major constraint to industrial and socio-economic growth in many other areas (UNEP 1999a).

The Latin American region is extremely rich in water resources: the Amazon, Orinoco, São Francisco, Paraná, Paraguay and Magdalena rivers carry more than 30 per cent of the world's continental surface water. With 12 per cent of the world's territory and 6 per cent of the world's population, the region has around 27 per cent of the total water supply, most of it located in the Amazon Basin (Cunningham and Saigo 1999). However, regional water supply varies significantly in terms of sub-regions, localities and seasons.

Two-thirds of the region's land is in arid or semi-arid areas. As mentioned in 'Land and Food' above, these areas include large parts of central and northern Mexico, north-eastern Brazil, Argentina, Chile, Bolivia and Peru (UNEP-ISRIC 1991). The Carib-

bean island of Barbados is among the ten most arid countries in the world, and the island nations in this sub-region have per capita water resources that are considerably lower than those in other island groups in the world: just 13.3 per cent of the Indian Ocean's existing resources and 1.7 per cent of the South Pacific's (UNEP 1999b).

Even countries located in the humid tropics and the Amazon Basin, such as Colombia, have a significant variability (IDEAM 1998). Total water supply in Colombia is estimated at more than 2 000 cubic kilometres per year: that is, an average of 1.76 million cubic metres per square kilometre. Allowing for quality and natural regulation variations, this water supply corresponds to 34 000 cubic metres per capita annually. Colombia's supply corresponds to the region's average, which is five times larger than the world average (in North America the average is 16 300 cubic metres, in Europe 4 700, in Africa 6 500 and in Asia 3 400). However, in dry years average water availability can decrease to 26 700 cubic metres per capita, and in 9 of 32 departments (Boyaca, César, La Guajira, Magdalena, Norte de Santander, Risaralda, San Andrés, Sucre and Valle del Cauca), average water supply is less than 60 000 cubic metres per square kilometre (29 per cent of the country's average).

In addition, regional water availability problems are increasing, mainly in countries with a large proportion of arid territories. In 1995, Mexico was the only country in the continent with a consumption of more than 10 per cent of the available fresh water, but at present, Mexico and Peru use more than 15 per cent of their total fresh water reserves each year, thus falling into the category of countries suffering 'moderate' pressures on water availability (WMO *et al.* 1996; UNEP 1999a).

Demand for water is growing rapidly as populations and industrial activity expand and irrigated agriculture (the largest use) continues to increase (WRI, UNEP, UNDP and WB 1996). In Brazil, for example, with estimates indicating that irrigation consumption is currently 60 per cent of the total water extraction, irrigated areas increased from 64 000 hectares in 1950 to 2.87 million hectares in 1998 (a growth of almost 4 500 per cent) and the irrigation quotient (irrigated area as a proportion of total farmed

area) has been increasing during recent years – from 4.8 per cent in 1996 to 6.2 per cent in 1998, despite an annual decrease of 9 per cent in farmed areas (ANEEL-SRH-OMM 1999).

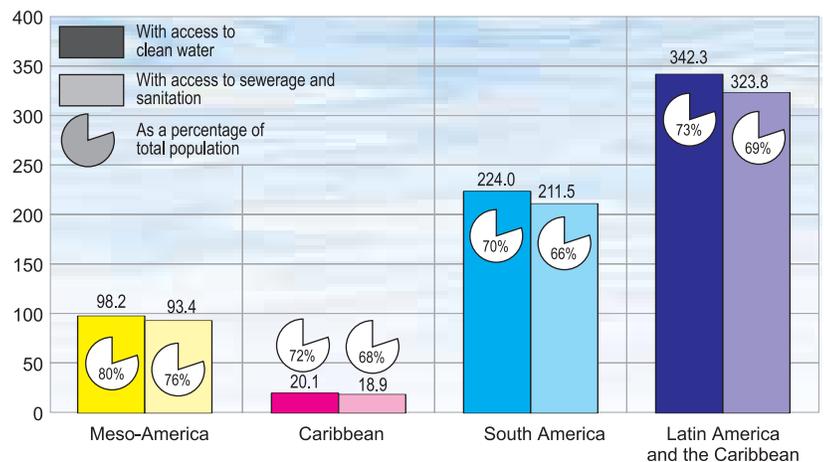
Many current patterns of water withdrawals are clearly unsustainable, thus compounding the pressures on water supply. Pumping from aquifers at rates far greater than those at which they are recharged is a particularly important aggravating factor, and the natural limits are unknown. In addition, increasing deforestation rates could also contribute to the severe annual flood and drought cycles.

Despite the advances of the past ten years, access to safe water remains a serious issue. Estimates for 1995 indicate that 26 per cent of the population in the region did not have access to potable water and 31 per cent lacked sewerage and sanitary services. In addition, the maintenance of existing systems is poor, and the existence of sewerage systems does not necessarily imply sanitary treatment of waste waters. In Costa Rica, experts suggest that – despite reported coverage of 97 per cent of sewage – no more than 35 per cent of waste water receives adequate treatment (Fernández and Gutiérrez 2000). Estimates indicate that in Latin America as a whole, only 2 per cent of waste water is treated (UNEP 1999a).

The main cause of water pollution is the direct discharge of untreated domestic and industrial wastes to surface water bodies, which contaminates not only the water bodies themselves but also adjacent ground water aquifers. The expansion of industry, mining and the use of agrochemicals has contaminated rivers and aquifers with organic solids, toxic chemicals and heavy metals. Underground aquifers in Merida, Mexico, have been severely affected by the influx of storm water and sewage, and there is a risk that the contamination will spread to the wells that supply the city (UNEP 1999a). In the Caribbean, only 39 per cent of 140 surveyed small industries in 1995 applied some kind of waste water treatment (UNEP 1999b).

The geographical distribution of water pollution in the region is dominated by flows from large metropolitan areas. In addition to population concentration and industrial production in these areas, other important contributing factors are: growth in con-

Population with access to clean water, sewerage and sanitation (millions)



Source: CEPIS-OPS, 1999 (from OPS: Health in the Americas, 1998; with 1995 data), and 1995 population data from CELADE, 1998.

ventional sewerage systems which has not been accompanied by corresponding treatment facilities; intensification of agricultural land use close to metropolitan areas; changes in economic structure, with increased emphasis on manufacture; concentrated run-off from paved areas in the growing cities; and the need for artificial regulation of stream flows. As a result, the quality of water bodies near large metropolitan areas has been seriously compromised.

Artisanal mining is another important source of contamination: gold mining in particular generates important mercury emissions. Almost all countries in Latin America practice gold mining activities, and estimates indicate that one million miners produce approximately 200 tonnes of minerals per year (Veiga 1997). However, mercury emissions have dropped from the high levels reached at the end of the 1980s because of the reduction in informal mining activities due to a scarcity of easily exploitable veins, improved organization of mining activities (basically by NGOs), and the high cost of mercury which has led many miners to practise recycling. Despite this, there is probably as much mercury emission as gold production. Approximately 5 000 tonnes of mercury have been deposited in the forests and urban environment since the onset of the new gold expansion in Latin America in the late 1970s (Veiga 1997).

Leaching of heavy metals, synthetic chemicals and hazardous wastes due to inappropriate use and disposal is another major cause of underground water

Access to sewerage and sanitation does not guarantee that residual waters are adequately treated.



contamination. The amount of polluting material that seeps into underground water from waste dumps and other sources (such as run-off in agricultural areas) seems to double every 15 years in Latin America (UNEP 1999a). Depletion of aquifers and sea-water intrusion are also important sources of underwater contamination. Salt water intrusion is of particular concern in small island states, where the limited ground water supply is surrounded by salt water.

Sediments produced by erosion and by domestic, industrial and agrochemical disposal, are among the main causes of water quality deterioration. The Alcehuate in El Salvador and the Virilla in Costa Rica are only two examples of rivers that are highly contaminated due to industrial and agricultural activities and metropolitan development.

As industry, irrigation and population grow, so do the environmental and economic costs of additional water supplies. The costs of supplying water to the cities are continually rising, with dramatic examples in large and growing urban areas. In Mexico City, water is pumped over elevations exceeding 1 000 metres into the Valley of Mexico, and in Lima upstream pollution has increased treatment costs by about 30 per cent (World Bank 1997a). Water desalination processes in the Caribbean also have a very high cost (UNEP 1999b).

Investment in sanitation and water offer high economic, social and environmental returns, but the next four decades will see urban population rise three-fold and the domestic demand for water increase fivefold in Latin America (WRI, UNEP, UNDP and WB 1994). At this point it is important to consider the possible impact of tourism growth, since water

consumption in this sector can be five or ten times higher than in other residential sectors.

Water availability has been a fundamental factor in the development of irrigation throughout the region. An area of 697 000 km² is currently irrigated, corresponding to 3.4 per cent of the region's territory (World Bank 1996) but salinization and waterlogging are eating away the productivity of 40 years of irrigation investment in countries such as Mexico, Chile and Argentina (Winograd 1995). In many cases, agricultural diversification requires more irrigation, thus increasing the pressure on available water resources.

After the hydroelectric projects that dominated the region in the 1970s, such as Itaipu, Salto Grande and Yaciretá in the River Plate Basin, and Tucuruf and Balbina in the Amazon Basin, the current trend in South America is the construction of *hidrovías* or waterways. Two ambitious projects are under way in the region, the Paraná-Paraguay and the Araguaia-Tocantins waterways, which are planned to harness five river systems over a total length of 8 000 kilometres to improve navigation networks.

During the past decade, environmental problems related to water have affected both urban and rural areas. Housing developments continue to be sited in sensitive areas such as on steep hill slopes in the upper parts of water catchment areas, or too close to sensitive ground water aquifers. Fresh water resources are thus being damaged at the same time as demand for water is increasing. In the arid and semi-arid areas there has been increased competition for scarce water resources. Using polluted water for drinking and bathing spreads infectious diseases such as cholera, typhoid and gastroenteritis. Several countries have had recent outbreaks of these diseases, which affect the urban poor in particular.