



# global fresh water

“The world’s freshwater resources are now under extreme pressure. There is no escape – we are all implicated ...”

*Watersheds come in families, nested levels of intimacy. On the grandest scale the hydrologic web is like all humanity – Serbs, Russians, Koyukan Indians, Amish, the billion lives in the People’s Republic of China – it’s broadly troubled but it’s hard to know how to help. As you walk upstream towards home, you’re more closely related. The big river is like your nation, a little out of hand. The lake is your cousin. The creek is your sister. The pond is her child. And for better or worse, in sickness and in health, you’re married to your sink.*

M Parfit, quoted in M Barlow, *Blue gold: the global water crisis and the commodification of the world’s water supply*, International Forum on Globalization, Sausalito, California, 1999, p. 37

*By the middle of this century, at worst seven billion people in 60 countries will be faced with water scarcity, at best 2 billion in 48 countries, depending on factors like population growth and policy making. Climate change will account for an estimated 20% of this increase in global water scarcity ... Water quality will worsen with rising pollution levels and water temperatures.*

E Drioli & F Macedonio, *New integrated water treatments and production modes for city planning*, New Technology for Infrastructure – the World of Tomorrow, ATSE Symposium, Sydney, 2006

Researchers from the NASA-sponsored Gravity Recovery and Climate Experiment (GRACE) are using satellites to measure changes in water distribution around the world. If we could look at water on Earth in such a way, what would we see?

Water covers 70% of the planet’s surface, but 97% of this is salt water and only 3% is fresh water. However, most of this fresh water is in frozen form. A mere 1% exists as surface water (rivers and lakes) and underground water (in aquifers). Yet it is this water that sustains most life on the planet.<sup>1</sup>

In some Mediterranean and Middle Eastern countries the renewable water resource per capita has declined by up to 80% in the last 10 to 15 years. It is forecast that by 2020 water scarcity will affect many regions around the globe, including half the countries in Europe.<sup>2</sup>

The use of water resources continues at an accelerating rate to meet the food, fibre and energy needs of a burgeoning global population, projected to reach over 8 billion by 2025. Environmental decline and reduced access to fresh water in various parts of the world has prompted a series of United Nations conferences over the past three decades.<sup>3</sup>

As the world’s population expands, the amount of water available per head of population will decline further. This decline will become even more dramatic in those parts of the planet where average rainfall is significantly reduced as a result of climate change.

# THE BIG PICTURE

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But scarcity is not the only issue. There are major problems with water quality, too. Fresh water in many parts of the world is contaminated. In developing countries, significant numbers of people die from waterborne bacterial illnesses each year.<sup>4</sup> Of the estimated 13 million people who die from such infections, 2 million are children. In Bangladesh, 28 to 35 million people drink water containing elevated levels of arsenic. Our nearest neighbour, East Timor, has high infant and under-five mortality rates brought about by diarrhoea and respiratory infections caused by contaminated water.<sup>5</sup>

The situation is somewhat different in the developed world, where industrial products and wastes, such as mercury, cadmium, insecticides and solvents, contaminate both surface water and groundwater reserves.

In Canada, despite past regulatory controls, Lake Ontario continues to be contaminated by toxic pollutants.<sup>6</sup> In the USA in 2001–02, 31 waterborne disease outbreaks were reported across 19 states, causing seven deaths and illness in 1020 people.<sup>7</sup> On the Australian mainland we have problems with saline, nitrate and pesticide contamination of groundwater.

Many countries have built dams as a means of generating electricity. A big change is visible in China, where the massive Three Gorges Dam is being built on the Yangtze River to meet 10% of China's demand for electricity. This project is expected to displace over 2 million people by the time it's completed. Laos is also investing heavily in dam construction for this purpose. Such projects come with significant environmental costs.

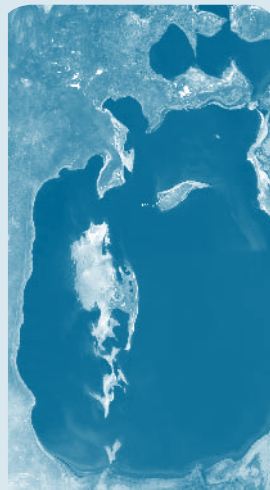
There is also a worrying trend towards water privatisation in a few countries, such as the UK, the USA and France. In contrast, other countries treat water as a matter of public trust to be guarded at all levels of government.



**Image 1. Russian fishing trawlers lying on the bed of a river that used to flow into the Aral Sea in Central Asia**

A large fleet of trawlers once harvested thousands of tonnes of fish each year from the Aral Sea. Excessive diversion of water to irrigate cotton farms put an end to this.

Source: <[www.earthobservatory.nasa.gov](http://www.earthobservatory.nasa.gov)>



**Image 2. Two satellite images of the Aral Sea, taken 14 years apart. (The picture on the left was taken in 1989 and the picture on the right in 2003.)**

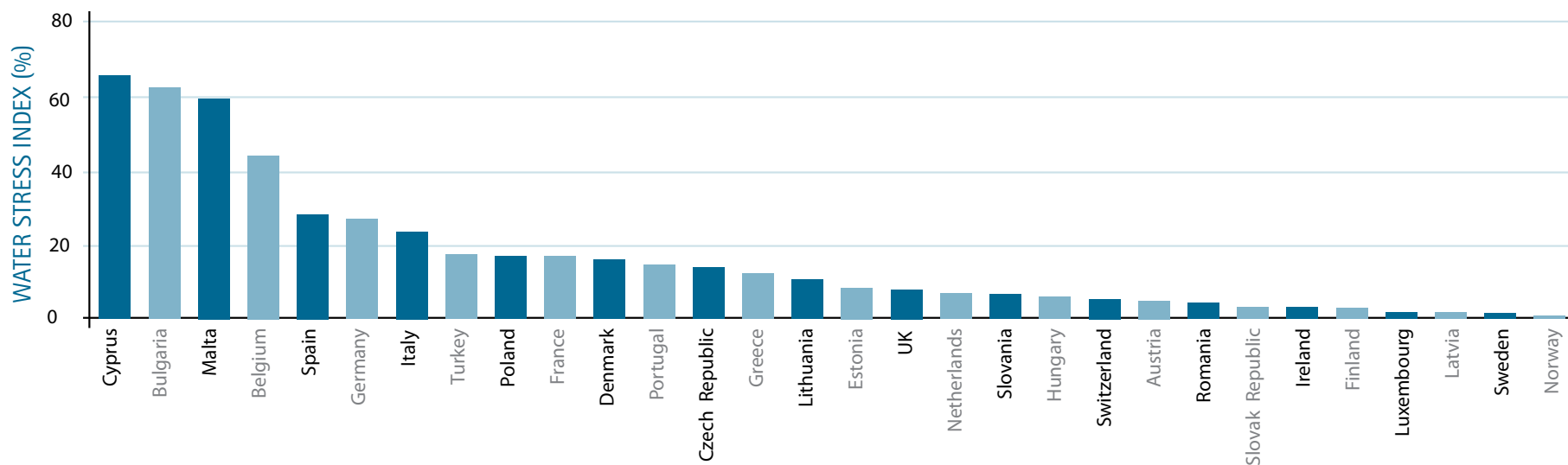
Spanning Kazakhstan and Uzbekistan, two former republics in the USSR, the Aral Sea was once the world's fourth-largest lake. Located in the driest region in the USSR, the water was brackish and fed by two rivers, the Amu Darya and the Syr Darya. In 1930 the Central Planning Committee of the USSR decided to sacrifice the Aral Sea by expanding irrigation and developing vast cotton farms. Irrigated land area in the region increased from 3 million ha in 1930 to 6 million ha in 1980.

The scheme was an environmental disaster. Between 1960 and 1987 the surface area of the sea decreased by 40%. By the early '80s, 20 of 24 species of fish disappeared and the commercial fish catch dropped from 48 000 tonnes in 1957 to zero. The stranded trawlers in image 1 once operated from a port that is now about 70 km from the lake shore.

Source: <[www.earthobservatory.nasa.gov](http://www.earthobservatory.nasa.gov)>



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**Figure 1. The Water Stress Index for European countries**

Calculations of water stress have been made for Europe.

The index shows how much of a country's renewable fresh water is being used as a percentage of what is available. At the present time half the countries in Europe, representing 70% of Europe's population, are facing water-stress issues.

Although calculations have yet to be made elsewhere around the world, the indications are that high water stress exists in many countries in Africa and Asia.

Source: E Drioli & F Macedonio, *New integrated water treatments and production modes for city planning*, New Technology for Infrastructure – the World of Tomorrow, ATSE Symposium, Sydney, 2006.

## ▶ REFERENCES

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## Some other useful sources

- PH Gleick (ed.), *Water in crisis: A guide to the world's fresh water resources*, Oxford University Press, New York, 1993.