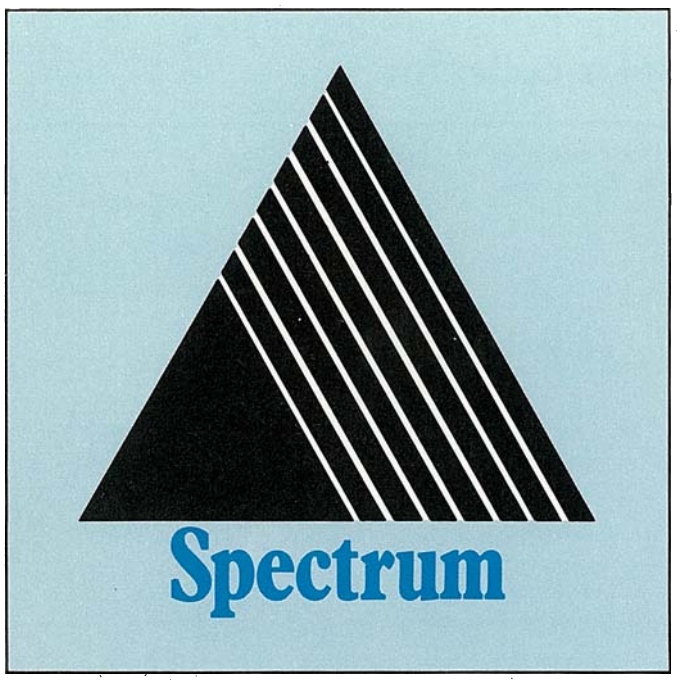


Water in the world's driest continent

The availability of water has shaped our country's history right from the beginning of European settlement. Botany Bay lacked potable water, so the settlers chose Port Jackson instead.

Water will continue to determine our development and lifestyle, according to Mr Neil Body of the CSIRO Division of Land Use Research. He has made an inventory of Australia's surface water resources and concluded that, in a number of areas, the time is fast approaching when increasing demand for water must be curbed, one way or another.

Considered as a giant basin, Australia collects, on average, water to a depth of 420 mm every year. However, because of the dryness of our land, only one-tenth of this amount finds its way into our river systems. Consequently, our rivers are small by world standards. The mean annual flow of our largest river system, the Murray–Darling, is estimated to be 22 billion cubic metres. By comparison, the Rhine yields 70 billion, the Danube 282 billion, and the Mississippi 593 billion cubic metres a year.

On the other hand, when our small population is considered, each Australian enjoys more than do people in similar countries. We have 208 000 cubic metres of water available per person per year; the figure for the United States is 20% of this amount and that for Britain less than 2%.

Nevertheless, we can't be too complacent, because quite a number of factors work against us. Firstly, our major water resources aren't near our large population centres, and secondly, a good proportion of our water is unusable: it is brackish, or cannot be impounded because of flat topography or very porous soil.

Most importantly, the year-to-year variability in stream flow is very large in our country. Because of this, an Australian water storage, fed from a given mean annual flow, must be 11 times bigger than one in Europe and six times bigger than one in the United States to reliably satisfy the same demand. The need to reserve such large volumes of water, to carry us over periods of low flow, costs us considerable amounts of capital to build the required reservoirs.

The use of bore water is one way around this problem. Although groundwater now makes up only 8% of the total water supply, it is beginning to be tapped in increasing quantities, particularly in arid and high-evaporation regions. Unfortunately, it is difficult to assess the size of a groundwater resource, and large fluctuations in demand cannot be met by a bore supply.

As would be expected in a dry country, evaporation in Australia is generally high. Over the vast majority of the continent, potential evaporation exceeds rainfall. As reservoir size increases, the larger the evaporation loss becomes (in relation to the volume stored), so there is a maximum size above which a dam cannot usefully store water.

In the light of the foregoing limitations, the time is fast approaching when supplying highly populated regions with adequate water will present difficulties.

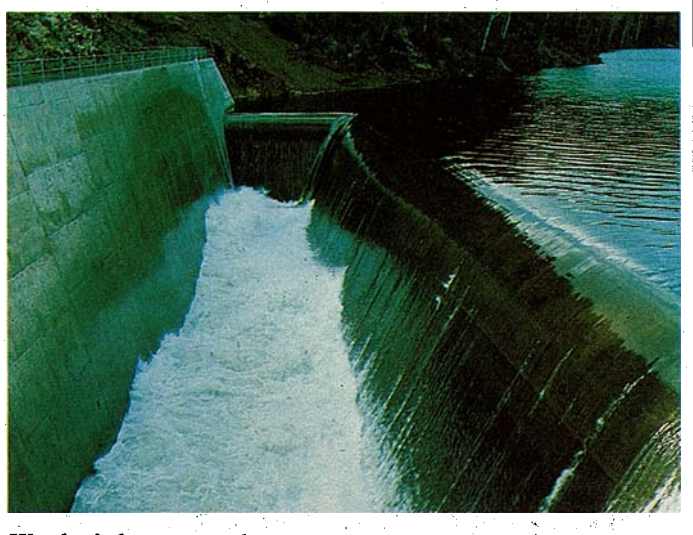
Sydney citizens now use 480 litres per head per day, and in Perth, before the recent drought, each person consumed 680 litres per day (490 in winter and 1300 in summer). An Australian average is 400 litres per day.

Demand is rising steadily. In 1930, the *per capita* demand in Melbourne was 250 litres per day; in 1975 it had risen to 420 litres per day. By odd coincidence, the demand per household has remained steady at 1300 litres per day (the number of persons per household has dropped from 4·9 in earlier years to 3·2 today).

The rise in demand is due to such innovations as washing machines and dish-washers. Nevertheless, the greatest proportion of the domestic supply — 35% of all water used in Melbourne — is still spent on watering gardens. Other household uses consume 30% and industry 25%; 10% is lost through leakage.

Water usage has now expanded to the point where, around Australia's south-eastern coast, we now harness 53% of the water resources between Newcastle and Geelong. Similarly, we have appropriated 55% of the resources near Perth.

Outside the cities, agriculture uses immense quantities of water.



We don't have enough water to meet 100% of demand for 100% of the time.

Australia-wide, 80% of our water is dedicated to irrigation and it is worth appreciating that water for irrigation is used at varying levels of efficiency. For instance, 1 kg of beef represents 6500 litres of irrigation water, 1 kg of rice 400 litres, and 1 kg of wheat 200 litres.

In the future, of course, something has to give, and Mr Body urges that we start exploring our options now.

One consideration is to make consumers pay the true cost of the water they use. At the present time, general taxation subsidizes the consumer by supplying funds for capital works — we pay only for operations and maintenance, not capital costs. If we were to pay the full cost, through increased water rates, it should significantly curb water use, although by exactly how much is unknown.

Rationing is a policy already accepted by a number of water supply authorities. Mr Body thinks that we will have to accept the fact that water rationing will form an essential part of the operations of most supplies based on surface water. We just don't have the resources to meet 100% of demand for 100% of the time.

Re-use of water is another strategy open to us. Some 75% of Sydney's water consumption re-appears as effluent. At the moment, it is very expensive to treat sewage to potable standards, but the future may see a change. Nevertheless, treated effluent is already being used in Adelaide's parks and gardens, and other capitals could follow this lead.

Forestry, agricultural, and mining interests compete for land set aside for water catchments, further limiting our water resources. Land use practices can have a major effect on both the quantity and quality of surface water provided by a basin. A marked deterioration in the quality of water from the Wellington Dam near Perth resulted from changes in land use there.

The number of cases of conflict of interest between different possible land use practices will increase, so we will need to carefully evaluate the worth of clean water to us in making decisions between them.

Amount of water consumed daily in the average Melbourne household

	litres
garden-watering (summer)	700
toilet-flushing	120
shower	110
bath	60
clothes-washing	110
dish-washing	60
drinking, cooking	20
car-washing	15
leakage	140

The average Melbourne household comprises 3·2people

This leads to Mr Body's final consideration in husbanding our water resources — public awareness. There is no indication we possess a keen awareness of our situation, according to Mr Body. In a drought, public response to appeals to conserve water has been good. With the return of rain, however, water use quickly rebounds to normal levels.

We need to make the best use of water spent on the garden; we need more efficient washing machines and toilets that flush with less water. Finally, we need to appreciate how much water costs us, both in money and in environmental terms.

Australia's surface water resources. D. N. Body. *Proceedings, Symposium of the Academy of Technological Sciences, October 1978*, 1979.