

M. J. Crozier

JOURNAL OF HYDROLOGY

NEW ZEALAND

Published twice annually by the New Zealand Hydrological Society

Volume 6

1967

Number 2

PRESIDENTIAL ADDRESS

The Place of Hydrology in New Zealand's Economy

Hydrology could not exist without water and when, as at present, our national economic condition is such that an increase in production with or without diversification is absolutely essential, it is wise to consider our water problems.

Production, apart from some buttons made in Lower Hutt, means to most New Zealanders, what we grow. Now every school-child can tell us what makes a seed grow — soil and water.

It is not an accident, of course, that soil continues to be linked with water in our minds because they have a vital connection — too much water, the soil is removed; too little water, the soil cannot be used, or if you just want to use water and dam up a stream, you have to be careful not to silt up your reservoir.

In surveying our water problems let us look first of all at how much water we have and how we utilize it with our soil resources. Because of the relatively new hydrological effort in this country, a complete picture is not yet available, but an estimate may be made as follows.

As a starting point we may take the country's average annual rainfall of approximately 65 inches; about 40% returns to the atmosphere by evaporation and transpiration and the remainder returns to the oceans mostly by means of stream flow, with a small quantity by ground-water flow.

In considering how much water we actually use we have to rely upon even scantier figures but rough estimates based on 1966 data give a picture of annual consumption as follows (assuming that use of ground water and reuse of water is minimal at present):

used by economic vegetation in transpiration	.....	.....	.....	.....	15.00 inches
used by hydro-electric development	.....				0.50 inches
used by industrial water supply	0.007	}			0.04 inches
used by urban water supply	0.010				
used by rural water supply	0.021				
used for irrigation	.....	.....	.....	.....	0.14 inches
<hr/>					
total economic use	.....	.....	.....	.....	15.70 inches
returned to atmosphere without beneficial use	.....	.....	.....	.....	11.00 inches
returned to oceans without beneficial use (not considering fisheries, wet-lands biology, or water sport)	.....	.....	.....	.....	38.30 inches
<hr/>					
total non-economic use	.....	.....	.....	.....	49.30 inches
<hr/>					
total precipitation	.....	.....	.....	.....	65.00 inches
<hr/>					

It looks an exceedingly rosy picture for the whole of New Zealand but let us not lull ourselves into a false sense of security. We have areas in New Zealand where the rainfall is only 12 inches per annum and this means, assuming water use equally distributed over the country, that we are already short by close to four inches of water in such areas! What makes it worse is that the rainfall is unequally distributed and the major water user, the soil, is certainly not in an optimum water condition throughout the year. We do not yet know how much we are short, and much hydrological research has to be done before even first figures are available.

The lesser water users are also important and it is useful to note that industrialization may use more hydro-electric power and will require greater water supply. Hydro-electric power could use perhaps up to seven inches of precipitation and even with moderate development of the country the water-supply demand would double every 25 years!

Industrialization would, of course, also require more water for the discharge of effluent, for we do not want to follow the example of America or Europe, where polluted rivers have become lifeless.

Now I have not yet mentioned control of water. Flooding and erosion are major problems in this country and, although considerable improvements have been made, data observed some 20 years ago are still relevant. These show that, over a period of 34 years, some 37 damage-causing floods occurred per annum. Moreover, a survey of one quarter of the South Island showed that 80% of the land was severely eroded and a survey of half the North Island indicated that 65% had some erosion.

This is water action which is not beneficial, but without hydrological studies we cannot tell to what extent. It is obvious that if the **overuse** of water could be redistributed, it could be most beneficial not only in reducing flooding and erosion but at the same time improving the water supply, whether for soils, stream flow or ground water.

Such studies on redistribution of water are carried out on experimental basins, and one of the first results from this research showed that for a given soil and grazing management, oversowing and topdressing not only improved the supply of water to the soil but also dramatically reduced erosive powers. They may also tend to reduce flood peaks for the smaller rainstorms. Simultaneously hard cash is earned by a doubling of production which would not have been possible if the water supply to the soil had not improved.

Hard cash is also required for hydrological research, but the present expenditure of \$0.5 million is insignificant if compared with the huge sums required for water-use or water-control measures for which hydrological data are now a first requirement. In 1966 the following estimated amounts were spent on such measures:

hydro-electric development	\$47.7 million	
industrial water supply	\$ 2.1	..
urban water supply	\$ 6.3	..
rural water supply	\$ 3.1	..
bridges and culverts	\$ 6.0	..
flood control	\$ 5.0	..
erosion control	\$ 0.6	..
irrigation	\$ 0.5	..
pollution control	\$ 2.0	..
flood damage to highways	\$ 1.4	..
urban storm-water control	\$ 5.4	.. (including sewerage excluding private expenditure)

In addition the industries that use most water, i.e. agriculture and forestry, do not at present use many water data because hydrology has not sufficiently progressed. Our 19,000,000 acres of grassland, 15,000,000 acres of tussock land, 2,000,000 acres of crop land and 1,000,000 acres of pine forests, which provide a gross income of close to \$800 million per annum, would, however, benefit considerably from a knowledge of hydrological facts. If in addition we consider recreations such as fisheries (which is a \$6 million industry), or duck shooting (which is a \$3 million industry), or skiing, or water sport in general, it is clear that there is little left in our economy which is not based — in the last analysis — on water, and we should seriously consider whether we can afford to regard hydrology as a small-time pursuit.

— Cornelis Toebes