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## PRESIDENTIAL ADDRESS

### The Environment

The environment is "in". Words like 'ecosystem' and 'eutrophication' are common household words used by all and sundry.

Hydrologists often claim that one of their tasks is the study of the ecology of water, and for this reason they now find themselves in the thick of the wave of interest in the environment. It is difficult to say to what extent they are involved, however, since we are not quite sure what we are talking about — for instance, it is hardly possible to give a definition of environment, and it may mean different things to different people.

Those who have often stressed the need to maintain the quality of our environment will derive some satisfaction from the recommendation of the United Nations Economic and Social Council, at its meeting of July 1968, that the problems of human environment should be included in the agenda of the next U.N. General Assembly. It was also recommended that efforts should be made to encourage and co-ordinate related national and international activities by all possible means; for instance, by convening a United Nations conference on this subject during the next year.

Subsequently, ICSU\* established an ad hoc committee for the purpose of preparing a report on those characteristics of the environment which are being altered by man. Hydrologists are represented on this committee by Dr Szesztay, President of IASH†, who has made an excellent report of the first meeting of this committee (published in *Bulletin of the IASH* 14 (2), 1969).

The committee listed 15 problems as possible subjects; Dr Szesztay reported that hydrology is involved in almost all of these, but stated that it would be difficult to separate purely hydrological questions among or within them.

Hydrologists could, however, consider the problem from another point of view: firstly — how do the man-induced environmental changes affect the hydrological cycle, and secondly — how are hydrologists able to measure these effects or their consequences. Such an effort would assist in more clearly marking the role of

\* International Council of Scientific Unions.

† International Association of Scientific Hydrology.

hydrologists, and will help in defining how they can co-operate with scientists in other related disciplines.

Looking at it this way, we could perhaps classify environmental problems into three broad groups: (i) atmospheric changes; (ii) water-quality changes; (iii) land-surface changes.

*Atmospheric changes* could have a profound effect on the hydrological cycle. This applies in particular to a possible increase in the level of carbon dioxide, and to a lesser extent to an increase in turbidity of the atmosphere.

Current theory postulates that the level of  $\text{CO}_2$  in the atmosphere regulates the temperature of the earth. Carbon dioxide molecules in the atmosphere absorb infrared radiation, but are virtually transparent to the visible radiation that delivers the sun's energy to the earth. Because the earth reradiates much of its energy in the infrared region, a so-called 'hot house' effect is created whereby the  $\text{CO}_2$  blanket prevents the infrared energy from escaping into space. As a result of this 'hot house' effect the atmosphere warms up.

It can be argued that with this rise in world atmospheric temperature, potential evapotranspiration increases and precipitation patterns change. How much will higher temperatures and changed precipitation affect water resources? Experiments have indicated that stream flow can be quite sensitive to a change in either of these factors, and in some regions water resources could be seriously affected if both factors were changed adversely.

It is, of course, known that cycles of increased  $\text{CO}_2$  levels have occurred in the past (caused by natural changes), but the problem is more severe at present since extensive forests, which could balance excessive  $\text{CO}_2$  levels, are fast disappearing from the earth — even grasslands are being converted wholesale to cropland in many areas. And, naturally, our dependence on adequate water is much greater than ever in the past.

Long-term effects of a temperature rise could be melting of the polar ice-caps, and although, theoretically, more water might be available for evaporation and subsequent condensation, the rise in ocean levels would pose immense problems.

Hydrologists have a most sensitive area of research in glaciers, and it is fortunate that plans are in an advanced stage in New Zealand to examine a glacier in full detail. Precipitation and evapotranspiration patterns are also being studied in some detail; work on representative and experimental basins will no doubt assist in detecting changes.

*Water-quality changes* do not necessarily influence the hydrological cycle to a large extent. Hydrologists come into the picture, however, not only by measuring the quality of water, but also by

defining desirable, and possible, chemical and physical qualities of water.

Also, hydrological research into inflows in still water bodies could assist in preventing problems such as eutrophication which now largely depend for their solution on research into methods of destroying weed growth.

*Land-surface changes* comprise erosion and a range of land-use and land-management changes, including the degradation or destruction of valuable ecosystems. All such changes affect the hydrological cycle, and research into the effects of such changes is a recognized field of hydrological research.

The UNESCO/FAO working group on the influence of man has recently collated the results of research on experimental basins to provide a guide to wise land-use policies, and they state that "present knowledge and experience of water resources can be combined to give some estimate of the hydrological consequences of major changes in land use, but experimental studies on a catchment basis are a wise first stage in development".

From this it is obvious that hydrologists can serve in particular as detecting agents of environmental changes. In the field of water resources as well as water quality they can indicate the consequences that may occur if particular human actions are continued or persisted with.

Dr Szesztay has agreed to lead a discussion on the role of hydrologists in global environmental research at the IASH international symposium on the results of research on representative and experimental basins to be held in Wellington in December 1970.

Hydrologists have sensitive detecting areas in their representative and experimental basins, and they will no doubt play a vital role in future. They should be ready for their part in environmental work, and this symposium will certainly assist, since important aspects of the environment are to be discussed.

I should like to stress the importance of this, and urge all of you to think about it during the coming year — in particular how we, as hydrologists, can co-operate with our fellow scientists from other disciplines to make a better place of mother earth.

CORNELIS TOEBES