

PRESIDENTIAL ADDRESS, 1963

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Normal procedure for presidential addresses of scientific societies is to survey a particular aspect of the respective science. I have deliberately refrained from doing this tonight since I think it more important to survey the future hydrological scene, particularly as it affects hydrologists.

I realize fully that the Society is made up of hydrologists, or those who provide the "goods", and water technologists, or those who request and use the data, and that gearing an address to hydrologists may present an unbalanced picture. However, it is my feeling that the data user is ultimately best served if the data collector does his job with enthusiasm and this can only be brought about if there is a defined purpose of work and if this purpose is backed by a strong organization.

The setting up of the Hydrological Survey in the early 1950's may be regarded as the first organized beginning of hydrology in New Zealand. The few engaged on the job in those days did not know the size of the undertaking they faced nor, initially, did they have any knowledge of how to fulfill it. This created a sense of purpose; to find this knowledge. Backed by a strong central management enormous strides were made and morale was high. About 1955 the central management collapsed; and, since the original purpose was largely satisfied, hydrology drifted along aimlessly. In 1959 a new central management was formed and a new purpose introduced - this time to provide data for the immediate and rapidly growing needs of water technologists.

Because of the necessarily fast growth in hydrology in recent years, benefits have lagged somehow and additionally there appears to be a feeling that the present purpose will dissipate as soon as the immediate needs of the water technologists are satisfied. Since this feeling is affecting morale, I think it is most important that I introduce tonight a purpose which should re-activate the spirit that marked the beginning of hydrology in New Zealand. And this refers to the International Hydrological Decade (IHD).

The IHD, in brief, will embrace an international programme in hydrology, planned to commence in 1965 and extend, initially, over 10 years. It is being organized by UNESCO, and the N.Z. Government has formally advised UNESCO that New Zealand will fully participate in the programme. A national committee is being convened at present by our member Mr. A.P. Campbell and there will also be an official representative of the Hydrological Society on this committee.

The needs and aims of the IHD were reaffirmed at a meeting in Paris early this year and I would like to quote

these needs and aims from the Paris report:

"The overall objective of an international programme in the field of hydrology is to accelerate the study of the regimen and resources of water with a view to their rational management in the interest of mankind, to promulgate the need for hydrological research and education in all countries and to improve their ability to evaluate and utilize their resources in the best possible way. That is, the programme will focus on science but will give strong consideration to utilitarian factors.

The need for such an international programme is reinforced by the very nature of hydrological phenomena which are related to the planetary circulation of the atmosphere and the distribution of land and sea and which in many cases involve consideration of very large areas. This implies that data should be collected properly from points on a network of observation stations which must be of adequate density and comparable standard in all countries. All countries have important problems relating to the estimation, conservation and rational management of their water resources, but there are many deficiencies in hydrological services in relation to data collection, data processing, research and water use which call for collaboration and mutual assistance between States. The facts that problems of water-resource development occur throughout the world, that deficiencies must be overcome quickly, and the scarcity of highly specialized research workers, who will often have to work outside their own countries, constitute additional reasons for an international co-ordinated approach.

The International Hydrological Decade will focus primarily on water in the land areas of the globe. It will be concerned with oceanic waters only in relation to specific problems in land areas. Likewise the programme will not be concerned with meteorology as such but will involve study of precipitation as a major element of the hydrological cycle in land areas.

The programme planned for the Hydrological Decade should therefore be centred upon continental waters (including islands) and should include seven basic components:

- (i) appraisal of the state of our knowledge of the hydrology of the world and identification of the principal gaps in it;
- (ii) standardization of observations, techniques and terminologies for collection, compilation and reporting data;
- (iii) establishment of basic networks and the improvement of existing networks to

- provide fundamental data on hydrological systems varying in size from small watersheds to the world as a whole;
- (iv) research on unique or critical hydrological systems in selected geological, geographical, topographical and climatic environments, constituting what may be called "representative basins";
 - (v) research on specific hydrological problems whose urgency and special nature call for a considerable effort at international level;
 - (vi) education and training in hydrology and related domains;
 - (vii) systematic exchanges of information

To be fully effective and to have the desirable coverage, the proposed long-term programme should be spread over a minimum period of ten years, from 1965 onwards, and this is why the programme should be named the "International Hydrological Decade".

A provisional programme has been formulated for member countries but before I detail these I should like to quote two further objectives of the IHG:

It is felt essential that one of the major objectives of the International Hydrological Decade should be to do everything to ensure that, at least in connexion with this programme, the collection of data be organized on the soundest possible basis so as to provide scientific research the material it absolutely requires and the data which hydraulic engineers need for their work.

Many hydrological phenomena recur at irregular intervals over a long period of years. Statistical methods calling for continuing observations over lengthy periods must be used for their scientific study. It is therefore both important and logical for the developing countries to begin forthwith to collect the basic data of which they will stand in such vital need in later years.

The programme for the member countries specifies the following basic set up:

- (i) Standardization of instruments, measurement methods and analysis techniques. We have done quite a bit in this field and our methods are not very different from those of the US Geological Survey, one of the largest hydrological organizations in the world;

- (ii) the designation of a number of stations which comply with basic quality standards as Hydrological Decade Stations. These are gauging stations, climate stations and any other hydrological observation posts. These could be selected quite simply from our existing stations;
- (iii) the calculation of a global water balance. Obviously we will be concerned with the water balance of the whole of New Zealand and this will require quite a few additional short term observation stations, both climatological and hydrological;
- (iv) the setting up of a number of representative catchments to understand better the hydrology of typical natural areas. These can be selected from our regional network.
- (v) the setting up of a number of experimental catchments where the effect of particular land management practices can be studied. We are doing this at Makara and Moutere and we also have proposals to set up experimental catchments on four typical soils of New Zealand. Two of these, one at Puketurua in Northland to study the effect of contour banking, and one near Taupo to study the effect of land development, will most likely be in operation next year;
- (vi) the setting up of a number of experimental catchments (vigil basins) which are allowed to develop as seems best for other purposes and on which the hydrological effects are observed. We have quite a few of these already, e.g. Taita Native, Devil's Elbow, Mangetepopo, Camp Stream, Hoon Hay and Cashmere etc;
- (vii) the setting up of a number of benchmark catchments. These catchments in their natural state uninfluenced by man and not likely to be influenced for a long time. We can select these from our regional catchments, e.g. Cleddau, Hooker etc;
- (viii) the undertaking of specialized education and training for hydrologists. This includes training and refresher courses, symposia, the establishment of regional hydrological institutes, dissemination of textbooks and basic reference materials.

Finally, to carry out this programme UNESCO suggested that:

- (a) National Committees be formed;
- (b) National hydrological services be strengthened;
- (c) Each country specifies to what extent it will partake.

New Zealand will participate in all proposals to a greater or lesser extent and this creates the new purpose I referred to earlier. Increased hydrological activity will result, and to generate and sustain this programme the Hydrological Society has to play its part. In particular the Society should point out the present weaknesses and strengthen these as soon as possible.

I will finally list what I think are some major weaknesses in our hydrological field:

(i) Waterlevel recording:

There are still plenty of weaknesses in waterlevel recording; the problem is partly instrumental and partly observational - I can only see improvements occurring if inspections are done by experienced personnel and the number of inspections is stepped up considerably.

(ii) Gauging:

I think we have improved, but not sufficiently. It is mainly a matter of training. Also, problems of screw versus cup meters should be settled; and other gauging methods explored.

(iii) Stage discharge curves:

We are making real strides here. A major problem, however, is the rating of unsteady flow conditions.

(iv) Rainfall sampling:

This is a major weakness - particularly the determination of mean catchment rainfall. We have some excellent procedures now but no comparative work is going on.

(v) Hydrograph analysis:

I realize that if we understood the hydrograph, probably most of our hydrological worries would be solved. This indicates how difficult the problem is. Nevertheless more work should be done on it. For instance, in simple unit hydrograph work we make some arbitrary deduction of baseflow - but leave the interflow because of the difficulties involved. The unit hydrograph theory however specifies the use of surface flow only.

(vi) Snow survey:

We are doing some experimental work but we are still not able to determine the water equivalent of a snow cover on a relatively large catchment.

(vii) Sediment:

Before thinking about sediment analysis we have to get our sampling techniques straight. How good we are in sampling we just don't know and this work has to be speeded up immediately.

These are a few of what I think are urgent problems. Now, having been given a purpose, having been detailed a programme, it remains for the central organization to strengthen its service, and for us all to act.