

VALEDICTORY ADDRESS

(1) It gives me great pleasure to have this unique opportunity of meeting experts and users of hydrological instrumentation on the one hand and the manufacturers and suppliers of advanced hydrological instruments on the other. I am glad that the National Institute of Hydrology has taken the lead in organising a National Workshop on this important aspect of water resources development. It is indeed heartening to note that the Indian National Committee on Hydrology (INCOH), the Ministry of Agriculture and Cooperation and the Department of Science and Technology have co-sponsored the event.

(2) Hydrological processes are highly variable in space and time, and this variability exists at all scales, from centimetres to continents, from minutes to years. Because comprehensive data collection over such a range of scales is difficult, hydrologic models, ranging from hydrologic components of climatic models to models of water quality, usually conceptualize processes that suit relatively simple data inputs.

While hydrological research may use long runs of historical data, operational needs of applied hydrology usually require data in real-time for immediate use such as in predictive models. Storms, floods, and droughts are natural events that can be measured only once, whereas laboratory experiments can be repeated. Instruments used in hydrology must, therefore, be reliable and operated such that data collected is of a known standard and precision.

(3) Advances in the hydrologic sciences require data and information systems that will provide the infrastructure to enable scientific interaction between researchers of different disciplines and employing different methodologies. Such information systems should provide hydrological information, not just raw data from instruments of in-situ sensors.

Although there is considerable interest in research on new techniques, less effort is directed in implementation of the new techniques in operational practice. It is natural that hydrologists prefer to develop ever more sophisticated techniques rather than engage in the much stimulating task of

transferring existing knowledge and technology to potential users for routine application in fields.

It is logical to propose that new techniques should only be introduced when and where their advantages over current techniques can be clearly demonstrated on both technical and economic grounds. We should of course not hesitate to take advantage of the benefits offered by these new techniques. A flexibility in attitude towards manual and automatic procedures and towards basic and sophisticated techniques is what is really required.

(4) In such a scenario, scientific investigation of water resources needs a data base out of hydrological data acquired and managed scientifically.

As contained in the National Water Policy and as advocated by INCOH and the World Bank's hydrology sector review, the following areas need immediate attention for improvement of hydrology in general and project hydrology in particular:

- i. Formulation of well defined data bases, augmentation of data collection networks and infrastructure for surface water, ground water and water quality,
- ii. Hydrologic instrumentation for surface water, ground water and water quality with a view to collect accurate and reliable data,
- iii. Monitoring of flows,
- iv. Return flow computations,
- v. Real time river basin planning,
- vi. Effective technology transfer, and
- vii. Procurement and development of softwares.

Deficiencies in these areas arise mainly because of manual data collection, lack of standard instruments, lack of necessary technical background, poor infrastructural facilities and improper methods of handling, processing dissemination and analysis of data.

(5) In order to overcome deficiencies and enhance consistency between recorded physical variables, a proper coordination among various central and state organisations is required. Now it is recognised by almost all water

user agencies that the hydrological database requires improvement in terms in terms of coverage and accuracy, and also in terms of storage, retrieval and interpretation of data through the use of computers and software. It is also realised that publication and access of information to all users has to be enhanced.

It is now evident that the collection of hydrological data is a basic need for water resources planning and management. In India there is urgent need to improve our data collection programmes to be able to get reliable data from field measurements. This calls for updating present techniques used for data collection and reorganising our manpower to work with the latest technologies available world-wide.

(6) Instrumentation plays a key role in hydrological data collection. Instrumentation technology has attained great heights of technological advancements. However, their application in the field of hydrology has been very limited. It is, therefore, very necessary to attain the capability of producing instruments within the country using indigenously available components and systems.

In order to achieve these objectives within a limited time frame, at one time it was considered that some form of international support is needed. To a limited extent, this process was initiated under the recently concluded Indo-Dutch project WAMATRA Phase II, and is also supported under an ongoing UNDP project at NIH.

It was also realised that the improvement in the performance of existing hydrological data collection and dissemination network could be achieved through physical improvement of network stations and instrumentation, manpower development and wide use of computers, and establishment of data banks. With a view to associate all concerned, central government and state government organisations in the process of modernising their respective observational networks, National Hydrology Project (NHP) with the assistance of World Bank was formulated. The aim was to strengthen all aspects of hydrological data collection, processing and dissemination for scientific planning and management of water resources.

(7) The Central Water Commission (CWC) has been the premier technical organisation in the field of water resources. Almost all the major and medium irrigation projects in the country and some projects overseas have had the benefit of the service of the CWC in one form or the other. The CWC maintains and operates a large number of flood forecasting stations in the inter-state river basins, helping in reducing loss of life and property. Despite limitations, CWC has been trying to keep pace with technological developments, in particular, in hydrometry leaving the atmospheric variables to the IMD.

The VHF telemetry link was attempted by the CWC as a pilot scheme in 1980 under an UNDP assisted project in the Yamuna basin. Under another foreign collaborative project CWC-DHI, an indigenously manufactured computer was installed in DVC for calibration and testing of some of the mathematical models. Under yet another foreign collaborative project with the USAID, advanced instrumentation was installed at selected sites in the Northern region so that these function as pilot projects and experience gained would be use elsewhere in the country.

For further improving the flood forecasting networks, there is urgent need to improve techniques, data collection instruments as also transfer aspects (i.e. telemetry), as we plan to extend the methodology to the river basins in the country. With a view to impart the latest data transmission technology in our forecasting networks, the CWC has recently attempted to invite offers from prospective bidders for advanced technologies like Meteor-burst telemetry systems in the Narmada basin.

(8) Let now look at the basic question of appropriate technologies for India. The technology is changing so fast that developing countries have not been able to catch up with the developed countries. In my opinion, it would perhaps be prudent to import the technology already available and build over it the indigenous technical know-how rather than make attempts to start from scratch. Also, considering the fast rate of developments, it has to be recognised that acquisition of technology from abroad must be accompanied with steps for absorption, adaptation and upgradation. There is therefore a need for a need for a strong national R & D base. Well equipped laboratories for testing

and a dedicated team of scientists are essential prerequisites to meet these requirements. Talents wherever available have to be located, attracted and nurtured.

(9) With the availability of modern microprocessor based instruments and systems, field instrumentation has become much more efficient, intelligent and reliable. Using such systems, it is now possible to acquire nearly real-time data, even in the unattended mode from remote and difficult sites. Microprocessors play an increasing role in the automated systems, by providing facilities like data storage, processing and calibration as well as quality control at the observation site.

In the field of data transmission many alternatives are becoming available. These include direct wire, telephone, radio, microwave telemetry, satellite relay and meteor burst. Technologically, all methods are applicable today, and their feasibility for operational use will be further improved in the coming years.

(10) Keeping in view the existing gap in the availability of indigenous field instruments, the National Institute of Hydrology initiated compilation of relevant information on this subject way back in 1986, and contributed significantly in the formulation of the National Hydrology Project. I am confident that with the complimentary roles being played by NIH and CWPRS in the field of hydrological instrumentation, in cooperation with other non-governmental organisations, this important area of hydrology is bound to attain the desired pace.

Besides development of new instruments, it is very important that well equipped testing and calibration facilities should also be created to ensure that instruments are kept in good condition leading to collection of accurate and reliable data. This requires national and regional centres where such tests can be conducted with infrastructural support even with global funding.

(11) I was told that during the last two days nearly 30 technical papers were presented and discussed by the manufacturers and users of hydrological instruments. I sincerely believe that the deliberations should in understanding and appreciating each others viewpoint better. I am happy

that by organising this National Workshop, the National Institute of Hydrology has fulfilled a longfelt need of field engineers, by bringing together the users and manufacturèrs through this Workshop. It is hoped that new avenues would be opened for accelerated indigenous development of hydrological instruments.

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