INAUGURAL ADDRESS

(1) It has been estimated that, to sustain one person, $1000M^3$ of water is required in a year. Our country's estimates of $1140BM^3$ of utilizable quantum of water can thus sustain 114 crores, the populration of India by AD2010. If interbasin transfer could augment the water availability by $250BM^3$, the population that can be supported will go upto 139 crores, which is the population of India in AD2020. Thus, the spectre of scarcity of water, water that occupies the centre-stage of our agro-based economy looms large on the horizon. Proper planning and effective implementation of such plans is the key to the optimal development of this scarce resource and to maximize the benefits. This requires periodical assessment of the surface and ground water potential on a scientific basis, their integrated development and conjunctive use. In order to achieve this, the basic need is accurate and reliable data. Operational hydrology, planning and modelling apart. Operation of reservoirs, flood forecasting, ground water extraction, irrigation scheduling, etc are all dependent on real time data. Real-time data is the prime need for calamity management-be it flood drought, earthquake or plague.

(2) A few years back, hydrology was not considered an exact physical science. It was clubbed with astrology and attached to probability or clubbed with geology and attached an uncertainty until proved. Hydrology is now tending towards exactness with the advent of computers. The demands for hydrometeorological data have become more exacting. The system where an observer makes manual measurements of rainfall, water level, discharge etc and then mails the data to the analyst is becoming obsolete. The need for data has now extended to areas which were earlier considered inaccessible and where on information has been available. In addition, the insistence on higher quality data has resulted in drastic changes, both in the methods of measurements as well as the means of transmitting data.

(3) Even in the early stages of its development, the pioneers of hydrology had to be active observers to answer their scientific questions. Most significant advances in the hydrologic sciences have resulted from new measurements; but the management of data like collection, processing, documenting, archiving, retrieving and distributing is often viewed as mundane or routine. It is, therefore, difficult for organisations and individuals to assure continuity, accessibility, and consistency of data.

Reliability and consistency are essential if the hydrological modelling studies are to benefit best from technological advancements. Sophistication in modelling and analysis notwithstanding, the results would only be as good as the data. The model may be exact and analytical procedures accurate, but the results cannot be relied upon, if data is inadequate and of poor quality.

(4) 'More the data, the better.' Date collection activities used to be planned based on this concept no long ago, but for a specific purpose. The trend has changed. Now the data is sought with multi-purpose objectives, essential for the rational and socioeconomic development of the country. Floods and droughts have in the past motivated the establishment of hydrological networks. Logic, facts and the quest for exploring new frontiers need national data collection systems, augmented to need the data needs that exist and shall arise in the future.

We have to face all kinds of odds, but the situation is not dismal. Deficiencies in the manual collection of data have to be overcome by automation of instruments. This is of special importance in a developing country like ours. The 'traditional' data collection techniques face large problems leading to a significant trend towards decreasing observational activity and resulting in data sets of very uneven quality. We have to think and plan if we want to be in business.

(5) During the last two decades, the availability of reliable micro-electronic devices, such as microprocessors and solid state memories, has lead to their incorporation in measuring instruments for use in many fields. Sensors based on new technologies and communication systems have made measuring instruments much more capable and intelligent. In addition to the direct use of microprocessor technology in measuring instrumentation and data transmission systems, on-site data processing and analysis is also being carried out using state-of-art intelligent instruments. The world-over, new concepts are being introduced in the design of hydrological instrumention. We cannot afford to lag behind. We must keep ourselves abreast with the latest developments in this important area. There is no dearth of technical knowhow or skilled manpower in the country.

It augurs well that the National Institute of Hydrology could bring together the users and the manufacturers at this Workshop thereby opening avenues for interaction and exchange of ideas for the indigenous development of hydrometeorological instruments.

(6) An important aspect of instrumentation is testing and calibration so that accurate and reliable data is obtained. IMD and CWPRS have been testing manually operated meteorological instruments and current meters, respectively. There is need for further strengthening to cater to the present and future needs. Presently, IMD has been formulating standard specifications for manual meteorological instruments. BIS takes up the responsibility of issuing Indian standards for different hydro-meteorological instruments. With increasing use of the automated type of instruments by various user organisations, it is necessary that Indian standards are formulated for such instruments.

(7) Efforts to develop hydrological instruments should not ingnore the technologies and expertise already available commercially, even if with private agencies. It would not be advisable to waste our efforts in developing such system/subsystems where lots of efforts as well as money has already been spent. On the other hand, manufacturers of the instruments should perceive the potential and should develop new equipment in coordination with research organisations and user agencies.

(8) There are many examples where systems have failed because insufficient attention was paid to logistics and the costs of maintenance. This not only requires adequate funds, but also requires specialised manpower. There is already a lack of trained personnel who can make use of the new technologies. Education and training, coupled with manpower policies for regular updating of the latest technology available, will be of utmost importance for the success of the future of hydrological data collection. This also requires a general awareness among the actual users of such instruments about the latest developments in the field of hydrological instrumentation. This possibly could be achieved through a forum where field hydrologists can interact with the developers/potential developers of field instrumentation.

(9) The High Level Technical Committee on Hydrology (HILTECH), now renamed as Indian National Committee on Hydrology (INCOH), identified in 1985/86 the challenge of improving the performance of existing hydrological data collection and dissemination network through physical improvements of network stations and instrumentation manpower development and wide use of computers, and establishment of data banks. The National Hydrology Project (NHP) with the assistance of the World Bank has been formulated to

strengthen all aspects of hydrological and climate data collection, processing and dissemination for scientific planning and management of water resources.

(10) Many a times it is observed that due to lack adequate knowledge these instruments, the users either do not get proper instruments or get instruments (mostly imported) with many redundant features. The publication of a Directory-cum-Buyer's Guide, in collaboration with the Ministry of Agriculture, Govt of India, and a recent technical publication of the NIH namely 'DAS for Hydrological Measurements' are welcome steps in this direction.

(11) Before concluding, I would to sound a note of caution. In our exuberance and enthusiam for all that is new, we have to avoid over-sophistication. Our ground conditions should not be lost sight of. Appropriate technology should be the watch-word-appropriate to our conditions. Recently I have come across proposals on automation in monitoring ground water levels. Is this required? If required, what should be the extent of such automation? In order to improve the quantity as well as quality of hydrological data collected in the field, modernisation and automation of data collection networks is very much a desired step. However, this has to be achieved in a gradual and well planned manner. I hope that the deliberations during the National Workshop would lead to fruitful discussions and specific recommendations for the future development of indigenous instruments in the country. This should not only result in making Indian hydrologists self-reliant, but also encourage Indian entrepreneurs to set up industry.

I have great pleasure in inaugurating this National Workshop.

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