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**REQUIREMENTS FOR TRANSMISSION
OF HYDROLOGICAL DATA
FOR FLOOD FORECASTING IN INDIA**

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01. In India, flood forecasting is carried out by the Central Flood Forecasting Organisation under the Central Water Commission. Almost all the large rivers, liable to floods, are covered under the programme. The Organisation is headed by the Chief Engineer, Central Flood Forecasting Organisation, with headquarters at Patna, working under the general guidance of the Member (Floods), Central Water Commission, New Delhi. There are three Superintending Engineers in charge of Flood Forecasting Circles at Delhi, Gauhati (Assam), and Maithon Dam (Bihar). Under the three Superintending Engineers, there are twelve Flood Forecasting Centres, each under a Deputy Director, and fifty Control Rooms, each under an Assistant Engineer.

Flood forecasts are issued for about 120 damage centres all over the country. The forecasts are issued mainly by correlation of river stages between base stations, located upstream on the main river and major tributaries, and the forecast stations. In some cases, discharge correlations are also used. The effect of rainfall and antecedent precipitation is taken into account, mostly in a qualitative manner.

02. There are about 320 stream gauging stations, where river stages are observed hourly during the flood season by observers posted at the site. Transmission of river stage and discharge data is made by radio telephone with the help of VHF and HF SSB wireless sets, working according to a pre-determined schedule. Except for rain-gauges located at the sites of wireless sets, rainfall data is generally collected by telegrams or on telephone.

03. The flood forecasting system is working fairly satisfactorily, especially on main stream rivers. The warning time is generally 24 to 48 hours, sometimes longer. However, in headwater reaches and smallest streams, sometimes the warning time, based on river stage or discharge data, is only 6 to 12 hours. In these cases, the need is felt of deriving flood forecasts from realtime rainfall data. Telemetering rain-gauges are under development by the India Meteorological Department, and about half a dozen such instruments have been under test for the last few years.

04. For improvement of river forecasting services in India, an UNDP Project has been drawn up, which envisages setting up of about ten remote sensing stations in the upper catchment of the Yamuna river. Telemetering from the remote stations may be either by ground-based radio working on VHF or UHF with necessary repeater stations, or may be based on the meteor scatter principle. The final decision will be taken in consultation with WMO after the project is finally approved by the Government of India and UNDP.

05. As mentioned before, the present telemetering system is by radio telephone operated by trained personnel using VHF or HF SSB wireless sets. The system is generally satisfactory and is in tune with social and economic conditions in India. We have no shortage of man-power. In fact, there are problems of unemployment, especially among educated youth. Manual observation of river stages and their transmission by wireless operators on radio telephone is quite dependable. The data transmitted can also be checked and clarifications obtained. The wireless sets are manufactured within the country.

06. Automation of collection and teletransmission of river stage and rainfall data is no doubt required under certain circumstances, such as from inaccessible locations in uninhabited mountainous or forest areas. However, there are several problems before we can go

in for automation in a big way. The first one would be of unemployment. The second one would be that most of the sophisticated recording and telemetering instrumentation would have to be imported. The high costs of imported equipment may well outweigh the savings due to reduction in man-power. Thirdly, the equipment would have to be protected from vandalism by ignorant or mischievous elements, or by damage from wild animals. If we have to appoint watchmen for safeguarding the instruments, we could as well appoint observers for measurement of river stage or rainfall, and reporting them by wireless.

07. Most of the rivers in India have meandering and shifting river beds. The river discharges vary considerably. During the dry season, the water depth is very small, and the flowing channel may be far away from the river gauge located near the bank. The rivers also carry a lot of sediment, tending to choke the pipe leading from the flowing channel to the gauge well.

08. Until such sophisticated equipment is manufactured within the country, we would be dependent on imports, not only of the initial equipment but also of spare parts to maintain the equipment in working order. Because of high replacement costs in developing countries, we tend to use equipment far longer than in developed countries. Quite often, the equipment becomes obsolete in the country of manufacture, and spare parts are no longer available.

09. There is, thus, need for development of suitable self-recording and telemetering hydrological instruments, which would be relatively inexpensive and sturdy for use in remote areas of developing countries and which would not be dependent in the long term on continued import of spare parts from abroad. This point was brought to the notice of the WMO/ESCAP Panel on Tropical Cyclones at the Sixth Session held at Rangoon (Burma) from 27th February to 5th March 1979. It was agreed that the problem should be brought to the attention of the WMO Commission on Hydrology and the Commission for Instruments and Methods of Observation for appropriate action.

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10. India has plans for launching a meteorological and communication satellite some time in 1981. For the time being, only about 100 data collection platforms are being planned for telecommunication of meteorological elements. It is proposed to keep provision for some hydrological elements also. Specifications for the instrumentation and location of the stations are yet to be drawn up.

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