12. DESIGN AND OPERATION OF FORECASTING OPERATIONAL REAL-TIME HYDROLOGICAL SYSTEMS (FORTH)

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12.1 INTRODUCTION

12.1.1 Definition of a FORTH (Forecasting Real-Time Hydrological) system

Hydrological forecasting is the prior estimate of future states of hydrological phenomena in real time. It comprises technical activities connected with hydrological and non-hydrological subjects, such as network design, data processing, hydrological analysis and synthesis (modelling), remote-sensing techniques, telecommunications, operational use of computers, etc. In view of this, the subject of hydrological forecasting should not be viewed as one particular hydrological technique, but as an economic activity using many technological developments, both hydrological and non-hydrological.

12.1.1.1 Flood forecasting

It is safe to say that flood forecasting is often compared with hydrological forecasting in general. But the emphasis of flood forecasting has changed in recent times. When the writer attended university some 40 years ago, flood forecasting was considered as a poor relation of actual flood prevention by structural measures (dams, dikes and levees), then considered the only effective disaster-mitigation measure. This philosophy prevailed for many decades until new evidence indicated that the point is "not to keep the water away from the people, but people away from the water". Firstly, it is impossible in many countries not to use the parts that the river regularly floods - the flood plain. In Asia and other parts of the world, floods are not only a curse, but also a blessing. Proper flood plain management, which foresees flood forecasting, can reduce the curse while retaining the blessing. Furthermore, flood forecasting as a means of flood damage reduction, has another, more subtle, advantage over structural methods of flood control. Sugawara (1974) has pointed out that flood control reservoirs are effective for small- and medium-sized floods but are of little value for the control of large, very infrequent events. He further notes that a population which depends on methods of controlling any type of disaster shields itself

from the more frequent events and so, having no chance to learn how to contend with any disaster, suffers even more from the uncontrollable large events. It seems that every method of disaster prevention has this unfortunate characteristic - it increases the damage from large disasters. A flood-oriented FORTH system serving well-established disaster-prevention operations should, in most cases, prove more efficient in mitigating the effects of major floods than would structural measures.

12.1.1.2 **Classification of forecasts**

Hydrological forecasts can be classified mainly by three, mutually interdependent, characteristics:
(a) The forecasted variable;
(b) The forecast purpose;
(c) The lead time also known as forecasting or forewarning period.

According to the forecasting period WHO recognizes four types of forecasts (WHO, 1983):

<table>
<thead>
<tr>
<th>Forecast Type</th>
<th>Description</th>
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<tr>
<td>Short hydrological forecast:</td>
<td>Forecast of the future value of an element of the regime of a water body for a period ending up to two days from the issue of the forecast.</td>
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<tr>
<td>Medium-term (extended) hydrological forecast:</td>
<td>Forecast of the future value of an element of the regime of a water body for a period ending between two and ten days from the issue of the forecast.</td>
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<td>Long-term hydrological forecast:</td>
<td>Forecast of the future value of an element of the regime of a water body for a period extending beyond ten days from the issue of the forecast.</td>
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<tr>
<td>Seasonal hydrological forecast:</td>
<td>Forecast of the future value of an element of the regime of a water body for a season (usually covering a period of several months or more).</td>
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<tr>
<td>Hydrological warning:</td>
<td>Emergency information on an expected hydrological phenomenon which is considered to be dangerous.</td>
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12.1.1.3 **Use of the WMO Hydrological Operational Multipurpose Sub-programme (HOMS) in FORTH system design**

It will be recalled that the WMO Hydrological Operational Multipurpose Subprogramme (HOMS) is intended to promote the transfer of hydrological technology between Members of WMO for use in their water-resource projects. It does this by making the technology available to users in the form of components. These components are of various kinds, for instance,