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Working Group on Hydrology  
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**Draft report**

# **Operational Hydrological Reference Basins**

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## 1. Introduction

There is general agreement among hydrology experts concerning the absolute necessity of observations in small hydrological catchments, both for practical application in water resources management and environmental protection, as well as for hydrological research.

The national representatives in the Regional working Group on Hydrology of the Association VI Europe of WMO agreed that in addition to catchments for the purpose of pure hydrological research, a monitoring network of small hydrological basins operated by the National Hydrological Services of the various countries is needed. Such a network would thus constitute one element of the basic national monitoring network.

To ensure that the information from these so-called Operational Hydrological Reference Basins (OHRB) can be used not only on a national but also on an international scale, comparability is essential. In view of this requirement, the working group assigned a rapporteur with the task of drawing up a recommendation for the cost-saving acquisition of long-term hydrological information in OHRB with special attention to the determination of the minimal necessary observation variables, data processing requirements and integration of such basins into an international network.

## 2. Introduction

The following characteristics refer to the OHRB:

- 1) The OHRB are to be run on a long-term basis.
- 2) The cost involved in measuring the hydrological data should be kept at a minimum.
- 3) The OHRB should be operated preferably by hydrological operational services and integrated in the basic networks of the participating countries.
- 4) The OHRB should cover the various hydrological regimes and take into account the different pedological, geological and land use conditions.
- 5) As far as possible, the OHRB should be used for ongoing research projects. It should be made possible to research institutes to set up and operate additional measurement stations.
- 6) The measurement variables should be collected with a high degree of accuracy to allow comprehensive analysis. It should be possible, using the data from the OHRB, to test the theories and procedures developed by research institutions.
- 7) The measurement, processing and analysis of data should proceed according to standard methods in order to ensure the comparability of the data and to permit a regional and international exchange.
- 8) It is not planned to implement the observations of the OHRB into a centralized data bank. For regional applications the necessary data sets will be provided by the National Hydrological Services. The descriptive informations of the OHRB should be integrated in an appropriate medium of WMO, possibly in INFOHYDRO or GRDC.

## 3. Criteria for the selection of OHRB

With a view to setting up an international measurement network of Operational Hydrological Reference Basins a number of criteria will now be enumerated, to be given due

consideration in the selection of basins. A basic premise in the process is that the basins for the determination of the water balance and the basins for the estimation of sediment transport constitute two separate groups of OHRB, as it often proves difficult to combine the two aims.

### 3.1 Basins for the determination of the water balance

- 1) The basins should, as far as possible, include all types of hydrological regimes.
- 2) As far as possible these basins should be located in areas which are minor influenced by human activities. The influence of man in these areas should be assessable.
- 3) It should be possible to clearly classify these basins in terms of basin characteristics.
- 4) The measurement infrastructure for the data collection should be of high quality and the procedures of data processing and analysis should be as much as appropriate as possible.
- 5) Preference should be given in the selection of basins to those for which good-quality, lengthy time series of observations are available.
- 6) Every effort should be made to use the stations in the OHRB for other purposes as well, in order to ensure operation for the longest possible period.

### 3.2 Basins for the determination of sediment transport

- 1) In the selection of basins where the bed load is measured in deposits, the type of bed load trap chosen is of primary importance. Only a fully operating bed load trap is useful as a measurement setup. It should be positioned such that neither significant deposits nor sediment sources are possible upstream from the gauge. The most suitable position for a bed load trap for measurement purposes is at the cone neck. Double trap systems, i.e., where a fine bed load trap is installed further downstream from a coarse bed load trap, are suitable for measurement purposes only if they can both be emptied at the same time.
- 2) The more uniform the selected basin is, the more significant are the results obtained. Unfortunately, there is such a great diversity of catchments and stream types that it would never be possible to satisfy every requirement. Nevertheless, the basins selected should fulfil the following conditions:
  - The major geological formations should be present in the measurement basins. They should belong to typical climatic regions.
  - In terms of precipitation and discharge, the measurement basins should be typical examples of "storm regimes", "continuous rain regimes" and "snow/glacier regimes". Major artificial introduction of sediments are to be avoided as much as possible. Basins with weak, average, or preferably strong sediment transport and those with rare to frequent debris flows should be chosen.
  - The basins should be smaller than 20 km<sup>2</sup>, as an exception 50 km<sup>2</sup>, but preferably up to 10 km<sup>2</sup> in size. Its shape should vary between elongated and kettle-like, and the stream network between low and extremely high density. The ground cover should vary, and the measurement network include slide and creep areas as well as stable basins. Future changes in the basin should be kept at a minimum (no noticeable changes in urban development or road-building, no major changes in land use for forest cover).
  - The entire spectrum of river types should be represented, from the most harmless stream to the mightiest torrent, on other words, rivers with minor to major erosion potential, with stable to unstable beds, with and without avalanche and landslide deposits in the riverbed, with and without driftwood problems, as well as with and

without debris flow or mudflows. The river course should vary from straight to strongly meandering, from mainly untouched to extremely altered.

#### **4. Previous activities**

The following investigations have been carried out in this concern:

- A review of earlier and recent activities in the field of hydrological monitoring in small basins
- Definition of objectives and benefits due to the operation of small basins
- Determination of descriptive parameters of the OHRB and of their respective measurement stations
- Determination of observation requirements in OHRB with special emphasis to water balance components and sediment transport
- Formulation of recommendations for processing and analysis of observations
- Determination of criteria for the selection of OHRB
- Presentation of a set of necessary informations related to the OHRB
- Redaction of the report "Hydrological Observation Requirements in Operational Hydrological Reference Basins"
- Revision of the report by the Regional Working Group on Hydrology
- Adoption of the report by WMO bodies
- Publication of the report in the series "Technical Reports in Hydrology and Water Resources", No 41, WMO/TD-No.610
- Presentation and discussion of the OHRB concept in several international institutions and programmes as UNESCO's International Hydrological Programme, FRIEND, AMHY and the International Commission for the Hydrology of the Rhine Basin
- Presentation of a report to the 8. session of the Working Group on Hydrology in Helsinki, Finland 1997

#### **5. Tasks of the rapporteur defined at the 8th meeting of the Working group on Hydrology in Helsinki**

- Identification of countries of AR VI willing to contribute to an European Network of OHRB
- Collection of descriptive parameters of selected basins
- Preparation of an inventory of these basins and distribution among the members of AR VI
- Support of WMO in implementation of these information into INFOHYDRO
- Eventually cooperation with other projects.

## **6. State of the art of the project and proposal**

At the meeting in Helsinki representatives of Austria, Bulgaria, Croatia, Czech Republic, Germany, Italy, Norway, Romania, Slovakia, Slovenia and Switzerland have expressed their willingness to participate in this project.

Until now the rapporteur has only received material from Austria, Norway and Switzerland, although the president of our working group have sent an additional request to the member states in September 2001. Examples are presented in Appendix 1- 6.

Therefore and based on the opinions, expressed by the representatives in Helsinki, the rapporteur decided together with the president of the working group, to propose to the working group at its 9<sup>th</sup> session to stop activities in the framework of the project "Operational Hydrological Reference Basins".