



The need for a global network of long-term small hydrological research basins

Braunschweig Declaration



Participants of the International Workshop on Status and Perspectives of Hydrology in Small Basins

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Hydrologische Wissenschaften
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I. Introduction

Since UNESCO launched the International Hydrological Decade (1965–1974) many hydrological research basins have been established and have since then been in focus of studies on hydrological processes at a basin scale. Only in well-defined small basins, where there are high-quality measurements, is it possible to investigate the complexities of combined physical, chemical and biological processes. Small hydrological research basins provide inter-disciplinary observatories. Realizing the relevance of environmental changes (e.g. climate and land-use changes), the value of long-term measurements in small research basins has become more important, for instance to cope with issues of non-stationarity in hydrological processes. Knowledge gained

from studies in small hydrological basins can be used for decision-making with respect to managing ecosystem services and water resources systems.

This declaration is based on the findings of the International Workshop on Status and Perspectives of Hydrology in Small Basins held in Goslar-Hahnenklee, Germany, 30 March to 2 April 2009.

The Workshop participants acknowledged the continuing support from UNESCO-FRIEND, ERB, WMO and IAHS for good knowledge-exchange frameworks in favour of scientific hydrology. At the same time, they perceived the need to strengthen the existing networks of small hydrological research basins.

A strengthened network of hydrological research basins would help to facilitate the synthesis of research required to meet future challenges in water resources management in a changing environment.

II. Benefits of a strengthened network of hydrological research basins

Workshop participants discussed a wide range of benefits from a strengthened network. For details see IHP/HWRP-Bericht 10, 2010. A few examples are given below.

Monitoring the real world

Advances have been made using mathematical models and scenarios of future land-use and climate change. However, there is a growing awareness of the fundamental need for long-term monitoring of the environment related to land-use, climate change and climate variability. Networks of small research basins provide essential outdoor laboratories for monitoring actual changes in environmental variables unlike to predicted changes, and for validation of models and scenarios of future environmental change.

Uncertainty

New insights gained from studies across networked gauged basins, and advanced approaches for dealing with modelling errors, can be applied for dealing with uncertainties throughout the observation-conceptualisation-modelling sequence. This will help with prediction in ungauged basins, for example, where additional sources of uncertainty exist. Dealing with modelling uncertainties across networked basins will lead to better techniques to assist with integrated water resources management.

Eco-hydrology

Networks of small basins provide good opportunities for monitoring ecological changes driven by different hydrological and/or climate changes. Comparative studies of

processes in urban/industrial and remote/pristine catchments supply important information for water and land-use management under environmental change. Furthermore, a better understanding of ecological changes thus gained will provide key insights for improving pollution control.

Cross-cutting themes

Networks of small basins are important tools in several types of study, e.g. (i) validation of modelling at larger spatial scales, (ii) assessing socio-economic aspects of the hydrological cycle and (iii) detection of trends and changes in runoff regimes and ecosystem responses due to anthropogenic activities and climate variability. A number of disciplines benefit from long-term research in small basins, e.g. engineering, climatology, forestry, biology, geochemistry, ecology and soil science.

Modelling

The initial development and subsequent improvement of a model requires high-quality data. When hydrometric and other measurements are made with high spatial and temporal resolution, small research basins deliver the high-quality data required for detailed model development. A network of small research basins is important for improving process representation for a range of different hydrological settings and

landscape features. A network also helps field researchers to identify from modelling the important physical processes that contribute to runoff formation in different environments.

III. Recommendations

Recognizing the value of existing networks of small hydrological research basins, the Workshop recommended:

1. Strengthening of existing networks in a cooperative endeavour to ensure long-term observations in a wide range of hydrological and environmental settings;
2. Creation of a global institutional framework for better recognition and support of networked small research basins;
3. Use of the global network as a set of representative and reference basins, providing long-term Observatories;
4. Use of the networked Observatories for active interdisciplinary process and modelling studies, as well as for education and training;
5. Adoption and support of the global network at the international level; and
6. Support for existing and, where appropriate, new hydrological research basins at the national level in order to contribute to the global network.

UNESCO-FRIEND

United Nations Educational, Scientific and Cultural Organization-Flow Regimes from International Experimental and Network Data

ERB

Euromediterranean Network of Experimental and Representative Basins

WMO

World Meteorological Organization

IAHS

International Association of Hydrological Sciences

