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Maximising information content from monitoring networks for optimal performance of water systems

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Development, population growth and climate change are factors that are affecting the way how water resources are being managed. The rapid change of land use and the evident changes of rainfall patterns and intensities all over the world during the last years are sufficient reasons to think that not only extreme events, but also normal hydrological events are going to be more and more difficult to handle in the future.

A vital part of the modern water management is the measurement of the different processes of the hydrologic cycle. For this purpose, monitoring networks provide data that is used by models to generate useful information content which is used by managers of water systems and decision-makers to keep a good water system performance. Nevertheless, the collected data may not be appropriate for adequately describing the water system due to a number of reasons, among others, limited information provided by data because of a low spatial coverage of monitoring points, low frequency of collection in time or low resolution.

This document presents the research ideas for maximising information content from monitoring networks for optimal performance of water systems. Among the ideas to develop, the use of hydrological and hydrodynamic models to adequately interpolate the information to non-measured points, the possibility to reduce the monitoring networks without affecting the accuracy of the predictions and the use of wireless technologies for the participation of the community in extreme-events monitoring are presented.

For the first idea the use of physically-based models in combination with data-driven models for generating information from the raw collected data is presented, taking into account the temporal and spatial scale variability of the data to be used. For the

second, information theory concepts such as entropy (uncertainty) and trasinformation (mutual information to measure redundancy) are used within the objective functions to optimise monitoring networks. For the last idea, wireless technologies will be used for collecting data from the public in real-time fashion to allow for a fast reaction in areas where no monitoring devices exist.

The case study of Delfland, the Netherlands, is presented for the application of the methodology in a low-lying regional water system.