Assessing the Global Water System: a Holistic View of Key Elements and Datasets Using the Unified Modelling Language

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Knowledge and data about the dynamics and processes of the Earth System and its components is increasing rapidly. One of the aims of the Global Water System Project (GWSP) – a joint project of the Earth System Science Partnership (ESSP) under the auspices of ICSU – is to provide an information base about freshwater in the Earth System. A key building block in this information base is the GWSP Digital Water Atlas. The purpose and intent of the Atlas is to describe the basic elements of the Global Water System, the interlinkages between these elements, and changes in the state of the system, by providing a consistent set of annotated maps and datasets.

A first step to implement the Atlas was to compile a list of basic datasets considered to be especially relevant to an inter-disciplinary perspective on the Global Water System. In order to provide an overview of these datasets and the relationships between them, the list was then analysed using an object-oriented approach. The resultant overview is in the form of a Uniform Modelling Language (UML) class diagram. This overview provides a first conceptual model of the Global Water System that will be further refined and will mature in parallel with the entire GWSP.

The exercise with the Atlas datasets showed that an object-oriented overview has some advantages over simple categorizations or (hierarchical) lists since it explicitly shows important relationships between different elements and between datasets,. The concentration on real-world phenomena, which is a result of the object-oriented analysis, also triggers dialogue and mediates discussions between different scientific disciplines. The overview of a system (or a set of related aspects or datasets) from a real-world multi-disciplinary perspective will not cover all the details considered by disciplinary scientists but it provides the opportunity to place them into a broader context and to stimulate discussion and collaboration.

Although object-oriented approaches and notations have some limitations, the exercise presented shows that they can support the multi-disciplinary overview and analysis of the increasing amounts of knowledge and data describing our environment; the triggering of immediate and constructive reactions to the diagrams presented being only one example.

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