Reporting Schemes for the European Water Framework Directive in the context of the Internet Portal WasserBLIcK and INSPIRE

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Abstract

IT developments for the implementation of the European Water Framework Directive (WFD) currently focus on the support of the reporting obligations, from regional Water Information Systems in multiple information integration and aggregation steps towards the European Commission. The present article illustrates how the reporting is currently organised in Germany based upon the Internet Portal WasserBLIcK. Furthermore, an outlook is given how the reporting schemes will be influenced by European projects like INSPIRE and ORCHESTRA that aim at providing standardised service-oriented architectures to improve the syntactical and semantic interoperability.

1.   Overview

The Water Framework Directive (WFD) is widely recognised as one of the most ambitious and comprehensive pieces of European environmental legislation to date (COM, 2000). Its aim is to ensure that all European waters are protected according to a common standard. The Directive has two key components:
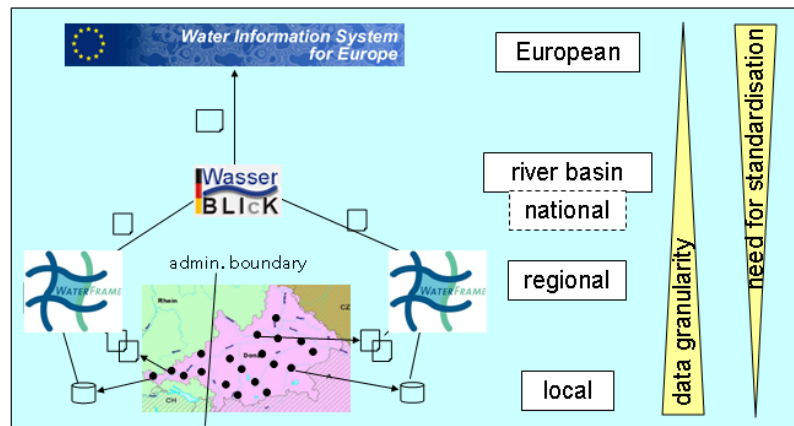

Figure 1: WFD Reporting with WaterFrame®, WasserBLIcK and WISE

1. a system of management of the natural water environment based around natural river basin districts (instead of administrative and political borders); and
2. the introduction of co-ordinated "programmes of measures" with the ultimate objective of achieving (at least) "good status" for most of the European rivers, coastal waters and under-ground waters by 2015.

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However, the WFD is not only a fundamental rethink of the EU water policy. It requires a multitude of coherent information and service sharing possibilities between the WFD stakeholders that go far beyond the data exchange procedures currently established between the environmental agencies in Europe. Thus, the European Commission has set up a Common Implementation Strategy for the WFD implementation. The working group Geographical Information System (GIS) is aiming at providing harmonised, however legally non-binding recommendations for the information management approach of the WFD.

2.   Impact of the WFD Data Model on Regional Water Information Systems

The GIS Guidance Document (Vogt, 2002) aims at guiding experts and stakeholders in the implementation of the WFD. Especially, it specifies a data model in which all information elements that are relevant for the WFD reporting process are specified and related to each other. This data model is mostly relevant for the WFD reporting obligations towards the European Commission. The basic data for these reports is collected and maintained in regional and/or national Water Information Systems that are operated by environmental agencies, before it is aggregated on national level (in Germany through the WasserBLIcK server, see section 3) and reported to the European Commission and published through the Water Information System for Europe WISE[3] (see Figure 1).

Important elements of this data model are the river basins, water bodies and river/lake segments as the natural units for the water quality assessment process. Figure 2 shows how the monitoring locations for groundwater and surface water and their related attributes such as measurements are related to the WFD objects in the thematic information system FIS Gewässer.
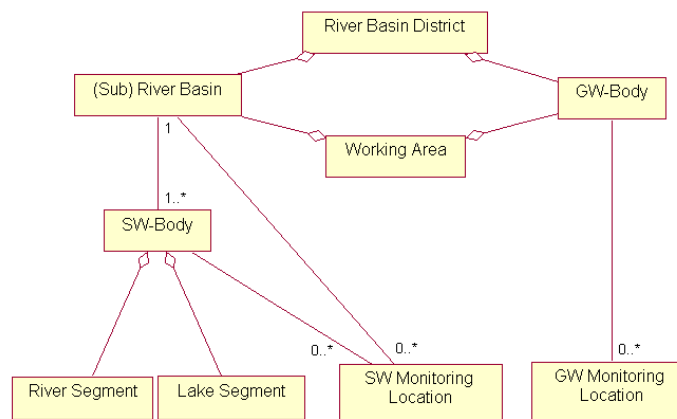

Figure 2: WFD Objects as realised in WaterFrame/FIS Gewässer

FIS Gewässer is one deployment of the WaterFrame® product suite of Fraunhofer IITB that is being developed and operated in close co-operation of the German Federal States of Thuringia, Bavaria and Baden-Württemberg. FIS Gewässer supports an explicit export/import interface to the templates defined by WFD-specific Internet Portals such as the **WasserBLIcK** server.

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[3] http://wise.jrc.cec.eu.int/

3.   WasserBLIcK: Platform for the Management of WFD-related Spatial Data

In September 2002 the water-management agencies of the German federal states agreed to run together with the German federal Ministry of Environment the Internet portal **WasserBLIcK** (Busskamp et al. 2003). The implementation and operation of this information and communication platform has been assigned to the Federal Institute of Hydrology (BfG). Today, WasserBLIcK has become an important instrument for the water-management agencies in Germany with its focus on supporting the administrations in the implementation of the WFD.
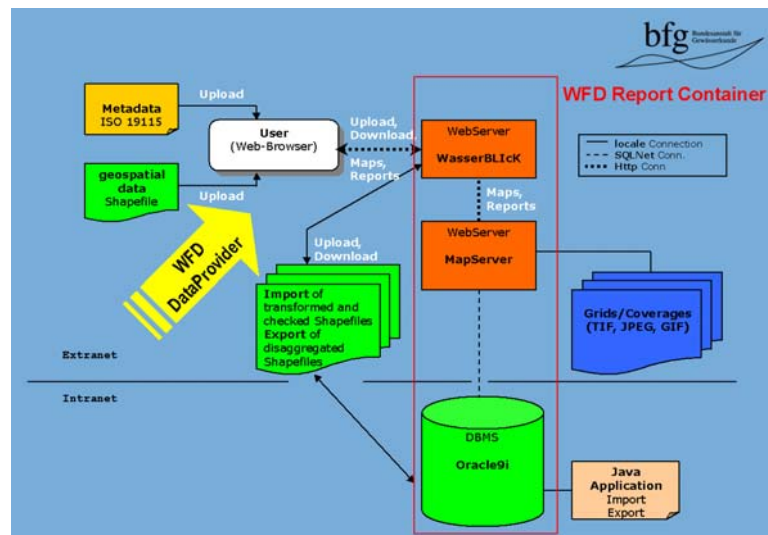

Figure 3: WasserBLIcK Architecture (see: http://www.wasserblick.net)

The WFD poses a particular challenge for water managers in the European member states. The very stringent time schedule for the implementation of the Directive into national law - along with the shared responsibilities for water resources and waterways in Germany's federal structure - demand an efficient management of information and communication. In view of the numerous activities on all governmental layers to solve legal and scientific-technical issues, the provision of up-to-date and well-structured information is indispensable for the correct and timely implementation of the Directive.

With regard to short-term reporting requirements on the progress of this implementation, it is essential to pool relevant data (e.g., texts, spread sheets, and geospatial data) both on a river basin district scale and for the whole country. Moreover, the WFD explicitly demands to digitally submit geospatial information to the European Commission. Here, WasserBLIcK offers the necessary tools for data acquisition, data homogenization, and data processing, thus developing the national data pool for digital reporting of thematic national and international maps to the European Union. For these purposes WasserBLIcK offers the *WFD Report Container* (see Figure 3) that consists of
- a WebServer based on the Web Content Management system WebGenesis® and a dedicated user access control,
- a spatial data management system and a map server conformant to the specifications of the Open Geospatial Consortium (OGC).

The WFD-specific data administration in WasserBLIcK is accessible by the *WFD Report Navigator* in the sections "Download", "Upload", "Maps" and "Reports". Here, the contributors of the competent au-

thorities find the necessary templates for data acquisition, code lists for homogenization of relevant domains, as well as software tools that assist the data providers in filling the data templates in the Shape format. The *WFD Report Navigator* also organises the transfer of filled-in templates to the system. In the context of the upload form, indispensable (ISO 19115 conformant) metadata about the data provider and the reported data themselves are registered, too. Following the upload, the data have to pass a quality-assurance procedure called "SchemaMapping". If the result is not negative, the data set is integrated into the spatial database of the *WFD Report Container* and thus becomes a component of dynamically generated maps and statistics products accessible via a DHTML Client.

The water-management authorities can benefit from another centralized service in the Download section. Here the homogenized spatial data that were disaggregated for river basin districts (Rhine, Elbe, etc.) may be downloaded for advanced cartographic, statistical, or analytical uses. The Reports section provides the ability to produce Web based Reports that hold information about topics e.g. addressed by the Reporting Sheets of the European Commission DG Environment (EC DG Env)[4], such as "Provisional identification of artificial and heavily modified water bodies" (COM 2004b). At this time, about 25 sheets exist to prove the pan-European implementation of the WFD Article 5 concerning the Characterisation of river basin: pressures, impacts and economic analysis. EC DG Env aims to innovate the information management about the State of Environment by establishing a Web based Information System (WISE)[5]. "It should be recalled that the long term objective is to develop a new, comprehensive and shared European data and information management system for water, including river basins, following a participatory approach towards the Member States" (COM, 2004b). *WasserBLIcK* serves as the German input node for this system.

4. Outlook: Impact of related European Initiatives such as INSPIRE and ORCHESTRA

Following three years of intensive collaboration with Member States experts and stakeholder consultation, the European Commission has adopted on the July 2004 a proposal for a Directive establishing an infrastructure for spatial information in Europe called INSPIRE (COM, 2004). The adoption of the proposal marks an important step on the way forward to a European-wide legislative framework that helps in achieving a European Spatial Data Infrastructure (ESDI). This proposal does not only address policy related issues concerning the development of an ESDI but also dedicates three chapters to the technical requirements that have to be fulfilled by the member states to establish the ESDI. These three chapters are on Metadata, Interoperability of spatial data sets and services, and so-called Network Services. Under these chapters the proposal list general requirements on these issues as well as it formulates the requirement to adopt appropriate implementing rules. The definition of these chapters is being performed by respective drafting teams as part of the INSPIRE process by selecting submitted specifications of registered projects or initiatives, so called Spatial Data Interest Communities (SDIC).

Once the INSPIRE specification will have been consolidated and agreed by the member states, the following paradigm change for the WFD reporting scheme may be realised based upon an agreed infrastructure:

- from a data-oriented push-mechanism: delivery of WFD-related information to the EU commission in terms of a report (ESRI shapefiles or OGC GML documents according to (Vogt, 2002)),
- towards a service-oriented pull-mechanism (offering data through standardised services to the interested community),

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[4] http://europa.eu.int/comm/environment/water/water-framework/index_en.html

[5] http://wise.jrc.cec.eu.int/

Furthermore, the WFD reporting scheme will also benefit from ongoing work on semantic interoperability. The integrated EU project ORCHESTRA[6] (Open Architecture and Spatial Data Infrastructure for Risk Management) initiated in September of 2004 has taken on this information technological challenge (Annoni, 2005). The goal of the three years project is the specification and implementation of an open, service-oriented software architecture to improve the syntactic and semantic interoperability in the area of environmental risk management. The following tasks are addressed in particular:

- Development of an effective and highly functional but generic software infrastructure to enable expert service applications even for multi-risk management tasks such as floods, forest fires, earthquakes or man-made risks, but also for other environmental domains such the implementation of the WFD.
- Integrated treatment of spatial, time, or object- related information.
- Explicit handling of border-spanning aspects of technology, administration and natural language.
- Explicit modeling and utilization of expert knowledge using an ontology-based approach.
- Validation of the ORCHESTRA Architecture in border-spanning application scenarios.
- Feedback of the architectural definitions of ORCHESTRA into the standardization process of ISO, CEN and the Open Geospatial Consortium (OGC)

The results of these infrastructure activities will constitute a major baseline for the development of a respective service-oriented IT Framework Architecture for the WFD implementation as jointly demanded by users and vendors (Usländer, 2003).

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[6] http://www.eu-orchestra.org