Geographical Information System "Meets" Environmental Data Management: Exemplified at Practical Projects

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The most practical Geographical Information Systems provide the data based on spatial aspects. They define spatial feature classes with additional thematic attributes. That's why in practice you find very often different feature classes for one real world object, e.g. one street both as line-object and as polygon-object – and the same attributes are saved two times with inconsistency.

But UML (Unified Modelling Language) and all UML-based data structures (among others the INSPIRE data specifications) define an object oriented data management. That means e.g.:

- one real object is one information object;
- all objects can have more and different geometries;
- the geometry is to handle like an attribute;
- the handling of generalisations and heredities;
- the need to manage versioning and historiography.

And the practical use cases require that object oriented structures too. In the following the necessity and innovative solutions should be presented by 5 examples:

Environmental Noise Directive

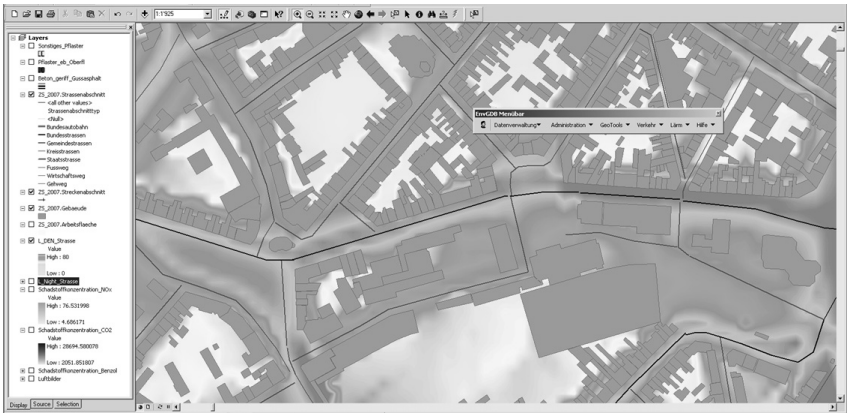

Fig. 1: Data management for the Environmental Noise Directive

Jekel, T., Car, A., Strobl, J. & Griesebner, G. (Eds.) (2013): GI_Forum 2013. Creating the GISociety.
 ISBN 978-3-87907-532-4.
 eISBN 978-3-7001-7438-7, doi:10.1553/giscience2013s113.

Innovations:

- using UML for the data specification;
- model driven programming (with an automatism from the model to the program);
- consequently use of the versioning for:
- transactions in a long timeframe;
- the management of reported environmental situations and planning data;
- qualification of the importing processes;
- interfaces to thematic simulation programs;
- delivery of web-services (viewing and download services).

Spatial Data Centre in Saarland

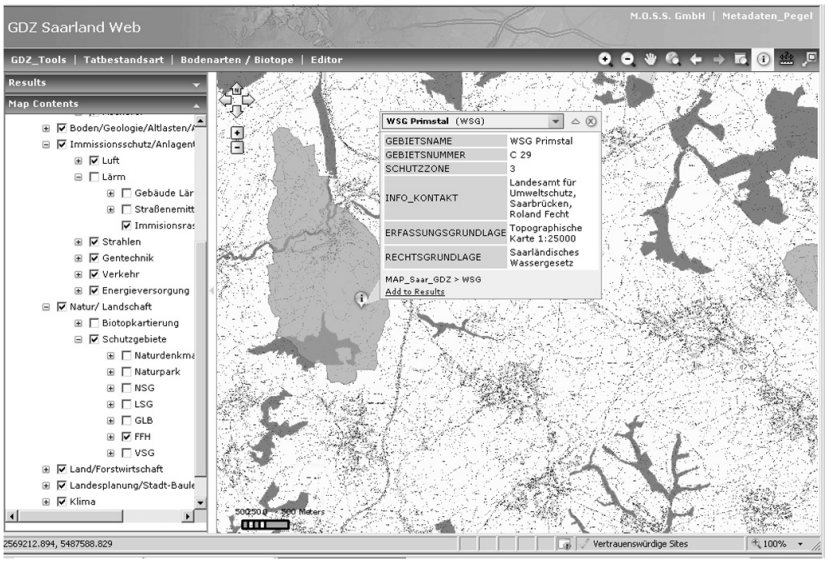

Fig. 2: Example of environmental data in the Spatial Data Centre

Innovations:

- cross object data providing and management over all environmental themes;
- creation of a theme crossed logical model;
- consequently object oriented data structures with
  - generalisations and heredities;
  - so called MultiFeatureClasses;
- interface to the metadata management.

Water Law and Water Book in Saxony

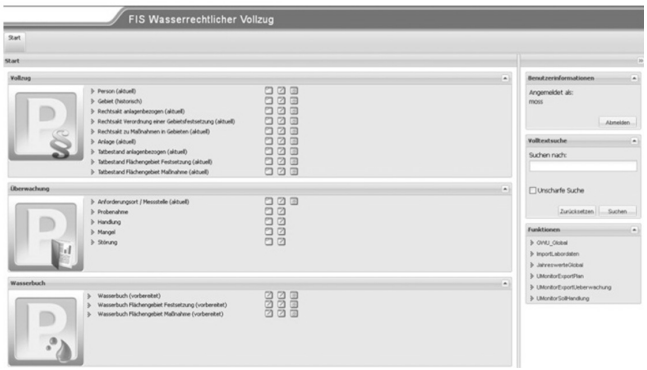

Fig. 3: Web Client of the application Water Law and Water Book

Innovations:

- creation of so called UseClasses to describe the user interface and their navigation (an addition in UML);
- automatic generation of web-services based on that UseClasses:
- implementing a complex system of the object accesses;
- historiography.

Water Framework Directive and Flood Risk Directive in Saxony

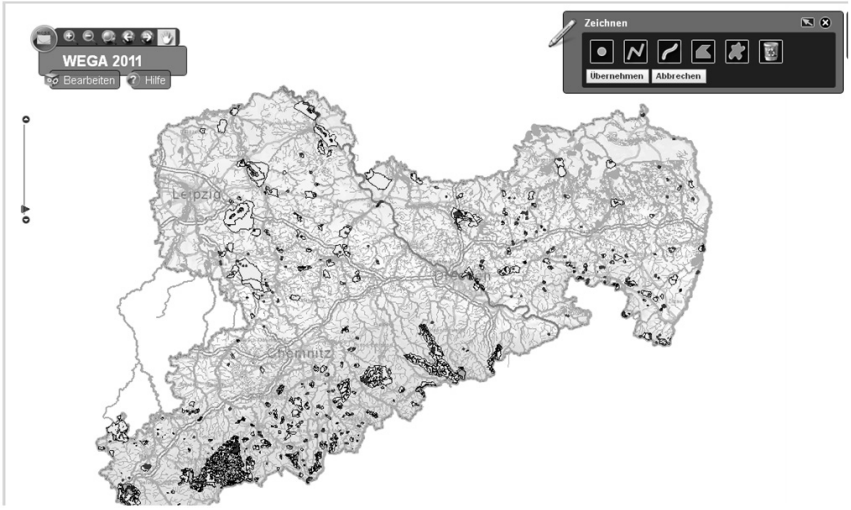

Fig. 4: Graphic Client for the representation of WFD- and FRD-objects

Innovations:

- interaction of all previous called components;
- implementing of the “routing” in the Web Client;
- data delivery for INSPIRE – Hydrography.

Management System for the observation of mining (Vattenfall)

Fig. 5: Graphic Client with mining

Innovations:

- use of all components for the industrial observation processes with:
  - real world objects;
  - management of the equipment;
  - descriptions of environmental situations;
  - data of the observations/measurements;
- interfaces to the internal processes including a “jump” from the geometry to the process management.

Summary

All components are realised in one methodological and technological solution that describes a new generation of environmental spatial data management:

- with a central frame work;
- an optional extensible data structure;
- consequently object oriented;
- scalable for the business processes;
- possibilities for the generation of any thematic applications – with automatic workflows.