

# **SDI of the Free and Hanseatic City of Hamburg and the Hamburg Metropolitan Region in the context of the Community programme eContentplus co-funded project Plan4all and in the context of INSPIRE**

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## **1 ABSTRACT**

The harmonisation of spatial planning data according to the INSPIRE Directive based on the existing best practices in EU regions and municipalities and the results of current research projects is the main focus of the eContentplus project, Plan4all. The project involves detailed description and summarising of the current situation and standards, proposal, testing and implementation of spatial planning metadata profile, common data model and harmonisation procedures. Plan4all will focus on implementation of the INSPIRE Directive into spatial planning processes, mainly based on building spatial planning data models for selected Themes and implementing recommendations of INSPIRE Drafting Teams for Metadata and Network services. The objective of Plan4all is to build a network of local, regional and national public bodies, stakeholders, ICT industry, organisations dealing with planning issues and regional development, universities and international organisations to find consensus about harmonisation of Spatial Data Infrastructure (SDI) for spatial planning according to the INSPIRE Directive and also to contribute to standardisation of related Spatial Data Themes from the INSPIRE Annexes.

SDI of the Free and Hanseatic City of Hamburg and the Hamburg Metropolitan Region (SDI-MRH) is part of the Plan4all network. Hamburg Metropolitan Region represents the cooperation between 14 districts in Schleswig-Holstein and Lower Saxony and the Hanseatic City of Hamburg. SDI-MRH brings datasets from the three federal states Hamburg, Lower Saxony (partly) and Schleswig Holstein (partly) together in one map client. The project mainly focuses on comprehensive regional planning at federal state and county level, urban land-use planning, protected sites, tourism, education and commercial areas related datasets. Datasets from different servers are shown together in one web mapping application. Data layout and data classification are harmonised so that datasets become comparable (e.g. harmonisation of spatial planning based on XPlanung data models and data-exchange format (XPlanGML)).

## **2 SDI IN GERMANY**

### **2.1 INSPIRE**

INSPIRE is a Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing the Infrastructure for Spatial Information in the European Community. INSPIRE addresses mainly such policy and activities that have direct or indirect impact on environment. There are also implications and overlap with other activities, policies and initiatives with complementary objectives. Infrastructure for spatial information means metadata supply, supply of spatial data sets and spatial data services made available on network services and technologies. The INSPIRE Directive applies to spatial data sets and services held by or on behalf of public authorities and used in conformance of their public tasks. Data must be in electronic format and must relate to one or more of the themes listed in Annexes I; II or III of the INSPIRE Directive. The INSPIRE Directive does not require collection of new spatial data. The juridical implementation of the INSPIRE directive in Germany means – by reason of the federal structure - a juridical implementation at level of the federal republic as well as within 16 federal states. The law about the access to digital geodata (Geodatenzugangsgesetz – GeoZG) at level of the federal republic came into force already on the 13th of February 2009, since 30.12.2009 the Free and Hanseatic City of Hamburg has the legal mandate for transposition of the INSPIRE directive by adopting a law about geospatial data infrastructure.

### **2.2 SDI in Germany**

The structure of government in Germany has three distinct levels, including some 14,000 local authorities, 16 states, and the federal government, all of which are generators and holders of public information. This

structure has an influence on the development of the German SDI. The national SDI in Germany (SDI-DE) is a public infrastructure coordinated by a common steering committee (LG SDI-DE) comprising members from the federal government, the federal states and the communal head associations. In Germany, each of the 16 federal states is responsible for its own topographic and cadastral service, environmental and statistical data collection, and in general for data policies. The federal states of the Federal Republic of Germany have already implemented or are in the process of implementing geoportals featuring a wide range of commonly used services. The GeoPortal.Bund (<http://www.geoportal.bund.de>) will be functioning as a central point of entry for GI in Germany, provided by the German Federal administration. It will be linked to the geoportals of the federal states, as well as to thematic databases and services. It shall also provide facilities for publishing data and metadata, and act as a node of the INSPIRE infrastructure. In 2004, the Geodatenkatalog was established as a part of GeoPortal.Bund. It is an online metainformation broker and central entrance point to the metadata catalogues of the emerging German NSDI. As an interdisciplinary search engine on distributed metadata Geodatenkatalog can be the main interface for the enquiry of core thematic metadata in Germany. Geodatenkatalog has also access to all UDK catalogues (Environmental Data Catalogues) in Germany via PortalU® catalogue interface (<http://www.portalU.de>).

In 2007 the guidelines for the implementation of SDI-DE Architecture V 1.0 were published (V 2.0 is actually in discussion). The document is available for the public ([www.gdi-de.org](http://www.gdi-de.org)). It describes goals, preconditions, technical issues and a roadmap (masterplan) for establishing the GDI-DE. It is seen as the common guideline for all public institutions dealing and using geoinformation. Technically it follows the service orientated architecture and describes in details the key necessary components like discovery-, view- and download-Services. The guidelines identify three groups of functionalities depending on the level of maturity of available specifications and products, with varying levels of obligation for public administrations: GDI-DE Essential, GDI-DE Optional, and GDI-DE Future (JRC 2009).

### 2.3 SDI on regional level

Beneath international SDI initiatives like the Infrastructure for Spatial Information in Europe (INSPIRE) or national initiatives like the spatial data infrastructure Germany (SDI-DE) Hamburg works directly on SDIs on the regional level like the spatial data infrastructure of the Metropolitan Region Hamburg (SDI-MRH). Through cross border projects like the SDI-MRH there is an intensive exchange with Hamburgs neighbouring federal states for bringing their SDIs together. In the dynamic growth regions of Europe, national borders are rapidly losing their significance.



Fig. 1: Hamburg Metropolitan Region

Those who want to assert themselves internationally in the globalized age need to think and act on a grander scale. The metropolitan regions in Germany are the eleven largest and most densely populated areas in the Federal Republic of Germany. They comprise the major German cities and their surrounding metropolitan areas and form the political, commercial and cultural centers of the country. The Hamburg Metropolitan Region is the compilation of 8 districts in the German federal state of Lower Saxony, 6 districts in the federal state of Schleswig-Holstein and the city-state of Hamburg in northern Germany. This area covers an area of

ca 19000 km<sup>2</sup> with more than 800 cities, towns or municipalities and is home to 4,266 million inhabitants. (MRH)

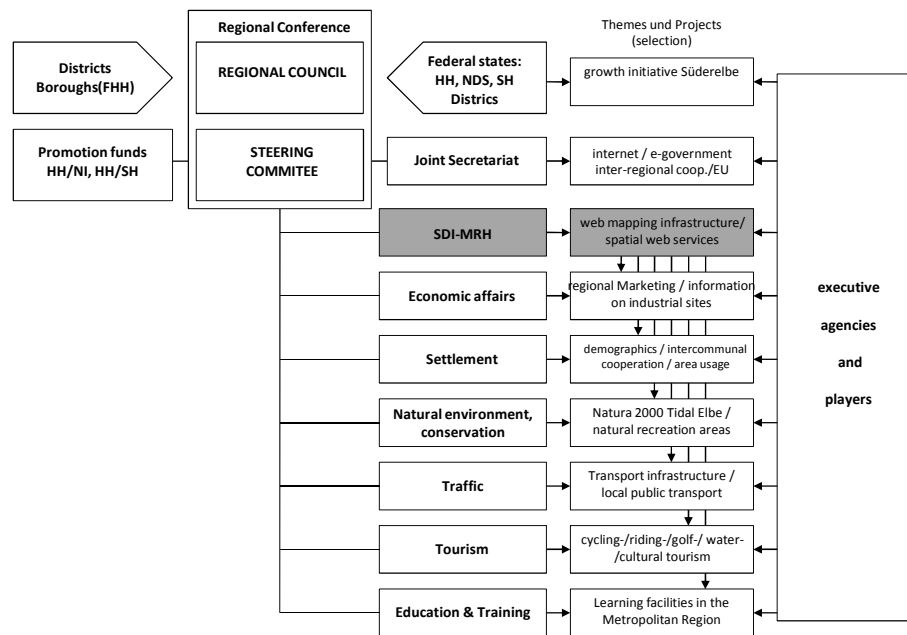


Fig. 2: Organization of regional cooperation in the Hamburg Metropolitan Region

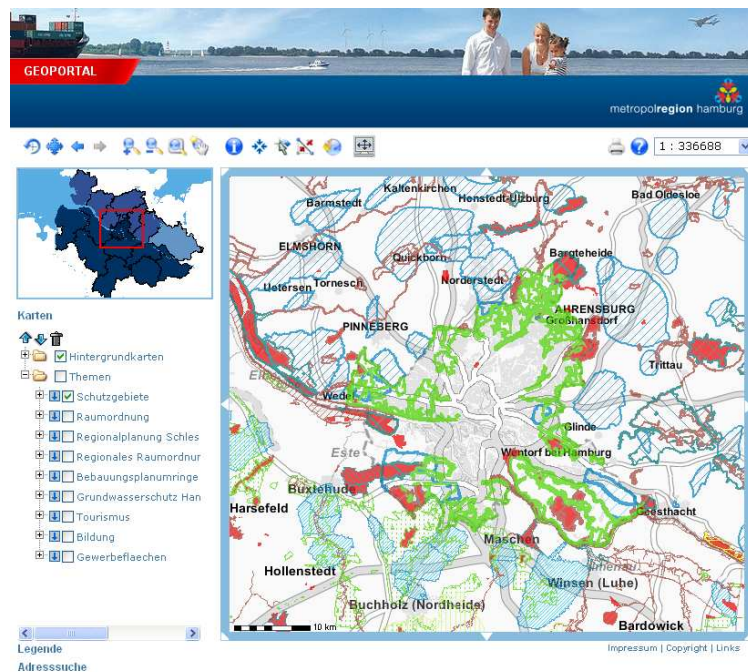


Fig. 3: SDI-MRH Web Map Client visualizing protected sites in the Hamburg Metropolitan Region

Spatial information does not end at state borders. Therefore neighbouring states are co-operating with Hamburg in establishing and running a WebGIS to offer spatial data and services to the public and the private sector for the metropolitan area of Hamburg. The Portal of the Spatial Data Infrastructure of the Hamburg Metropolitan Region (SDI-MRH) should realize the uniform access to basic and specific spatial data over federal state borders for the three states Hamburg, Schleswig-Holstein and Lower Saxony (<http://www.geoportal.metropolregion.hamburg.de>). SDI-MRH mainly focuses on making available comprehensive regional planning at federal state and county level, urban land-use planning, protected sites, tourism, education and commercial areas related datasets. Datasets from different servers are shown together

in one web mapping application. The work on this WebGIS differs in a technical and a content regarding part. The technical part (based on SDI-DE Architecture V 1.0) of the realisation includes the definition of standards for web services and the definition of functionalities of the WebGIS. The implementation of functionalities and the administration of the WebGIS is made by the State Enterprise Geoinformation and Surveying of the Free and Hanseatic City of Hamburg (LGV). The technical working group in this SDI project has written a system of rules for all participants who want to take a part with their spatial data. The content regarding part includes the definition of themes and on the semantic and visual harmonization of spatial data from different federal states. It is additionally required to define uniform styles and legends for the specific data types: e.g. the color and the attributes of nature protection areas. Therefore working groups with members from three different federal states on different administrative levels discuss and develop styling rules in a time-consuming process for the different themes visualized in the portal (e.g. styling rules for visualizing protected sites).

To visualize one theme from three different state servers as one is it necessary to cascade the web map services. The LGV administers not only the WebGIS, it also merges a multiplicity of WMS from the three states to build uniform datasets for the user.

Alongside the visualization there is the informational part. To show all information of the different WMS in a uniform way is it necessary to transport the WMS GetFeatureInfo-Request through the cascade. This is often a difficult concern because of the heterogeneous GetFeatureInfo-Result formats of the different WMS software. LGV realised it by using XSLT, which is a language for transforming XML documents into other XML documents. Incoming GetFeatureInfo results in XML from different WMS are parsed through a specific XSLT document and transformed into a standard GML and HTML result. The Portal of the Spatial Data Infrastructure of the Metropolitan Area of Hamburg shows how a uniform visualization over state and administration border could be realized in a SDI. It also shows that this process is accompanied by a lot of organisational and communicational work (Tegtmeyer 2009).

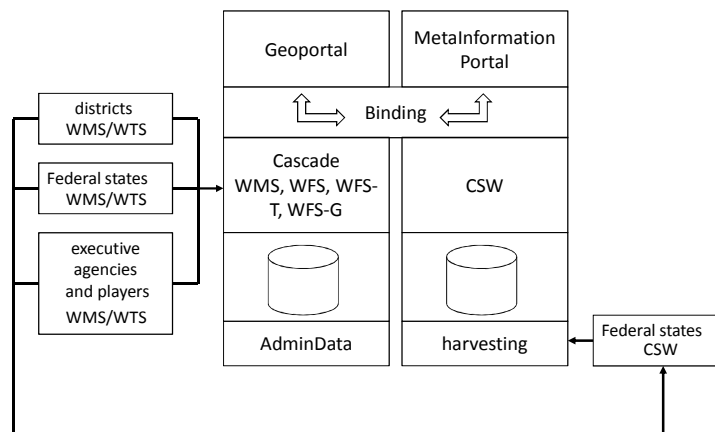


Fig. 4: technical infrastructure SDI-MRH

### 3 SDI FOR SPATIAL PLANNING

For the exchange of digital planning data between actors involved in planning processes, as well as for the internet-based visualisation of planning data to potential users, a digital harmonised data exchange format is needed. This data exchange format must be able to represent every possible spatial plan without loss of information. Existing exchange CAD formats like Autodesk DWG / DXF cannot be used for this purpose, because they mainly describe the graphical representation, and not the semantically content of a plan. A semantically data model, describing the geometrical and logical content of a spatial plan independent from its graphical representation and an object oriented data exchange format supporting this model are missing. For this reason a semantic data model (XPlanung) and a neutral exchange format (XPlanGML) for urban

planning data is developed since 2003 in Germany. XPlanung (<http://www.xplanung.de>) belongs to Germany's national eGovernment strategy pursued by the federal government, federal-state governments and municipal administrations "Deutschland-Online". XPlanung is part of the "Deutschland-Online Project Geographic Data". Lead management for this project has the federal state of North-Rhine Westphalia (GEObasis.nrw). LGV and SDI-MRH are involved since 2003 in the development of XPlanung. XPlanung is also part of SDI-DE.

The central goals of XPlanung are:

- lossless data exchange between the actors involved in planning processes,
- standardised data exchange format for horizontal (intermunicipal) and vertical (planner – municipality – county – federal state) process of coordination of planning,
- support electronically assisted proceeding on the granting of planning permission,
- standardised data format for e-participation platforms,
- semantic description of planning data as a basis for the establishment of services (query, monitoring, reporting) and visualisation in different software applications,
- central storage of urban land-use plans / other plans of special urban planning legislation (e.g. formally designated redevelopment area) in a uniform semantic structure as a data base for different software applications and information systems.

The developed standard XPlanGML relies on the international standard GML 3. XPlanGML formalizes all legal regulations relevant for urban planning. Corresponding to German planning law XPlanung standardised data models and data-exchange format (XPlanGML) for:

- comprehensive regional planning at federal, federal state and county level (based on framework law "Federal Spatial Planning Act"),
- preparatory land-use plan, binding land-use plan, project and infrastructure plan (based on "Federal Building Code")
- landscape programmes, landscape master plans, landscape plans (based on framework law "Federal Nature Conservation Act").

The standard XPlanGML represents the planned urban development from a juridical point of view. XPlanGML objects have a two dimensional geometrical representation. The XPlanGML objects and their corresponding attributes represent legal restrictions and regulations. Restrictions may be formulated geometrically (e.g. specification of the area where buildings are allowed or forbidden) and / or attributive (e.g. specification of a maximal height, number of storeys or occupancy index of a building). If a specific regulation cannot be formalized by a set of attributes, an integration into the XPlanGML data model as free text is possible. Optionally, this text can be related to specific parts of the planning area. The use of XPlanGML for exchanging spatial data is just a recommendation, using XPlanGML is not regulated by law.

Spatial planning is addressed by INSPIRE spatial data theme No. 4 "Land use": Territory characterized according to its current and future planned functional dimension or socio-economic purpose (e.g. residential, industrial, commercial, agricultural, forestry, recreational). Additionally almost all the spatial data themes listed in the INSPIRE Annexes are valuable for spatial planning. XPlanGML is appointed as reference material for INSPIRE data specification for the Annex III theme "Land use" and for the by the eContentplus programme of the European Commission co-financed European project Plan4all.

The main aim of Plan4all is the harmonisation of spatial planning data according to the INSPIRE Directive. The project is based on the existing best practices in EU regions and municipalities and the results of current research projects in this area. The expected results are European forums for SDI (Spatial Data Infrastructure) in spatial planning, a database of best practices and analysis of best practices in terms of organisation, sharing, harmonisation and SDI building recommendations for spatial planning. SDI of the Free and Hanseatic City of Hamburg and the Hamburg Metropolitan Region (SDI-MRH) are part of the Plan4all network.

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