



# Spatial Data Infrastructures in Germany: State of play 2010



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## Change matrix 2010 versus 2007

A concise graph is added to indicate changes of the various paragraphs compared to the previous report. Two colours are used: Green and Yellow indicating major and minimum changes respectively compared with the 2007 State of Play. This graph does not reflect the country situation. Merely it represents our findings/changes per section on our preparation of the desktop analysis



## Executive Summary

This report is summarizing the review of SDI in Germany, and reflects the degree to which the SDI situation in Germany is similar to the ideas set out in the INSPIRE position papers<sup>1</sup> and in the more recent INSPIRE scoping documents.

The structure of government in Germany has three distinct levels of public authority: local, regional and national, 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 (GDI-DE) is a public infrastructure being coordinated by a common steering committee (LG GDI-DE) comprising members from the federal government, the federal states and the communal head associations. The organisation structure of GDI-DE is completed by the GIW-Kommission (Commission for Geo-Information Business), which can be seen as consulting body inside the development of SDI in Germany. In September 2007 the architectural baseline for the German National Spatial Data Infrastructure (GDI-DE) was adopted and presented to the public. The architecture has been conceived to be technically open and defines the most important rules to be applied in order to ensure the interoperability of GDI-DE's constituent components. It is based on an analysis of already existing German SDI initiatives on both state and federal level and of INSPIRE. It is rooted on ISO and OGC specifications.

Considering typical use cases within GDI-DE, technological requirements were identified that the architecture has to fulfil. The focus was set on implementation specifications that are relevant to geoinformation (particularly those laid down by ISO and OGC), as well as legal frameworks, E-Government requirements and commercially available product solutions. The specifications were categorized according to their level of maturity into three groups of varying levels of obligation:

1. GDI-DE Essential
2. GDI-DE Optional
3. GDI-DE Future

In March 2010 the 2<sup>nd</sup> (beta) version of the GDI-DE architecture was published online and includes the developments since 2007.

The GeoPortal.Bund (<http://www.geoportal.bund.de>) is functioning as a central point of entry for GI in Germany, provided by the German Federal administration. It is linked to the geoportals of the federal states, as well as to thematic databases and services. The Federal Agency for Cartography and Geodesy (BKG) is responsible for the development and operation of the [GeoPortal.Bund](http://www.geoportal.bund.de). BKG cooperates closely with the Bund and Länder administrations concerning management and further extension. The GeoPortal is the central information and communication platform for the joint establishment of the GeoData Infrastructure of the Federal Government, the Länder and the Municipal Umbrella Associations. It also provides facilities for publishing data and metadata. With regard to the planned EU (INSPIRE)-geoportal the GeoPortal.Bund will be able to form a node with this.

Since the release of the GeoPortal.Bund in October 2005 the geodata search engine GeoMIS.Bund ([Ordinary Search, Extended Search](#)) has been integrated into a new

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<sup>1</sup> INSPIRE position papers, final versions: RDM, ETC, DPLI, ASF, IST, IAS (latest version).

technical platform, which allows visualization of data from different public institutions. This way, users can view geodata found on interactive maps and combine them as desired ([Baseviewer](#), [Expertviewer](#)). Geodatenkatalog as a part of GeoPortal.Bund was established as an online metainformation broker and central entrance point to the metadata catalogues. As an interdisciplinary search engine on distributed metadata Geodatenkatalog is 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<sup>®</sup> catalogue interface (<http://www.portalU.de>).

The AdV (Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder der Bundesrepublik Deutschland, that is the Working Committee of the Surveying Authorities of the federal states of the Federal Republic of Germany) (<http://www.adv-online.de>) provides common documentation of the reference data available as well as a pricing and data collection policy. The information system ATKIS<sup>®</sup> (Authoritative Topographic-Cartographic Information System) ([www.atkis.de](http://www.atkis.de)) as the central service of the German national survey is a major common project by the 16 federal state surveying authorities and the BKG. The product line comprises digital landscape models (DLM), including digital terrain models (DGM), and the digital topographic map series 1:25,000 to 1:1,000,000 as well as related metadata.

The Geodatenzugangsgesetz which implements INSPIRE for the federal level was published in 2008 and entered into force in February 2009. The Act creates a legal framework to access spatial data, spatial data services and metadata from the federal geodata holders, primarily aimed at environmental protection. The laws of the Länder are very alike the federal law, based on a common strategy for the transposition and a common template for the law that was agreed on by all Länder and the federal state. Nine Länder have already adopted their legislation, with the other seven to follow in 2010.

## Table of Contents

<b>CHANGE MATRIX 2010 VERSUS 2007 .....</b>	<b>4</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>5</b>
<b>TABLE OF CONTENTS .....</b>	<b>7</b>
<b>ABBREVIATIONS AND ACRONYMS.....</b>	<b>8</b>
<b>1           GENERAL INFORMATION .....</b>	<b>10</b>
1.1      METHOD.....	10
1.2      OVERVIEW OF SELECTED SDI-INITIATIVES.....	10
<b>2           DETAILS OF THE GERMAN NSDI: GDI-DE® .....</b>	<b>14</b>
2.1      GENERAL INFORMATION .....	14
2.2      COMPONENT 1: COORDINATION AND ORGANIZATIONAL ISSUES.....	16
2.3      COMPONENT 2: LEGAL FRAMEWORK AND FUNDING.....	23
2.4      COMPONENT 3: DATA FOR THEMES OF THE INSPIRE ANNEXES.....	28
2.5      COMPONENT 4: METADATA .....	36
2.6      COMPONENT 5: NETWORK SERVICES .....	37
2.7      COMPONENT 6: THEMATIC ENVIRONMENTAL DATA .....	41
2.8      STANDARDS .....	43
2.9      USE AND EFFICIENCY OF SDI .....	48
<b>3           ANNEXES .....</b>	<b>49</b>
3.1      LIST OF SDI ADDRESSES / CONTACTS FOR GERMANY.....	49
3.2      LIST OF REFERENCES FOR GERMANY .....	51

## Abbreviations and acronyms

AdV	Working Committee of the Surveying Authorities of the States
AFIS	Amtliche Festpunktinformationssystem
AGeoBW	Amt für Geoinformationswesen der Bundeswehr
AG IMAGI	Arbeitsgruppe des IMAGI
ALB	Automated Real Estate Book
ALK	Automated Real Estate Map
ALKIS	Authoritative Real Estate Cadastral Information System
ATKIS	Authoritative Topographic-Cartographic Information System
AUC	Atmospheric User Centre
BfN	Federal Agency for Nature Conservation
BKG	Federal Agency for Cartography and Geodesy
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
CF-NetCDF	Climate and Forecast Metadata Convention - Network Common Data Form
CRS	Coordinate Reference System
DDGI	German Umbrella Organisation for GI
DFD	German Remote Sensing Data Centre
DGK	German Geodetic Commission
DGM	Digital Terrain Model
DHDN	German Main Triangle Network (Deutsches Hauptdreiecksnetz)
DLM	Digital Landscape Model
DLR	German Aerospace Centre
DOM	Digital Surface Model
DTK	Digital Topographic Map
DUDEN	German language dictionary
EOWEB	Earth Observation WEB
EU	European Union
EUROGI	European Umbrella Organisation for Geographical Information
FIR	Further Investigation Required
FOI	Freedom of Information
GDI-DE	National Spatial Data Infrastructure for Germany
GeoTIFF	Geo Tagged Image File Format
GeoZG	German Law for Geo Data Access (Draft)
GI	Geographical Information
GIS	Geographical Information System
GIW-Komm.	Commission for Geo Business
GKSt.	Office of the Steering Committee of the National Spatial Data Infrastructure for Germany
GML	Geography Markup Language
GPS	Global Positioning System



HDF-EOS	Hierarchical Data Format - Earth Observing System
IFG	German Law for free access to public information
IMAGI	Inter-Ministerial Committee for Geo Information
INSPIRE	Infrastructure for Spatial Information in Europe
ISO	International Organization for Standardization
ITF	INSPIRE Task Force
IWG	German law for reuse of public sector information
LG GDI-DE	Steering Committee of the National Spatial Data Infrastructure for Germany
ML	Model Language
MoE	Ministry of Environment
NIA	No Information Available
NGDB	National geodatabase
NITF	National Imagery Transmission Format
NRW	North Rhine Westphalia
NSDI	National Spatial Data Infrastructures
O&M	Observations & Measurements
OGC	Open Geospatial Consortium
PortalU <sup>®</sup>	German Environmental Information Portal
PPP	Public-private partnerships
PSI	Policy and legislation on access to public sector information
SAL	Sensor Alert Service
SAML	Security Assertion Markup Language
SDI	Spatial Data Infrastructures
SES	Sensor Event Service
SLD	Styled Layer Description
SOA	Service Orientated Architecture
SOS	Sensor Observation Service
SPS	Sensor Planning Service
UBA	Federal Environmental Agency
UDK	Environmental Data Catalogue (Metadata model of PortalU <sup>®</sup> )
UIG	German Environmental Information Law
UrhG	German Copyright Act (Urheberrechtgesetz)
UTM	Universal Transverse Mercator
XACML	eXtensible Access Control Markup Language
WCS	Web Coverage Service
WFS	Web Feature Service
WMC	Web Map Context
WMS	Web Mapping Service
WNS	Web Notification Service
WTS	Web Terrain Service

# 1 GENERAL INFORMATION

## 1.1 Method

This report is summarizing the review of SDI in Germany, and reflects the degree to which the SDI situation in Germany is similar to the ideas set out in the INSPIRE position papers<sup>2</sup> and in the more recent INSPIRE scoping documents.

The 2002 report was based on the analysis of various documents, project references and web sites readily accessible in English and German. Comments from a number of German SDI-experts have been integrated in the 2003 as well as in the 2004 versions. The update of 2005 was based on input from the German experts from the BKG, IMAGI, NRW and MoE. Modifications were integrated and reviewed and completed with additional information. The update of 2006 was based on input provided by Martin Lenk (IMAGI), information obtained during a meeting of the INSPIRE Task Force in Frankfurt (August 2006) and from several presentation at the EC GI&GIS workshop in Innsbruck (June 2006<sup>3</sup>). In 2007, German authorities responsible for INSPIRE reviewed the whole report and reformulated/restructured according to the last developments. In July 2008 templates with information on services were received which was integrated in the 2007 country report, but which were not used for the assessment at the European level (see summary report). The answers on data sharing which were received at the same time were not longer integrated.

For the 2009 update the survey report was used along with the information extracted from the web and the various presentations/publications from workshops and conferences. In this version obsolete information was removed, while a conclusion paragraph regarding the status of each indicator was added for each component.

## 1.2 Overview of selected SDI-initiatives

The structure of government in Germany has three distinct levels of public authority: local, regional and national, 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 (GDI-DE) is a public infrastructure being coordinated by a common steering committee (LG GDI-DE) comprising members from the federal government, the federal states and the communal head associations. Each federal state member represents and coordinates the public services, agencies etc. of its federal state, e.g. the mapping and cadastre administration, the geological agency, the environmental agency etc. The chair of LG GDI-DE changes every two years. So a wide approval by SDI stakeholders inside the public administration is guaranteed (see also chapter 2.2).

The organisation structure of GDI-DE is completed by the GIW-Kommission (Commission for Geo-Information Business), which can be seen as consulting body inside the development of SDI in Germany. The GIW-Kommission is a body chaired by the Federal Ministry of Economies and Technology. It contains mainly members from

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<sup>2</sup> INSPIRE position papers, final versions: RDM, ETC, DPLI, ASF, IST, IAS (latest version).

<sup>3</sup> It might be useful to mention that the situation in 2008 changed because of the institutional establishment of (GDI-DE) SDI Germany. Therefore the content of the document after the update 2008 is quite different compared to versions before.

national lobby organisations. A main task of the GIW-Kommission is the removal of obstacles against an easy use of geo-data sets provided by public authorities. These obstacles are: heterogeneous licensing, rather high pricing or insufficient quality and access- and using-restrictions by data protection laws.

The coordination offices of LG GDI-DE and GIW-Kommission are cooperating in various projects.

**Surveying and mapping administration** is a task of the 16 federal states. Each of the federal states is responsible for its own topographic and cadastral service, environmental and statistical data collection, and in general for data policies. Traditionally data collection is largely decentralised and carried out mostly on the regional and local level, which means that the processing and maintenance of data is mostly tailored to local and regional requirements, which leads to a built-in incompatibility. The different federal states have issued laws (e.g. "Surveying and Cadastral Acts") that regulate the work, which the regional and local authorities are carrying out.

The surveying and mapping administrations of the 16 federal states are responsible for creating and maintaining the reference data describing real estate and the landscape. Whereas the mapping agencies of the federal states are responsible for providing large and medium scale reference data, the cadastre offices have to perform the tasks of the real estate cadastre and to support the work of the mapping agencies.

The responsible ministries and directors are collaborating in the Working Committee of the Surveying Authorities of the federal states of the Federal Republic of Germany (AdV – Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder der Bundesrepublik Deutschland – <http://www.adv-online.de>). The Federal Ministry of the Interior, and of Transport, Building and Housing and the Head of the "AGeoBW" (Amt für Geoinformationswesen der Bundeswehr) also belongs to the AdV. Permanent guests of AdV are the German Geodetic Commission (DGK), representing the universities, education and research in geodesy and geo information, and the "Bund/Länder Working Committee for Rural Development (ArgeLandentwicklung)", responsible for land consolidation and rural development in Germany.

There is an authorisation by agreements between the Federal Administration and the federal states on the production of topographic reference data (including maps). All scales larger than 1:200,000 are done by the federal states, while the equal and smaller scales are compiled by BKG (Bundesamt für Kartographie und Geodäsie), the Federal Agency for Cartography and Geodesy. The BKG supports as a competence centre for geodesy and geo information the administrations of the Federation and the federal states. It advises the Federal Government in all questions related to geodesy and geo information and it safeguards the relevant German interests at the European and international level. BKG contributes significantly to the establishment and the deployment of the German spatial data infrastructure (GDI-DE<sup>®</sup>).

The AdV provides common documentation of the reference data available as well as a pricing and data collection policy. A metadata information system ([http://www.geodatenzentrum.de/isoinfo/iso\\_rahmen.iso\\_div](http://www.geodatenzentrum.de/isoinfo/iso_rahmen.iso_div)) informs users about the availability and quality of topographic reference data. ATKIS<sup>®</sup> (Authoritative Topographic-Cartographic Information System) as a central service of the German national survey is a major common project by the 16 federal state surveying authorities and the BKG. The product line comprises digital landscape models (DLM), including

digital terrain models (DGM), and the digital topographic map series 1:25,000 to 1:1,000,000.

The **Deutscher Dachverband für Geoinformation (DDGI – German Umbrella Organisation for GI)** is an important GI-lobbying body. The DDGI (<http://www.ddgi.de>) is the forum bringing together institutional players and data providers from across the country, with members from the private sector and academia. DDGI promotes interdisciplinary German interests in the private GI sector, stimulates the construction and the application of GI on national and international level. It aims at optimizing the economical use by quality and contents' standardization and at improving the availability and usability of geo data. It is an interdisciplinary, non-profit and neutral organization. Through its initiatives it promotes synergy across the main stakeholders at federal and federal state level, and linkages to the European dimension via EUROGI.

The following table lists the national and regional SDIs available in Germany at the moment.

Table: Countrywide overview of SDI.						
Levels of SDI:	NUTS region name(s)	NUTS codes	Status <sup>4</sup>	Spatial coverage: National	Spatial coverage: Region 100%	Description available?
National						
GDI-DE <sup>®</sup>	Germany (Federation, Federal states and Municipalities)	DE	Partly operational	100%		Y
IMAGI	Germany (Federation, part of GDI-DE)	DE	Partly operational	100%		Y
Regional						
Baden-Württemberg			Partly operational	10,01%	100%	Y
Bavaria			Partly operational	19,76%	100%	Y
Berlin			Partly operational	0,25%	100%	Y
Bremen			Partly operational	0,11%	100%	Y
Brandenburg			Partly operational	8,26%	100%	Y
Hamburg			Partly operational	0,21%	100%	Y
Hessen			Partly operational	5,91%	100%	Y
Mecklenburg-Vorpommern			Partly operational	6,49%	100%	Y
Niedersachsen			Partly operational	13,34%	100%	Y

<sup>4</sup> "Status" is seen here in a technical definition, not organisational

Table: Countrywide overview of SDI.						
Levels of SDI:	NUTS region name(s)	NUTS codes	Status <sup>4</sup>	Spatial coverage: National	Spatial coverage: Region	Description available?
			Partly operational	9,55%	100%	Y
			Partly operational	5,56%	100%	Y
			Partly operational	0,72%	100%	Y
			Partly operational	5,16%	100%	Y
			Partly operational	5,73%	100%	Y
			Partly operational	4,42%	100%	Y
			Partly operational	4,53%	100%	Y

## 2 Details of the German NSDI: GDI-DE<sup>®</sup>

### 2.1 General Information

Up-to-date geo information, available all over the country, is crucial for the further development of the information and scientific society as well as for monitoring of the environmental changes and security. The German Federal Government launched activities for the provision of a spatial data infrastructure in collaboration with the federal states, universities and industry. The explicit aim is to increase cooperation between data producers and data users and to provide up to date geo data in a most common available way.

Through the joint setup of the Spatial Data Infrastructure for Germany [German designation: GDI-DE<sup>®</sup>] by the Federal Government - the federal states and the communes/municipalities, the potential of geo information is strengthened, primarily with regard to political, administrative, and economic decision-making processes. The GDI-DE<sup>®</sup> creates the prerequisites for obtaining, evaluating and applying geo information on the basis of a National Geo Database (NGDB = reference data and thematic data and metadata) with the aid of a geo information network of services and standards. This can be guaranteed by means of transparent and open data retention as well as by the construction of a user-friendly geo data portal on the Internet.

In 2007 the guideline for the implementation of GDI-DE was published: GDI-DE Architecture V 1.0. The document is available for the public ([http://www.gdi-de.org/de\\_neu/download/AK/GDI\\_ArchitekturKonzept\\_V1.pdf](http://www.gdi-de.org/de_neu/download/AK/GDI_ArchitekturKonzept_V1.pdf)). It describes goals, preconditions, technical issues and a roadmap (master plan) for establishing the GDI-DE.

In March 2010 the 2<sup>nd</sup> (beta) version was published referring on the developments occurred since 2007 and focusing on the standards used towards the implementation ([http://www.gdi-de.org/de\\_neu/download/AK/GDI-DE-Architekturkonzept-V2%28beta%29.pdf](http://www.gdi-de.org/de_neu/download/AK/GDI-DE-Architekturkonzept-V2%28beta%29.pdf)).

The Master plan is seen as the common guideline for all public institutions dealing and using geo information. Technically it follows the architecture of SOA (Service Orientated Architecture) and describes in detail the most necessary components such as Discovery-, View- and Download-Services. A geo data portal is seen as a fundamental component of the GDI-DE<sup>®</sup> and is functioning as one point of entry for Germany and international users providing a large variety of services. GDI-DE<sup>®</sup> is linked to the services and geoportals of public institutions of the Federation, federal states and the municipalities.

One step forward to provide the expanding geo data market with topographic reference data was the establishment of a Geo Data Centre (founded already in 1996) within the BKG. Currently with the GeoPortal.Bund<sup>®</sup> it is possible to obtain, evaluate and apply geo information, including thematic data, which are interoperable with the geobasic/reference data.

GDI-DE identified a number of functionalities which are supported by nationally and internationally recognized specifications and corresponding products form the essential or obligatory core of the GDI-DE architecture (Wytzisk et al., 2009). These are presented in the following table.

<b>Service type, data format, reference system</b>	<b>Specification</b>
Catalogue service	OpenGIS® catalogue service specification 2.0.2 - ISO metadata application profile, version 1.0.0
Vector data service	OpenGIS® WFS 1.0 – Web feature service implementation specification OpenGIS® WFS 1.1 – Web feature service implementation specification
Raster data service	OpenGIS® WCS 1.0 – Web coverage service implementation specification
Visualisation service	WMS-DE version 1.0 (based on WMS 1.1.1)
Gazetteer service	OpenGIS® Gazetteer service – application profile of the web feature service implementation specification 0.9.3
Coordinate reference systems	ETRS89 with the UTM 32 mapping (EPSG code: 25832) Geographic coordinates in WGS84 (EPSG code: 4326)
Metadata and metadata formats	ISO 19115:2003 – spatial data metadata ISO 19119:2005/PDAM1 Geographic Information – Services ISO/TS 19139 (RC2) – metadata – XML schema (when available)
Vector data formats	OpenGIS® geography mark-up language (GML) encoding specification 2.1.1 OpenGIS® geography mark-up language (GML) encoding specification 3.1.1)
Raster data formats	GeoTIFF (Geo-tagged image file format) HDF-EOS (Hierarchical data format – earth observing system) DTED (Digital terrain elevation data) NITF (National imagery transmission) GML3 (Geography Markup Language)

## **2.2 Component 1: Coordination and organizational issues**

Coordination activities are deemed crucial in a federal system as Germany. The institutional setup of GDI-DE began first with the establishment of the "Interministerieller Ausschuss für Geoinformationssysteme" (IMAGI – Inter-Ministerial Committee for Geo-information) by the Federal Government in 1998 as an improvement on coordination in the field of GI. The secretariat was transferred to the Bundesamt für Kartographie und Geodäsie (BKG – Federal Agency for Cartography and Geodesy). The members of IMAGI ([www.imagi.de](http://www.imagi.de)) thus are all federal ministries and IMAGI has to organize effective data collection and exchange among them on a federal level. The AdV attends the IMAGI sessions as a permanent guest.

The Federal Government addressed the following tasks to the IMAGI:

- Conception for an effective data management for spatial data on federal level
- Development and operating of a metainformation system as part of a geoportal of the Federation
- Optimizing the technical and organizational responsibilities for geo data management
- Consulting for harmonizing and optimizing administrative requirements for delivery of geo data
- Awareness rising for the use of Geo information
- International representation of Germany in the field of Geo information

Further political support came at the start of 2001 when the German Parliament, Bundestag, passed a resolution to rapidly implement the German SDI and promote the interdepartmental use of GI in the public sector. In April 2003 the German Parliament (Bundestag) debated the achievements and shortcomings, and asked the Federal Government to increase the efforts devoted to the establishment of the GDI-DE<sup>®</sup> underlining the need for coordination of the GDI-DE<sup>®</sup> activities at Federal level. In compliance with the resolution of the German Parliament, the Chiefs of the Federal and Federal states Chancelleries adopted a resolution dealing with the set-up of the GDI-DE<sup>®</sup> in November 2003. The organisational structure for the set-up of the GDI-DE<sup>®</sup> has been approved and established in 2004 (Figure 1).



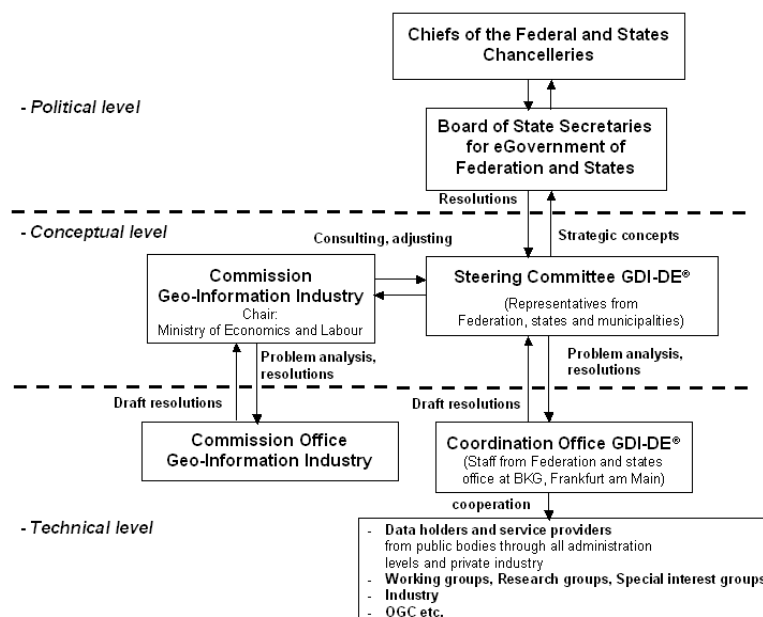


Figure 1: Organisational structure of the GDI-DE to integrate different administration levels of Federation, federal states, municipalities and the private sector

The GDI-DE structure is organised in the responsibility of eGovernment in Germany. The highest level is a working group of state-secretaries (vice-ministers) from the Federation and the federal states together with representatives from the local level. The actual measurements are decided and assigned by a Steering Committee (LG GDI-DE). Orders from the Steering Committee are carried out under the coordination of the GDI-DE office situated in BKG, Frankfurt. The staff of the office is composed by administrative officers from Federation and federal states.

#### Development of the organisational model GDI-DE since 2005:

The chair of the steering committee LG GDI-DE rotates between its members. The Federation started with the first Chair being Baden-Württemberg in January 2007. The others will follow in alphabetical order.

One of the first important measurements taken by LG GDI-DE was the passing of the GDI-DE office "Administration Agreement". The Administration Agreement was signed by the Federal Government and all federal states. It guarantees the rooms, equipment and staff plus a budget to finance its activities. At present there are up to six people working in the GDI-DE office. This includes staff of the IMAGI office from the Federal Government and staff being paid by the federal states.

Coordination is done through the SDI Steering Committee and the SDI Office. The Steering Committee represents Federation, States and Municipalities Organisation. The SDI Office is the central point in the network of SDI stakeholders and is responsible for technical advice and quality assurance. It is situated at the Federal Agency for Cartography and Geodesy and financed between Federation and States.

The GDI-DE is the coordination body towards the INSPIRE implementation, while the leading role is undertaken by the Surveying Organisations/Agencies (e.g. Federal Agency for Cartography and Geodesy within Federal Administration).

## Ongoing activities of the Steering Committee GDI-DE and its office

In September 2007 the architectural baseline for GDI-DE was adopted and published by LG GDI-DE. The so-called GDI-DE Architecture V1.0 has been conceived to be technically open and defines the most important rules to be applied in order to ensure the interoperability of GDI-DE's constituent components. It is based on an analysis of national SDI initiatives and INSPIRE. Technically it references ISO and OGC specifications. In March 2010 the 2<sup>nd</sup> (beta) version was published referring on the developments occurred since 2007 and focusing on the standards used towards the implementation ([http://www.gdi-de.org/de\\_neu/download/AK/GDI-DE-Architekturkonzept-V2%28beta%29.pdf](http://www.gdi-de.org/de_neu/download/AK/GDI-DE-Architekturkonzept-V2%28beta%29.pdf)).

The GDI-DE architecture lists and evaluates implementation specifications, which are relevant to modern geo information (particularly those laid down by ISO and OGC) considering legal frameworks and eGovernment requirements. The specifications were categorized according to their level of maturity into three groups of varying levels of obligation:

- GDI-DE Essential
- GDI-DE Optional
- GDI-DE Future

It also contains the GDI-DE Implementation Plan (figure 2), which is based on the technical concepts of the GDI-DE architecture and determines activity fields, procedures and instruments, which shall be implemented on all operational levels of GDI-DE.

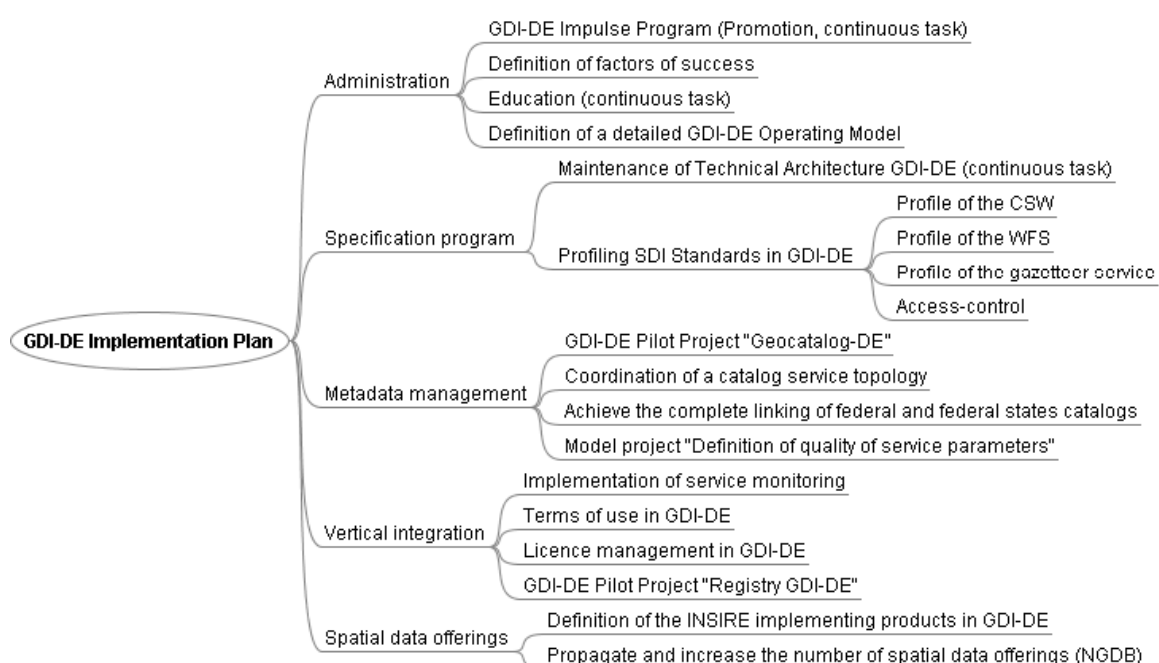


Figure 2. GDI-DE Implementation Plan

The main tasks are:

**GDI-DE Operating Model:** To cope with organizational challenges a detailed cross-administrative operating model will be established. The operating model will cover already existing and future business cases and will focus on those administrative issues which are crucial for realizing vertical integration of service offers.

**GDI-DE Specification Program:** The specification program supports the maintenance of the technical architecture GDI-DE. Future requirements either from the ongoing INSPIRE process or from sub-national SDIs will be carefully integrated without affecting recent implementations.

**Metadata Management:** To improve the network of Germany's major catalogue services and the management of its metadata a pilot project has been initiated: Geodatenkatalog-DE. The aim is to link distributed catalogue services – e.g. hosted on the federal or municipality level – in a way that distributed metadata can be quickly accessed from a single entry point. In particular interoperability and performance issues are subject of this project and different methods like harvesting, caching or cascading will be evaluated.

**Vertical Integration:** Consistent License management is an important component for cooperative data and service sharing. In addition to this, efficient data and service sharing also requires distinct keywords and related descriptions. With a GDI-DE pilot project called "Registry-DE" it is planned to setup a central registry service to manage and provide consistent SDI-information (e.g. parameters of coordinate systems, units of measure, definition of terms etc).

**Spatial Data Offerings:** In order to increase the number and quality of spatial data offerings it is planned to provide recommendations concerning the identification of key datasets in public administration in Germany. The recommendation could define key datasets by the following indicators:

- The dataset is required by public administrations to provide services according to their legal mandate.
- The dataset is of interest for a modern administration.
- The dataset is of general economic interest.
- The dataset is of research interest.

Spatial datasets, which meet at least one of these requirements, form the so-called Germany's National Geodatabase (NGDB).

**GDI-DE Impulse Program:** The Impulse Program is a promotion for GDI-DE. Public or private organizations that support GDI-DE by implementing GDI-DE compliant services or by other supporting efforts can register their contribution and sign the "Charter of GDI-DE Contributors". These partners will be promotionally effectively listed on the GDI-DE website.

Towards INSPIRE implementation a number of tasks have been completed are on hold as well as remain uncertain (Wytzisk, 2009). Specifically:

Completed:

- Adoption of Federal Law and most of the State laws.

- Implementation of SDI-Network (Organisation) including providing a budget.
- Participating on in European Drafting Process (Implementing Rules etc.).
- Creation of common architecture concept.

#### On Hold:

- Developments of technical tools for INSPIRE-Implementation, e.g. Software for conformity testing or transformation of datasets for structural-conformity. Technical Solutions for those purposes do not exist or they are not mature enough, so they have to be developed from the scratch.
- Identification of data-sets and services for Annex I. The identification process started after the adoption of the draft regulations for Interoperability of data sets for Annex I at 14th December 2010. First results will be available in May 2010.

#### Uncertainties:

- Identification of data-sets and services for Annex III. The identification has not been started yet. The start will depend on more clarity of data themes, e.g. through the drafting process for regulations for Interoperability of data sets Annex II and III.

A key instrument to coordinate the GDI-DE structure is the adjustment of GDI-DE issues in working groups. Working groups are usually formed by delegates from the public sector in cooperation with private companies. They are coordinated by the GDI-DE Office. Currently there are three active working groups:

- GDI-DE WG Architecture: The architecture working group compiled and maintains the Technical Architecture GDI-DE. Also the definition of the GDI-DE Operating Model is assigned to this group.
- GDI-DE WG Services: The services working group is analysing SDI-specification and develops national profiles if necessary
- GDI-DE WG Metadata: The working group for metadata management is run by metadata providers of the public administration as well as metadata specialists from software companies. The coordination of distributed catalogue-networks and the use of metadata standards in GDI-DE are addressed by this working group.

Another key instrument for the implementation of GDI-DE is the set up of pilot projects. Besides the already mentioned projects "Registry GDI-DE" and "Geodatenkatalog-DE" there is another important pilot project "Protected Area Sites". In this project distributed map services across several administrative areas and levels of detail have been connected to produce a joint map of protected areas over Germany. All contributing geo-resources remain distributed, but on request it is possible to compose a joint harmonised map. In a first phase the system had been exemplarily implemented by a selected number of partners in Germany. On the second phase, completed in 2008, the goal of universal provision of protected information for Germany has been largely achieved. In addition,

concepts have been, for example in the areas of presentation, common attribute information, and the use of a central registry and the provision of WFS services. The main objective for the third phase is to provide the WMS service “Protected Area Sites” in accordance to the requirements of INSPIRE.

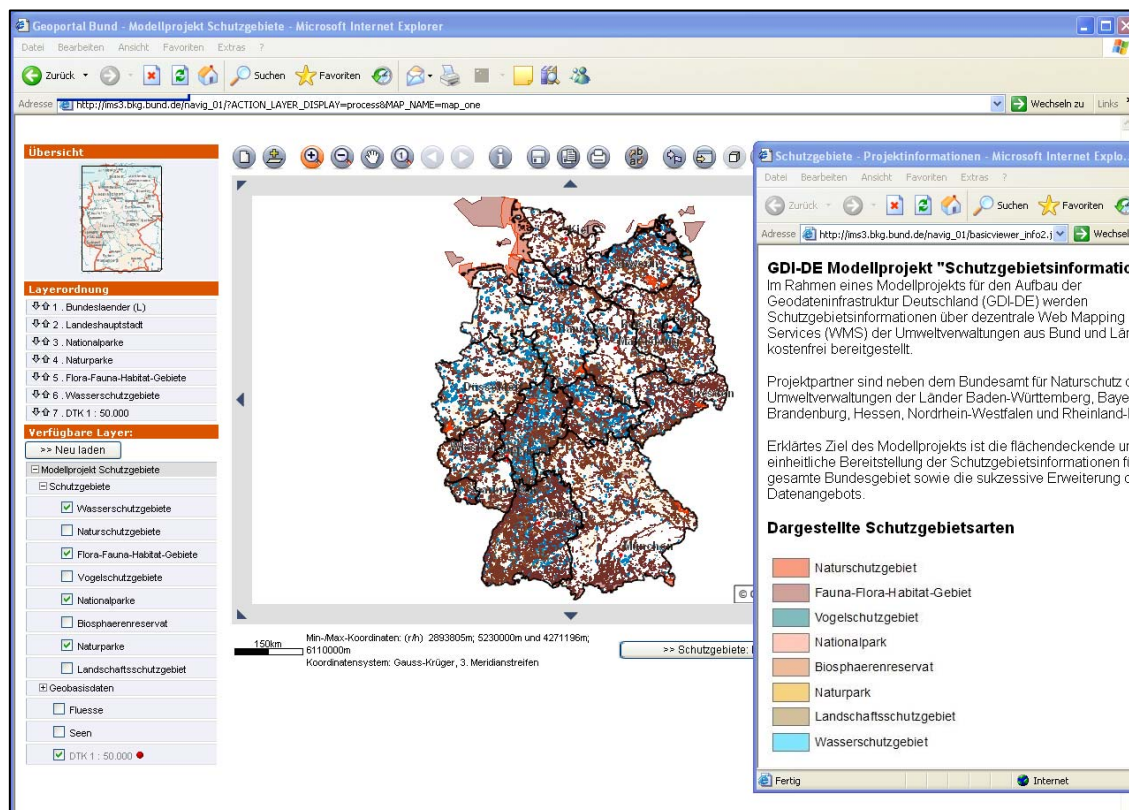


Figure 3: Cascading Web mapping Services for national wide harmonised Visualisation of Protected Areas in Germany (GDI-DE pilot project)

To co-ordinate the national activities in the framework of INSPIRE especially on a thematic level a German INSPIRE Task Force (ITF) was explicitly established, combining the political coordination of the INSPIRE-legislation and the expert knowledge of existing national structures. The ITF, chaired by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) as the responsible authority for the INSPIRE legislation on national level, comprises representatives from the LG GDI-DE, the BKG, the BfN and several Expert Working Groups, the representative of the Bundesrat (2<sup>nd</sup> chamber) for INSPIRE and a representative of the Federal Ministry of the Interior. The German drafting team experts are regularly invited to attend the ITF-meetings. The main objective of the ITF is to coordinate the INSPIRE legislation process with the establishment of the GDI-DE and to provide a national forum accompanying the development of the INSPIRE implementing rules.

### Major initiatives at the level of the Federal States

Parallel to the GDI-DE development, which is a coordinated development of the federation and the federal states with representation of the local level (municipalities), SDI developments have taken place in the federal states starting in the late 90s. These developments are now strongly related to the SDI developments of the GDI-DE.

Further information of the developments at the level of the Federal states is available in the internet:



**Baden-Württemberg**  
[www.lv-bw.de/lvshop2](http://www.lv-bw.de/lvshop2)



**Bayern**  
[www.gdi.bayern.de](http://www.gdi.bayern.de)



**Berlin**  
[www.stadtentwicklung.berlin.de/geo\\_information/projekt-gdi/](http://www.stadtentwicklung.berlin.de/geo_information/projekt-gdi/)  
<http://gdi.berlin-brandenburg.de>



**Brandenburg**  
<http://gdi.berlin-brandenburg.de>



**Bremen**  
[www.Geodaten-Management.Bremen.de](http://www.Geodaten-Management.Bremen.de)



**Hamburg**  
[www.geonord.de](http://www.geonord.de)  
[www.hmdk.de](http://www.hmdk.de)  
[www.geoinfo.hamburg.de](http://www.geoinfo.hamburg.de)  
[www.huis.hamburg.de](http://www.huis.hamburg.de)



**Hessen**  
[www.Geoportal.Hessen.de](http://www.Geoportal.Hessen.de)



**Mecklenburg-Vorpommern**  
[www.geodaten-mv.de](http://www.geodaten-mv.de)  
[www.lverma-mv.de](http://www.lverma-mv.de)



**Niedersachsen**  
[www.geodaten.niedersachsen.de](http://www.geodaten.niedersachsen.de)



**Nordrhein Westfalen**  
[www.gdi-nrw.org](http://www.gdi-nrw.org)



**Rheinland-Pfalz**  
<http://www.geoportal.rlp.de>



**Saarland**  
[www.lkvk.saarland.de](http://www.lkvk.saarland.de)  
[www.gis.saarland.de](http://www.gis.saarland.de)  
[www.umwelt.saarland.de](http://www.umwelt.saarland.de)  
[www.lua.saarland.de](http://www.lua.saarland.de)



**Sachsen**  
<http://www.gdi.sachsen.de>



**Sachsen - Anhalt**  
[www.lvermgeo.sachsen-anhalt.de](http://www.lvermgeo.sachsen-anhalt.de)



**Schleswig-Holstein**  
[www.gdi-sh.de](http://www.gdi-sh.de)  
[www.umweltdaten.landsh.de/atlas/script/index.php](http://www.umweltdaten.landsh.de/atlas/script/index.php)



**Thüringen**  
[www.thueringen.de/ikg-giz](http://www.thueringen.de/ikg-giz)

## 2.2.1 Conclusions of Component 1

The German SDI and INSPIRE approach is truly national. All Lander are involved and contribute to the NSDI. All the building blocks have reached a significant level of operationality (organisation, legal & funding, data, metadata, services, standards, and environment). To co-ordinate the national activities in the framework of INSPIRE especially on a thematic level a German INSPIRE Task Force (ITF) was explicitly established, combining the political coordination of the INSPIRE-legislation and the expert knowledge of existing national structures. A lot of interest groups, not only public sector but also research, working groups, and industry are involved, but rather from the development perspective than from the end-user perspective. The DDGI is active, but not directly involved in the coordination of the SDI (GDI-DE) Public sector users are participating in the SDI and INSPIRE.

Based on these conclusions we score the indicators as follows:

- The approach and territorial coverage of the SDI is truly national
- One or more components of the SDI have reached a significant level of operationality (6)
- The officially recognised or de facto coordinating body of the SDI is a NDP, i.e. a NMA or a comparable organisation (Not so clear)
- The officially recognised or de facto coordinating body for the SDI is an organisation controlled by data users (Not so clear)
- An organisation of the type 'national GI-association' is involved in the coordination of the SDI
- Producers and users of spatial data are participating in the SDI
- Only public sector actors are participating in the SDI (No)

## 2.3 Component 2: Legal framework and funding

### 2.3.1 Legal framework

The main legal instruments on the federal level include the federal law on access to geographic data (Gesetz über den Zugang zu digitalen Geodaten - Geodatenzugangsgesetz – GeoZG) and the Administration Agreement, signed by the federal government and all the Länder.

The Geodatenzugangsgesetz, which implements INSPIRE for the federal level, was published in 2008 and entered into force in February 2009. The Act creates a legal framework to access spatial data, spatial data services and metadata from the federal geodata holders, primarily aimed at environmental protection (M. Badowski,

Implementation of the INSPIRE-Directive in Germany and Poland – Legal Point of View).

The laws of the 16 Länder are very alike the federal law, based on a common strategy for the transposition and a common template for the law that was agreed on by all Länder and the federal state. Nine Länder have already adopted their legislation, with the other seven to follow in 2010.

### **2.3.2 Public-private partnerships (PPPs)**

Within the context of INSPIRE implementation the German SDI (GDI-DE) is opened for third parties: As long as they accept the underlying principles of GDI-DE and the regulations of GeoZG third parties may contribute their geo data and metadata using the geoportal of GDI-DE. They just have to ensure the compliance with the technical rules defined by the GeoZG, the INSPIRE implementing rules and the GDI-DE Architecture.

In that respect the work of the INSPIRE Task Force can be seen as an example of a PPP. Representatives of the government, scientific institutions and enterprises cooperate to coordinate the outcome of European and national legislation with the technical development within GDI-DE. Establishment of GDI-DE itself is done with major participation of the "Commission of Geo-Information Industry" on the conceptual level

### **2.3.3 Policy and legislation on access to public sector information (PSI)**

The Federation implemented the European Directive 2003/98/EG on PSI into national law in 2006 by adopting the "Informationsweiterverwendungsgesetz" (IWG – reuse of public sector information). The IWG regulates the Federal as well as the Federal state and municipal administrative level. Furthermore the Federation in September 2005 adopted the "Informationsfreiheitsgesetz" (IFG – free access to public information)", granting each person an unconditional right to access official federal information.

'Freedom of information laws' have been adopted at the regional level by some of the Länder. In Brandenburg the right to freedom of information was explicitly laid down in legislation (constitution) in 1998. It relates to the right of all citizens to access public records held by state authorities, districts and cities, unless public or private interests prevail. Berlin, Schleswig-Holstein, North Rhine-Westphalia, Mecklenburg-Vorpommern, Hamburg, Bremen, Saarland and Thüringen have also recently adopted freedom of information laws. Other federal states are still preparing their FOI laws.

Directive 2003/4 on access to environmental information has been implemented by the German Environmental Information Law (Umweltinformationsgesetz - UIG), which passed the German Parliament on 22<sup>nd</sup> of December 2004. UIG defines the facilities which are affected, describes the access to environmental as well as rejection of access, active dissemination of environmental information and fees. It has entered into force on 14 February 2005. The main instrument to support access to environmental information is the German Environmental Information Portal, PortalU<sup>®</sup>



### 2.3.4 Legal protection of GI by intellectual property rights

In Germany the national legislator is competent to issue copyright regulation and other intellectual property laws. The federal states are not allowed to issue state laws that contradict national laws.

The German Copyright Act (Urheberrechtgesetz – UrhG) explicitly states that works of literature, science or art have to be original to enjoy copyright protection. Since products of geographical information are functional, their level of originality tends to be rather low. Works with a low level of originality such as geographic maps, tables and so on enjoy copyright protection if some creativity has come into play, for instance in the generalisation process that is inherent in map production, or in the selection and arrangement of data. However, if the level of originality is low, protection granted is similarly low.

Photographic works that are original are covered by common copyright. The German Copyright Act however has a special clause that gives the creator of a non-original photograph a right to resist duplication (art. 72 UrhG). The Directives 96/9/EC on the legal protection of databases and 91/250/EC on the legal protection of computer programs have been fully integrated in German Copyright Act.

According to article 5 of the Copyright Act, government information is not subject to copyright. Government information is divided into two categories. One category encompasses laws, decrees and so on (article 5(1)), whereas another category deals with official works published in the official interest for public information (article 5(2)). Interpretation of this last article is however very strict since – according to the Supreme Court – it only applies to information that is meant to be made generally available and copied.

The different federal states laws that regulate the work of the surveying and mapping authorities contain clauses that regulate the use of information collected or produced by them.

The 2001 Directive on copyright in the information society was transposed by the *Gesetz zur Regelung des Urheberrechts in der Informationsgesellschaft* of 10 September 2003.

### 2.3.5 Restricted access to GI further to the legal protection of privacy

Protection of privacy has a long tradition in Germany and is considered tantamount to a human right. Hence privacy and personal data laws in Germany are generally very restrictive. Spatial datasets that contain information on individuals are in principle subject to the German laws on the protection of privacy. To ensure protection of privacy when implementing the INSPIRE-Directive, the Federal commissioner for data protection was involved when drafting GeoZG.

The Federal Data Protection Act of 20 December 1990 (Bundesdatenschutzgesetz) – as already amended by the law of 14 September 1994 – was later amended by the Federal Data Protection Act of 18 May 2001. This latest act implements Directive 95/46/EC and came into force on 23 May 2001. The Federal Data Protection Act applies to the federal public sector and the private sector. All federal states (except Sachsen and Bremen) adopted new Data Protection Laws to implement the EU Directive. These acts apply to the public sector of the respective federal states.

A particularity of German data protection law lies in the fact that in addition to the above Federal Data Protection Act there are numerous sector-specific provisions. All these rules are granting the data subject a variety of possibilities aiming at the respect of his individual data protection rights. The use of (public) geodata is also restricted by the cadastral laws at the federal state level.

Directive 2002/58 on privacy and electronic communication has been transposed in German law.

### **2.3.6 Licensing framework**

Each German authority or agency currently defines its own data policy on a case-by-case basis under the direction of the appropriate Minister. The GDI-DE Steering Committee, GIW-Commission, IMAGI, DDGI and AdV are all – directly or indirectly – working towards the development of a harmonised and simplified licensing framework for GI.

A framework to get comparable prices for geo data was adopted by IMAGI in 2006, (see 2.3.7). One of the tasks of AdV is also to deliberate on the costs. These bodies thus have a mission in developing a pricing policy for GI.

A good example for simplifying licensing processes is the contract between the Federal states and the Federal Ministry for Interior to provide reference datasets from the federal states to the Federal Administration. It regulates an annual all-inclusive payment from federation to the federal states, which enables the BKG to provide all topographic data sets and services to Federal Agencies for free.

In order to further coordinate and simplify the licensing policies for geographic data, the GDI-DE is currently working on licensing templates for spatial data sets and services, aiming at the gradual harmonisation of licences. The provision of licences via standardised web services is in preparation.

### **2.3.7 Funding model for SDI and pricing policy**

#### **Funding model**

Funding the public SDI coordination differs between the Federal states themselves and in comparison to the Federation. Most organisation and funding models are based on the existence of managing SDI Offices being situated inside mapping agencies.

The GDI-DE Office at the BKG in Frankfurt is funded through an "Administration Agreement" (see 2.2).

#### **Pricing Policy**

In Germany users of public geo data have to pay for most of the spatial data. Official core data (reference and thematic data) that are supplied by the surveying, mapping, cadastral and other departmental administrations are made available at the costs of economic value and dissemination. Variations do exist in the pricing policies of the different public authorities.

The costs for reference data are determined by the AdV. Responsibility for data policies and pricing guidelines rests with the federal states. There is a clear understanding among

them that the GDI-DE® is a public infrastructure and that policies for access to the core data should hence be developed consistent with this vision.

In 2006 the IMAGI adopted a common "template of terms of use for delivery and service of Geo information from the Federal administration". The IMAGI approved the use of the template inside all affected Federal institutions. The document provides 3 categories for pricing rules:

1. a certain set of general free information for non-commercial use will be distributed via the web,
2. standard products will be available to the user at fixed reasonable prices and
3. special services – if requested by the user – will be charged according to full cost recovery.

### 2.3.8 Conclusions of Component 2

The Geodatenzugangsgesetz, which implements INSPIRE for the federal level, was published in 2008 and entered into force in February 2009. The Act creates a legal framework to access spatial data, spatial data services and metadata from the federal geodata holders, primarily aimed at environmental protection. Within the context of INSPIRE implementation the German SDI (GDI-DE) is opened for third parties. There is also a GDI-DE Architecture. The different federal states laws that regulate the work of the surveying and mapping authorities contain clauses that regulate the use of information collected or produced by them. Spatial datasets that contain information on individuals are in principle subject to the German laws on the protection of privacy. The GDI-DE Steering Committee, GIW-Commission, IMAGI, DDGI and AdV are all – directly or indirectly – working towards the development of a harmonised and simplified licensing framework for GI. In order to further coordinate and simplify the licensing policies for geographic data, the GDI-DE is currently working on licensing templates for spatial data sets and services, aiming at the gradual harmonisation of licences. The provision of licences via standardised web services is in preparation. The GDI-DE Office at the BKG in Frankfurt is funded through an "Administration Agreement". The costs for reference data are determined by the AdV. Responsibility for data policies and pricing guidelines rests with the federal states.

Based on these conclusions we score the indicators as follows:

- There is a legal instrument or framework determining the SDI-strategy or – development
- There are true PPP's or other co-financing mechanisms between public and private sector bodies with respect to the development and operation of the SDI-related projects (Not so clear)
- There is a freedom of information (FOI) act which contains specific FOI legislation for the GI-sector (Not so clear)

- GI can specifically be protected by copyright
- Privacy laws are actively being taken into account by the holders of GI
- There is a framework or policy for sharing GI between public institutions
- There are simplified and standardised licences for personal use (In Preparation)
- The long-term financial security of the SDI-initiative is secured
- There is a pricing framework for trading, using and/or commercialising GI (In Preparation)

## **2.4 Component 3: Data for themes of the INSPIRE annexes**

Since 2005 the AG IMAGI, the expert group of the IMAGI has been developing an explicit definition for the National Geo Database (NGDB). The NGDB includes all relevant public geo datasets for legal tasks as well as for the support of good governance and also considers the demand of Sciences and German Economy. Furthermore, the AG IMAGI is developing a list of available geo products, which are seen as a part of the NGDB. The result of this activity is available in GeoPortal.Bund since 2007 (<http://geoportal.bkg.bund.de/>). The concept of the NGDB is also described in the GDI-DE architecture V1.0.

Regarding the three INSPIRE annexes addressing the 34 spatial data themes, the INSPIRE Monitoring report is available at: ([http://productive.gdi-de.org/monitoring/monitoring\\_2009\\_GDI-DE.xml](http://productive.gdi-de.org/monitoring/monitoring_2009_GDI-DE.xml)).

Germany lists 635 reported spatial datasets and 332 spatial services. The list is divided to sections according to the monitoring indicators, spatial datasets and spatial services. Regarding the monitor indicators, the number (also in percentage) of themes with metadata is mentioned.

As far as datasets and services are concerned, these are described in terms of

- Organisation
- Existence of metadata
- Conformity of metadata
- Relevant area [km<sup>2</sup>]
- Actual area [km<sup>2</sup>]
- Search
- View
- Download

For the services the number of access per year is also provided.

### **2.4.1 Scale and resolution: European, National, Regional, Local, Other**

Reference and core thematic data are produced at all these scale levels.

### **2.4.2 Data by resolution or scale range for the INSPIRE themes**

An overview of the available datasets is given below:

#### *Authoritative Topographic-Cartographic Information System (ATKIS):*

The product line ATKIS<sup>®</sup> (Authoritative Topographic-Cartographic Information System) includes digital landscape models, digital topographic maps and digital terrain models. All products listed here are stored and – if possible – harmonised centrally at the Geo Data Centre of the Federal Agency of Cartography and Geodesy.

#### *Digital Landscape Models (DLM)*

The DLMs describe the topographic features of the landscape and the relief of the earth's surface in vector format.

The databases contain the following six themes: settlements, transport, vegetation, hydrography, relief and other areas (e.g. islands, national parks, etc.). Each theme contains one or more data layers. The following landscape models are available:

- Basic-DLM (compiled from the scale range 1:5.000 – 1:25.000, horizontal accuracy  $\pm 3$  m)
- DLM 50 (partly ready, in responsibility of the federal states)
- DLM 250 (resolution 1:250.000,  $\pm 125$  m)
- DLM 1000 (content of 1:500.000,  $\pm 250 - 500$  m)

With the help of appropriate GIS-software, the DLM can be visualized as simple map graphics.

#### *Digital Topographic Maps (DTK)*

The following DTMs with different scales are provided by the German state survey for nationally standardised topographic description of the territory of the Federal Republic of Germany with georeferenced Digital Topographic Maps (DTM):

- Digital Topographic map 1:10 000 DTM10
- Digital Topographic map 1:25 000 DTM25
- Digital Topographic map 1:50 000 DTM50
- Digital Topographic map 1:100 000 DTM100

- Digital Topographic map 1:250 000 DTM250
- Digital Topographic map 1:1.000 000 DTM1000

Thereby, the surveying authorities of the Federal States are responsible for the DTM10/DTM25, DTM50 and DTM100 while the Federal Agency for Cartography and Geodesy (BKG) is responsible for the DTM250 and DTM1000. The DTM10 covering the needs only exists in the new Federal States.

The DTM is either:

1. new digital topographic maps which are derived in new map graphics and levels arrangement from a corresponding ATKIS-DLM and DGM and are designated as DTM (e.g. DTM25) or the
2. conventional digital topographic maps which are created by scanning analogue originals and computer supported updating and are designated as “Provisional Edition” DTM-V (e.g. DTM25-V).

With the increasing provision of the DTM, it is intended to stop supplying the DTM-V. It is possible that both types of product will be provided for a transitional period.

Digital topographic maps are provided as raster data and printed maps. The raster data are divided in different levels according to cartographic content elements and can be handed over as single-colour, single levels and as single-colour and coloured combination issue (“Single-colour Edition” and “Colour Edition”).

#### *Digital Terrain Model (DGM)*

The following digital terrain models (DTM) of different qualities are being set up in the course of the ATKIS®-project by the German state survey for the standardised description of the relief of the territory of the Federal Republic of Germany:

- Digital terrain model 2 - DTM2
- Digital terrain model 5 - DTM5
- Digital terrain model 25 - DTM25
- Digital terrain model 50 - DTM50
- Digital terrain model Germany - DTM-G
- Digital terrain model 250 - DTM250
- Digital terrain model 1000 - DTM1000

Thereby, the state surveying authorities of the Federal States are responsible for the high and medium quality digital terrain models while the Federal Agency for Cartography and Geodesy (BKG) provides the DTM250, DTM1000 and the DTM-G.

Not every Federal State has all DTMs covering the needs for the high and medium quality levels.

Digital terrain models (DTMs) are arranged in regular grids or irregularly or as lines in geocoded numbers of points for position and height which describe the landforms of the Earth's surface. Digital terrain models can also contain enhanced information (e.g. scarps, structure lines, individual geodetic points).

The ATKIS® feature type catalogue for digital terrain models (ATKIS®-OK DTM) specifies which feature types a DTM contains and how the features must be formed.

#### *Quasigeoid of the Federal Republic of Germany – SatNivGeoid*

For the territory of the Federal Republic of Germany a combined satellite-geodetic gravimetric levelling quasigeoid (*SatNivGeoid*) was derived that allows the conversion of ellipsoidal GPS heights in ETRS89 with reference to the reference ellipsoid GRS80 and levelling heights in the DHHN92 (NHN) with an accuracy of 1 cm in the plain, 2-3 cm in the highlands and 3-5 cm in the high mountains. The grid width in each model is 1'x 1,5' in geographical coordinates. The geoid can be delivered either for the whole territory of the Federal Republic of Germany or in four parts.

*Digital surface models (DOM)* are not yet provided.

For further information please refer to

[http://www.geodatenzentrum.de/geodaten/gdz\\_rahmen.gdz\\_div?gdz\\_spr=deu&gdz\\_akt\\_z\\_eile=2&gdz\\_anz\\_zeile=3&gdz\\_user\\_id=0](http://www.geodatenzentrum.de/geodaten/gdz_rahmen.gdz_div?gdz_spr=deu&gdz_akt_z_eile=2&gdz_anz_zeile=3&gdz_user_id=0)

#### *Real Estate Cadastre – ALKIS® and AAA®*

The real estate cadastre is a description of the ownership of land with geographic reference, in the public interest, neutral to the parties concerned, comprehensive, up to date and reliable.

The task of the surveying, mapping, and cadastral authorities of the federal states of Germany is to provide reference data for spatial information (Geobasis Data) for the use of official, industrial and private users. The demand for this data to be provided in digital format continues to increase and has been met at a very early stage by the authorities, which up to now record and provide the data of the real estate cadastre in the ALK (Automated Real Estate Map) and ALB (Automated Real Estate Register) and the topographic data in the ATKIS (Authoritative Topographic Cartographic Information System) in a digital, standardized manner across the whole of Germany. Geo information of official surveying and mapping also includes information on the control stations. Because these originally belong neither to ALK nor to ATKIS, they are now modelled in their own information system called Authoritative Geodetic Control Station Information System (AFIS) with a separate feature catalogue.

ALKIS® is the new Official Land Registry Information System. ALKIS® (Authoritative Real Estate Cadastre Information System) replaced the existing solutions by integrating ALK and ALB and the coordinate register in a common model. ALKIS reduced the duplication (redundancy) in collection and processing. It is based on the geographical information standards of ISO and OGC, while its core database is the database provided by all surveying authorities.

The AdV projects AFIS, ALKIS and ATKIS with their nationally standardised features are described in a common form under the heading Documentation for Modelling Geo

information of Official Surveying and Mapping. They are associated with each other in a common reference model as a common application schema for AFIS, ALKIS and ATKIS.

The **AAA ® data model** is to serve the basic data sets from ATKIS ®, ALKIS ® and AFIS ® a basic database of geographic data of the official surveying together since all the land survey data merged and converted to it (<http://www.adv-online.de/icc/extdeu/broker.jsp?uMen=0a170f15-8e71-3c01-e1f3-351ec0023010>)

Core thematic data on the national level exist partly in several federal agencies. Following an agreement of public authorities on Federal and Federal state level, the Federal Agency for Nature Conservation (Bundesamt für Naturschutz – BfN) holds surveying maps of sites for nature protection (Nature Protection Sites, Landscape Protection Sites, Biosphere Reserves, Nature Parks, National Parks). Due to weak commitments in the agreement, the underlying database of geographic information is not sufficient for further analysis.

### 2.4.3 Geodetic reference systems and projections

In 1991 the AdV (Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany) decided to introduce the future-oriented datum ETRS89 instead of the previous Gauß-Krüger system based on DHDN datum. In 1995 the AdV confirmed this decision and determined the Universal Transverse Mercator projection (UTM) as the projection system for the ETRS89 datum.

The specification based on a uniform reference and projection system for Europe followed the intention to transfer spatial reference data geometrically correct in common unique system. However, the practical transfer of geo data sets to ETRS89 with UTM was done only partly by public and private administrations. Therefore transformation services are still necessary for the combination of geo data in different Coordinate Reference Systems (CRS).

In the western part of Germany all federal states are using the same CRS based on the datum German Main Triangle Network (Deutsches Hauptdreiecksnetz, DHDN) with Gauß-Krüger projection (DE\_DHDN / GK\_3).

There is a need for appropriate transformation parameter sets to transform from DE\_DHDN / GK\_3 to geodetic datum ETRS89 with UTM projection DE\_ETRS89 / UTM. There are common agreements about these sets for the whole country. They were published in 2001 to transform in several quality levels:

- for an accuracy of the coordinates of about 3 m and
- for the Northern, Central and Southern part of the covered country area with an accuracy lower than one meter.

In the eastern part of Germany there are several official projection systems in use:

- Federal state Sachsen-Anhalt use the DE\_42/83 / GK\_3 as basis for surveying activities, topographic and base mapping, cadastral purposes



- Mecklenburg-Vorpommern and Brandenburg use DE\_ETRS89 / UTM as agreed on as the official German geodetic reference and projection system by the AdV in 1995.
- Sachsen and Thüringen have the DE\_PD/83 / GK\_3 resp. DE\_RD/83 / GK\_3 which are concrete realisations of DE\_DHDN / GK\_3 and conform to it in the meter level.

For all these coordinate systems the descriptions and the parameters for transformation into ETRS89 are available in the Information System for European Coordinate Reference Systems **CRS-EU** [http://www.crs-geo.eu/sid\\_9B33C30ED5DB4197DE922ED800ABEB81/crseu/EN/Home/homepage\\_node.html?nnn=true](http://www.crs-geo.eu/sid_9B33C30ED5DB4197DE922ED800ABEB81/crseu/EN/Home/homepage_node.html?nnn=true) (new website available since 17-June-2009). For some of the CRS an online transformation service is available at the Geodatenzentrum of BKG <http://www.geodatenzentrum.de>.

With AdV decision of 1993 the German Main Height Network (Deutsches Haupthöhennetz, DHHN92) is introduced as the official height reference system for Germany. For the DHHN92 normal heights about normal height zero (NHN) will be derived. The NHN level is identically with 1 cm with respect to the Normaal Amsterdams Peil.

The level and scale for the gravity measurements in Germany is determined by German Gravity Basic Network (Deutsches Schweregrundnetz 1994, DSGN94), which was validated by absolute gravity measurements.

The AdV has developed a technical concept in direct relation to the GeoInfoDok for the establishment of a „registry“ for coordinates systems (CRS) which aims to achieve a machine readable description of the coordinates systems used in the AAA data. Linked with this is a central provision of generally applicable coordinate's transformations for the entire territory of the Federal Republic of Germany and specified sub areas which should be performed GDI-compliant and based on services. The GDI-DE has integrated the idea of a central registry in the GDI-DE architecture concept and set up a corresponding model project „Registry“ with an associated working group. This model project focuses on the central description of coordinates systems and coordinates transformation as well as other content within a GDI suitable for registries. In close cooperation with the AdV, the GDI-DE is further developing the registry based on the software components for coordinates systems and transformations already realised as prototypes by the AdV (ADV national report 2008/2009).

#### **2.4.4 Quality of the data**

Quality of the data is dependent on the data used from the National Geo database (NGDB). It will be concretised when the INSPIRE Implementation Rules for the Annex themes are ready. AdV's innovative measures in comprehensive quality management both for the field surveys as well as for the prompt central processing ensure the high quality of the database.

### 2.4.5 Interoperability

Interoperability is dependent on the data used from the National Geo database (NGDB). It will be concretised when the INSPIRE Implementation Rules for the Annex themes are ready. Since the architecture of the GDI-DE is an open architecture, it enables the interoperable transport of data via standardized interfaces.

### 2.4.6 Language and culture

The language used at present is German.

### 2.4.7 Data Content

Data content is in conjunction with the chosen product of the National Geo Database and is subject to the responsibility of the respective ministry.

### 2.4.8 Geographical names

Geographical names are written in German according to the DUDEN language dictionary.

Spelling rules are documented in "Toponymic guidelines" (see also [http://www.stagn.de/Portals/0/020809 TOPGUIDE ZWEISPR MIT ABB.pdf](http://www.stagn.de/Portals/0/020809_TOPGUIDE_ZWEISPR_MIT_ABB.pdf)).

The geographical names included in the ATKIS work (as attributes of the features) refer, depending on the scale, in particular to the following groups of topographical features: populated places, mountains, mountain ranges, rivers, lakes, seas, bays, islands, vegetation, landscapes and special points of interest.

Furthermore, the BKG maintains two stand-alone databases of geographical names. These databases contain names of the municipalities, villages and parts of municipalities, landscapes, mountains, islands, rivers, canals, lakes, seas and others. The database GN250 follows the scale 1:250.000 and contains about 61.000 entries. The database GN1000 follows the scale 1:1.000.000 and contains about 13.000 entries.

The Federal Agency for Cartography and Geodesy (BKG) is owner, creator, administrator and distributor of these datasets. BKG is aiming at connecting the stand-alone geographical names databases with ATKIS.

### 2.4.9 Character sets

Since 2007 the UNICODE UTF-8 is used as character set.

### 2.4.10 Conclusions of Component 3

Already from the previous DE's SoP report Geodatasets existed which provide a basis for contributing to the coverage of pan-Europe for the INSPIRE-selected data themes and components while the geodetic reference system and projection systems are standardised, documented and interconvertible. The 2010 MR indicated that 635 datasets exist. The AdV has developed a technical concept in direct relation to the GeoInfoDok for the establishment of a „registry“ for coordinates systems (CRS) which aims to achieve a

machine readable description of the coordinates systems used in the AAA data. GDI-DE is further developing the registry based on the software components for coordinates systems and transformations already realised as prototypes by the AdV. Germany focus greatly on the quality of their data and attention is paid to all aspects in the QC process. Since the architecture of the GDI-DE is an open architecture, it enables the interoperable transport of data via standardized interfaces. The main language used is German and to a lesser extent English

Based on these conclusions we score the indicators as follows:

- Geodatasets exist which provide a basis for contributing to the coverage of pan-Europe for the INSPIRE-selected data themes and components
- The geodetic reference system and projection systems are standardised, documented and interconvertable
- There is a documented data quality control procedure applied at the level of the SDI
- Concern for interoperability goes beyond conversion between different data formats
- The national language is the operational language of the SDI
- English is used as secondary language

## **2.5 Component 4: Metadata**

### **2.5.1 Availability**

Consistent metadata are produced for a significant part of the reference and core thematic data. With more and more geo-services becoming available, production of service metadata has started.

### **2.5.2 Metadata catalogues availability + standard**

In 2004, the Geodatenkatalog as a part of GeoPortal.Bund was established as 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 the Geodatenkatalog can be the main interface for the enquiry of core thematic metadata in Germany.

At the present time there are fourteen distributed metadata information systems with more than 35000 datasets connected to Geodatenkatalog. They describe geodata regarding biota and environment, basic data, air, water, statistics, infrastructure, geology, farming, etc. Geodatenkatalog has access to all UDK catalogues in Germany via PortalU® catalogue interface.

The catalogue of data sources integrated in PortalU® is based on the UDK metadata model that was developed for the environmental ministries and agencies (on the federal and federal state level) in Germany and Austria. In Germany, the UDK catalogues maintained by federal and federal state environmental authorities can be accessed through the central internet portal (<http://www.portalu.de>).

The UDK metadata model complies with generic international standards (e.g. Dublin Core) and has, within the last 10 years, evolved into a de facto-standard for referencing environmental information. In 2004, the UDK metadata model was modified to be compatible with the ISO19115/19119 standards. Since then, it is used to reference core thematic data (i.e. environmental data), basic geospatial data (in some federal states), and geo-services in a fully ISO compatible format. The implementation of the metadata is based on the ISO 19139 Geographic Information - XML schema implementation.

Both Geodatenkatalog and PortalU® implement a catalogue interface that complies with the "OpenGIS® Catalogue Services Specification 2.0 - ISO19115/ISO19119 Application Profile for CSW 2.0" and since April 2008 with the "OpenGIS® Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile".

### **2.5.3 Dublin core metadata standards for GI-discovery**

see 2.5.2

### **2.5.4 Metadata implementation**

The on-line access to the metadata as well as (in part) to the original data is implemented by the German Environmental Information Portal – PortalU®. Important meta information is given by subject domain, spatial domain, temporal domain as well as name, address and other information on the data owner.

## 2.5.5 Conclusions of Component 4

Metadata are produced for a significant fraction of geodatasets of the themes of the INSPIRE annexes. In 2004, the Geodatenkatalog as a part of GeoPortal.Bund was established as 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 the Geodatenkatalog can be the main interface for the enquiry of core thematic metadata in Germany.

Based on these conclusions we score the indicators as follows:

- Metadata are produced for a significant fraction of geodatasets of the themes of the INSPIRE annexes
- One or more standardised metadata catalogues are available covering more than one data producing agency
- There is a coordinating authority for metadata implementation at the level of the SDI

## 2.6 Component 5: Network Services

Since the release of the GeoPortal.Bund in October 2005 the geodata search engine GeoMIS.Bund ([Ordinary Search](#), [Extended Search](#)) has been integrated into a new technical platform, which allows visualization of decentrally kept data from different public institutions. This way, the user can view geodata found on interactive maps and combine them as desired ([Baseviewer](#), [Expertviewer](#)).

Among others, the GeoPortal.Bund is used as platform for model projects of the common initiative of the Federal Government, the Länder and the Municipal Umbrella Organizations for the setup of the GDI-DE. Through cooperation on this broad basis the requirement is met that projects of the IMAGI are harmonized with the GDI initiatives of the Länder and municipalities as well as with running eGovernment projects (in this case BundOnline), in accordance with the principle “some for all” that ensures a coherent development between the above activities.

The geodata search includes 3 options:

- Simple search (where data search is started without additional indications.)
- Extended search (where users can refine their search by additional information on space, theme (category) and time)
- Assisted search (where the user is guided to a result by means of assistance)

At the same time the Portal offers 3 Geoviewers:

- Baseviewer (The baseviewer offers general thematic entry into the services and maps linked to the GeoPortal.Bund.)

- NGDB – National GeoDataBase (The viewer of the National GeoDataBase visualizes distributed geodata sets constituting the core of the GeoData Infrastructure Germany)
- GDI-DE Model project “Protected Area Information” (With regard to the focal theme “Protected Area Information” distributed map services of the environment administrations of the Federal Government and the Länder are bundled and provided at a uniform level.)

The Geoportal of the Federation is used for national SDI purposes. It offers a central entry points to Metadata and Services (e.g. about 35.000 Metadata Sets and more then 300 services). Further developments of the portal towards a national Geoportal status are in preparation.

### 2.6.1 On-line access service for metadata: discovery services

On the AdV website, a metadata catalogue for topographic cartographic information systems, real estate information systems and geodetic fundamentals can be accessed. AdV also provides common documentation of the geo data available and functions as an entry point for geodetic, topographic and cadastral data and the federal gazetteer of place names. Additional work is however needed for seamless search of data across themes for the country as a whole.

A list of 123 services is available at [http://141.74.33.52/ngdb-liste/produkte\\_all\\_print.aspx](http://141.74.33.52/ngdb-liste/produkte_all_print.aspx). The list provides discovery and view services of national cover datasets in various formats and scales. The main Providers are BBR, BKG, and BSH. Some of the services provide also metadata information.

The online metadata information system Geodatenkatalog has been set up by BKG to provide an internet application with web-based query tools for accessing federal information on geodata (topographic reference data as well as thematic data). Geodatenkatalog<sup>®</sup> greatly facilitates access to and use of the databases (maintained decentralized). It is a platform-independent search system and incorporates all specialist metadata information systems of the federal authorities. Geodatenkatalog<sup>®</sup> is a service available to authorities (federal administrations as well as for the federal states and communes), industry and the general public via Internet. It provides users with metadata from fourteen distributed systems and a wide thematic range.

It is an integral part of the federal geoportal [German designation: GeoPortal.Bund], which provides users with different services and information. The Geodatenkatalog and the GeoPortal.Bund are based on the ISO family of standards – especially on the ISO 19115, 19119, 19139 and OGC ["ISO 19115/ISO19119 Application Profile for CSW 2.0"](#) and ["OpenGIS<sup>®</sup> Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile"](#) standards.

Some 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. These portals are linked to the GeoPortal.Bund. With regard to the planned EU (INSPIRE)-geoportal the GeoPortal.Bund will be able to form a node with this.

In this sense the model project named "Geodatenkatalog-DE" regards and implements the requirements of INSPIRE (i.e. implementing rules on metadata and network services

(discovery services). The data of the federal states and the federation will be focused in a consistent way and topology to one central point for the delivery to the INSPIRE Portal.

For quality management reasons a conformance test was developed in the model project. This test is based on the OGC team engine and it is planned to put it to OGC. It proves if a catalogue service is alive, if the namespaces, the SOAP header are o.k., 19139 schemata and multilinguality.

For more information see "Survey for the impact assessment of the INSPIRE EU Geo-portal".

The environmental administrations in Germany agreed on the metadata model UDK, which distinguishes classes as

- Data collection/Database
- Service/Application/Information system
- Document/Report/Literature
- Geographical information/Map
- Organizational unit/Task
- Plans/Projects/Programs

### 2.6.2 On-line access service for data: download services

ATKIS (Authoritative Topographic Cartographic Information System) data can be obtained via Internet by <http://www.geodatenzentrum.de>. ATKIS is an information system initiated by the AdV, which is performed uniformly at the federal level. This information system aims at the provision – under public law – of digital models of the Earth's surface suited for data processing. It will change the existing production processes of the traditional topographic map series of the federal states of the Federal Republic. In this way ATKIS constitutes a database for computer-assisted digital processing and analogue output forms, but also a base of spatial reference for the linkage to and combination with technical geo-thematic data. Information is available in German and English.

Satellite data and their metadata can be obtained via the DLR EOWEB (Earth Observation WEB) Satellite Data Information Service, a data catalogue of the German Remote Sensing Data Centre (DFD). Thematic maps are also available. Links are provided to further map catalogue access services like: AUC (Atmospheric User Centre), World Data Centre (for atmospheric data, CEOS data catalogue/archive, Einet (data catalogue of EURIMAGE, Sirius (data catalogue SPOT Image), GLOBE (Global Elevation model of USGS), Aviso (Oceanographic data).

The on-line access for core thematic data of environmental administrations is realized by the German Environmental Information Portal PortalU<sup>®</sup> ([www.portalu.de](http://www.portalu.de)). PortalU<sup>®</sup> brings together a wide range of distributed information from a multitude of public organisations in Germany, such as environmental authorities, agencies and ministries at federation and federal state level.

### 2.6.3 Inter-linkages of on-line access services for metadata and data

See 2.5.2 Metadata catalogues availability + standard

### 2.6.4 OpenSource software and access services

The underlying modular software of the German Environmental Information Portal PortalU<sup>®</sup> InGrid<sup>®</sup> is based on standard OpenSource technologies, which were adapted to the needs of PortalU<sup>®</sup>. To store configuration information and local metadata, InGrid<sup>®</sup> relies on MySQL as RDBMS. The InGrid<sup>®</sup> search engine is based on Nutch and Lucene, and the built-in GIS utility applies the UMN Mapserver. As map viewer the OpenSource software mapbender is used and the portal surface is realised by jetspeed.

### 2.6.5 Availability of viewing services

See 2.5.2 Metadata catalogues availability + standard

### 2.6.6 Availability of catalogue services to regulate access

NIA

### 2.6.7 Availability of catalogue services that perform payment operations

NIA

### 2.6.8 Availability of catalogue services to extract and send data to a user application

NIA

### 2.6.9 SDI user applications

NIA

### 2.6.10 Availability of geo-processing services

Algorithms to convert GI between coordinate systems and to ETRS89 are available on [http://www.crs-geo.eu/crseu/EN/Home/homepage\\_node.html?\\_nnn=true](http://www.crs-geo.eu/crseu/EN/Home/homepage_node.html?_nnn=true).

### 2.6.11 Conclusions of Component 5

Germany has several discovery, viewing and download services (51, 243 and 38 respectively, according to the 2010 MR). At the same time the 2010 MR states that is 1 transformation service.

Based on these conclusions we score the indicators as follows:

- There are one or more discovery services making it possible to search for data and services through metadata



- There are one or more view services available for to visualise data from the themes of the INSPIRE annexes
- There are one ore more on-line download services enabling (parts of) copies of datasets
- There are one or more transformation services enabling spatial datasets to be transformed to achieve interoperability
- There are middleware services allowing data services to be invoked (No)

## 2.7 Component 6: Thematic environmental data

The German Environmental Information Portal PortalU<sup>®</sup> (<http://www.portalu.de>) is online since June 2006. Its user-interface was realised on the basis of up-to-date portal-technology.

PortalU<sup>®</sup> gives answers on questions about the environment by a powerful search engine that also supports spatial searches. Besides the search engine separately prepared environmental topics, service pages with up-to-date environmental news, and environmental monitoring data are available. Furthermore an integrated map-viewer allows access to geospatial data. These components of PortalU<sup>®</sup> aim to improve the understanding of environmental information especially for non-experts.

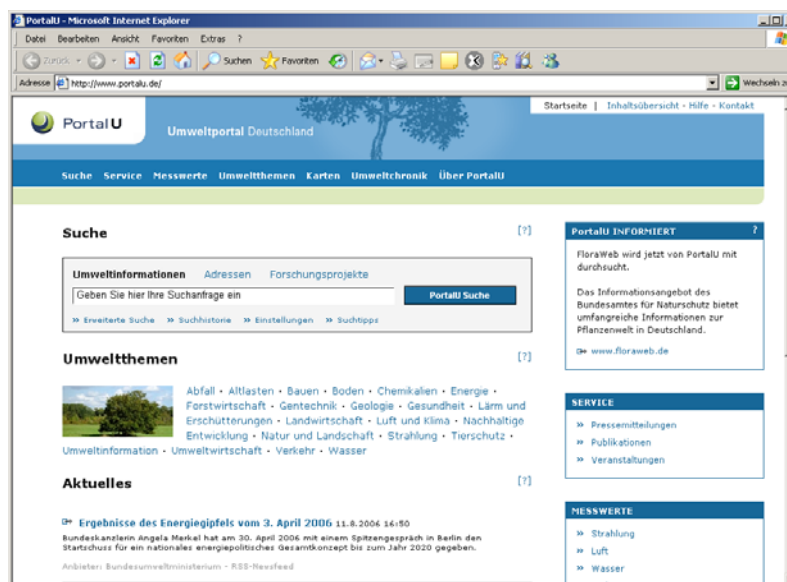


Figure 4: PortalU<sup>®</sup> main page

The portal offers central access to over 2,500,000 web pages and about 500,000 database entries from over 340 public organisations in Germany such as the Environmental Specimen Bank of the Federal Environmental Agency (UBA) or the Documentation Data Base for Nature and Landscape of the Federal Agency for Nature Conservation (BfN).

The German environmental metadata model (UDK) is fully integrated in PortalU<sup>®</sup>. Thus PortalU<sup>®</sup> provides both direct accesses to environmental data and environmental metadata through one interface.

Altogether 28 data bases from public administrations are available. 17 of them are UDKs, which contain about 5,000 INSPIRE relevant metadata entries. In PortalU all environmental information, web pages, databases as well as data catalogues can be searched by simple or advanced search queries according to the requirements of the user.

Moreover, PortalU offers:

- a separate access to service pages (SERVICE),
- environmental measurement pages (DATA),
- access point to diverse environmental topics (TOPICS),
- selected Web Mapping Services (MAPS) and
- an environmental chronicle (ALMANAC).

(<http://www.portalu.de/ingrid-portal/portal/main-about.psm1>).

The PortalU<sup>®</sup> metadata module is ISO-conform and compatible with the metadata formats used by the GDI-DE and INSPIRE. The metadata are made accessible through a standardized catalogue-interface based on the same OGC specifications that are applied by the GDI-DE. Thus an effective communication of PortalU<sup>®</sup> with the metadata component of the GDI-DE is warranted. PortalU<sup>®</sup> is linked to the GeoPortal.bund (<http://geoportal.bkg.bund.de/>) as catalogue for environmental geospatial data.

### **2.7.1 Application of the legal framework and funding principles to thematic environmental data**

In the context of the agreement of environmental authorities on federal and federal state level mentioned in chapter 2.7.3 the following funding principle was implemented: 450 t€a were spent for running PortalU<sup>®</sup>, at 2007, paid half by federal level, half by federal state level. For further developments of the common system 300 t€a are planned. 75 % of that amount is paid by the federal level, 25 % by federal state level.

### **2.7.2 Application of metadata issues to thematic environmental data**

Based on the law on free access to environmental data information, a memorandum of understanding between the ministries of environment of the Federal Government and the federal states was signed in January 1996 for maintaining and developing the German Environmental Data Catalogue (Umweltdatenkatalog), UDK. Since then several 10-thousand documents, projects, digital maps, geoservices, and other environmentally relevant information items are referenced by the UDK.

After an update of the memorandum in 2003 the UDK-metadata model was fully integrated in PortalU<sup>®</sup>. Other kinds of metadata systems can be connected to PortalU<sup>®</sup> by a CSW interface.

### 2.7.3 Application of access services to thematic environmental data

The UDK metadata model allows specifying URLs that link directly to thematic data or accordant services (e.g. web-mapping-services). A web mapping services (WMS) referenced by UDK metadata is integrated in PortalU<sup>®</sup>. The WMS enables the user to visualize geospatial data. Thus multiple geospatial data sets (e.g. digital maps) from different sources can be visualized in PortalU<sup>®</sup>.

### 2.7.4 Application of standards issues to thematic environmental data

One of the GDI-DE pilot projects pertains to environmental spatial designations. See chapter 2.7 and 2.8.

### 2.7.5 Application of update procedures issues to thematic environmental data

FIR

### 2.7.6 Conclusions of Component 6

PortalU<sup>®</sup> offers central access to over 2,500,000 web pages and about 500,000 database entries from over 340 public organisations in Germany.

Based on the information provided on the previous paragraph we score the indicator as follows:

- Thematic environmental data are covered by the described SDI-initiative or there is an independent thematic environmental SDI

## 2.8 Standards

The following list includes the standards (with reference links) used in GDI-DE (in German) available at ([http://www.gdi-de.org/de\\_neu/download/AK/GDI-DE-Architekturkonzept-V2%28beta%29.pdf](http://www.gdi-de.org/de_neu/download/AK/GDI-DE-Architekturkonzept-V2%28beta%29.pdf))

#### List of referenced standards

##### Standardformate für Vektordaten

OGC-GML Version 3.2, ISO 19136:2007/OpenGIS<sup>®</sup> Geography Markup Language (GML) Encoding Standard, Implementation Specification: [http://portal.opengeospatial.org/files/?artifact\\_id=20509](http://portal.opengeospatial.org/files/?artifact_id=20509) (OGC#07-036)

OGC-GML Version 2.1, OpenGIS<sup>®</sup> Geography Markup Language (GML) Encoding Standard, Implementation Specification [http://portal.opengeospatial.org/files/?artifact\\_id=11339](http://portal.opengeospatial.org/files/?artifact_id=11339) (OGC#02-069)

##### Standardformate für Rasterdaten

GeoTIFF, Geo Tagged Image File Format <http://trac.osgeo.org/geotiff/>

HDF-EOS, Hierarchical Data Format - Earth Observing System  
<http://www.nsidc.org/data/hdfeos/> DTED, Digital Terrain Elevation Data <http://earth-info.nga.mil/publications/specs/printed/89020B/89020B.pdf>

NITF, National Imagery Transmission Format  
<http://www.ismc.nima.mil/ntb/baseline/documents.html>

CF-NetCDF, Climate and Forecast Metadata Convention - Network Common Data Form  
<http://cf-pcmdi.llnl.gov/>

### **Standardformat für grundlegende Datentypen im Bereich SensorWEB**

OGC-SensorML Version 1.0.0, Sensor Model Language  
[http://portal.opengeospatial.org/files/?artifact\\_id=21273](http://portal.opengeospatial.org/files/?artifact_id=21273) (OGC#07-000)

### **Standardformat für Beobachtungen und Messungen**

OGC-O&M Version 1.0.0, Observations and Measurements - Part 1 - Observation Schema [http://portal.opengeospatial.org/files/?artifact\\_id=22466](http://portal.opengeospatial.org/files/?artifact_id=22466) (OGC#07-022r1) OGC-O&M Version 1.0.0, Observations and Measurements - Part 2 - Sampling Features [http://portal.opengeospatial.org/files/?artifact\\_id=22467](http://portal.opengeospatial.org/files/?artifact_id=22467) (OGC#07-002r3)

### **Standardformat zur Beschreibung von Sensoren**

OGC-SensorML Version 1.0.0, OGC Sensor Model Language  
[http://portal.opengeospatial.org/files/?artifact\\_id=21273](http://portal.opengeospatial.org/files/?artifact_id=21273) (OGC#07-000) OGC-SensorML Version 1.0, OGC SensorML Encoding Standard - Schema Corregendum 1 (1.01) [http://portal.opengeospatial.org/files/?artifact\\_id=24757](http://portal.opengeospatial.org/files/?artifact_id=24757) (OGC#07-122r2)

### **Standard zur Definition von SensorML-Profilen**

OWS-6, OGC-SensorML Profile for Discovery Engineering Report 0.3.0  
[http://portal.opengeospatial.org/files/?artifact\\_id=33284](http://portal.opengeospatial.org/files/?artifact_id=33284) (OGC#09-033)

**Standardformat für Metadaten** ISO/TS 19139:2007 Geographic Information --  
 Metadata -- XML Schema Implementation  
[http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=32557](http://www.iso.org/iso/catalogue_detail.htm?csnumber=32557)

### **Standards für Visualisierungsvorschriften**

SLD Version 1.1.0, OpenGIS Styled Layer Descriptor Profile of the Web Map Service Implementation Specification [http://portal.opengeospatial.org/files/?artifact\\_id=22364](http://portal.opengeospatial.org/files/?artifact_id=22364) (OGC#05-078r4) SE Version 1.1.0, OpenGIS Symbology Encoding Implementation Specification [http://portal.opengeospatial.org/files/?artifact\\_id=16700](http://portal.opengeospatial.org/files/?artifact_id=16700) (OGC#05-077r4) SLD Version 1.0.0, OpenGIS Styled Layer Descriptor Implementation Specification [http://portal.opengeospatial.org/files/?artifact\\_id=1188](http://portal.opengeospatial.org/files/?artifact_id=1188) (OGC#02-070)

### **Standard für Kartenzusammenstellungen**

WMC Version 1.1, OpenGIS Web Map Context Implementation Specification  
[http://portal.opengeospatial.org/files/?artifact\\_id=8618](http://portal.opengeospatial.org/files/?artifact_id=8618) (OGC#05-005)

### **Standard für Filter und Abfragen**

FE Version 1.1, OpenGIS Filter Encoding Implementation Specification  
[http://portal.opengeospatial.org/files/?artifact\\_id=8340](http://portal.opengeospatial.org/files/?artifact_id=8340) (OCG#04-095)

### **Standards für Koordinatenreferenzsysteme**

WGS84 (EPSG 4326) ETRS89 (EPSG 4258)

### **Standards für Projektionen**

ETRS89/ETRS-TM32 (EPSG 3044) ETRS89/UTM Zone 32N (EPSG 25832)

### **Standards für Kartendienste**

OGC-WMS Version 1.3, OpenGIS Web Map Service (WMS) Implementation Specification  
[http://portal.opengeospatial.org/files/?artifact\\_id=14416](http://portal.opengeospatial.org/files/?artifact_id=14416) (OGC#06-042)

WMS-DE-Profil Version 1.0 (basiert auf OGC-WMS Version 1.1.1) [http://www.gdi-de.org/de\\_neu/download/AK/WMS\\_DE\\_Profil\\_V1.pdf](http://www.gdi-de.org/de_neu/download/AK/WMS_DE_Profil_V1.pdf)

Technical Guidance to implement INSPIRE View Services  
<http://inspire.jrc.ec.europa.eu/index.cfm/pageid/5>

### **Standard für einen Dienst zur Erstellung von perspektivischen Ansichten**

OGC-WTS Version 0.3.2, OpenGIS® Web Terrain Server

[http://portal.opengeospatial.org/files/?artifact\\_id=1072](http://portal.opengeospatial.org/files/?artifact_id=1072) (OGC Discussion Paper, OGC#01-061)

### **Standard für einen Dienst zur Erstellung von 3D-Szenegrafen 1**

Draft for Candidate OpenGIS® Web 3D Service Interface Standard  
[http://portal.opengeospatial.org/files/?artifact\\_id=36390](http://portal.opengeospatial.org/files/?artifact_id=36390) (OGC#09-104r1)

### **Standards für Downloaddienste**

OGC-WFS Version 2.0, OpenGIS® Web Feature Service Implementation Specification  
noch nicht veröffentlicht

OGC-WFS Version 1.1, OpenGIS® Web Feature Service Implementation Specification  
[http://portal.opengeospatial.org/files/?artifact\\_id=8339](http://portal.opengeospatial.org/files/?artifact_id=8339) (OGC#04-094)

OGC-WFS Version 1.0, OpenGIS® Web Feature Service Implementation Specification  
[http://portal.opengeospatial.org/files/?artifact\\_id=7176](http://portal.opengeospatial.org/files/?artifact_id=7176) (OGC#02-058)

Technical Guidance to implement INSPIRE Download Services  
<http://inspire.jrc.ec.europa.eu/index.cfm/pageid/5>

### **Standard für einen Dienst zur geografischen Namenssuche**

OGC-WFS-G Version 0.9.3, OpenGIS® Gazetteer Service – Application Profile of the Web Feature Service Implementation Specification (OGC-Best-Practice)  
[http://portal.opengeospatial.org/files/?artifact\\_id=15529](http://portal.opengeospatial.org/files/?artifact_id=15529) (OGC#05-035r2)

### **Standard für einen Dienst zur Bereitstellung mehrdimensionaler, gerasterter Datenbestände**

OGC-WCS Version 1.0, OpenGIS® WCS - Web Coverage Service [http://portal.opengeospatial.org/files/?artifact\\_id=3837](http://portal.opengeospatial.org/files/?artifact_id=3837) (OGC# 03-065r6) OGC-WCS Version 2.0, OpenGIS® WCS - Web Coverage Service Entwurf - zum Redaktionsschluss noch nicht veröffentlicht.

### **Standard für einen Suchdienst**

OGC-CSW OpenGIS® Catalogue Service Specification 2.0.2 - ISO Metadata Application Profile, Version 1.0 [http://portal.opengeospatial.org/files/?artifact\\_id=21460](http://portal.opengeospatial.org/files/?artifact_id=21460) (OGC#07-045)

Technical Guidance to implement INSPIRE Discovery Services <http://inspire.jrc.ec.europa.eu/index.cfm/pageid/5>

### **Standard für einen Koordinatentransformationsdienst**

Draft Technical Guidance for INSPIRE - Coordinate Transformation Services <http://inspire.jrc.ec.europa.eu/index.cfm/pageid/5>

### **Standards für Modelltransformationdienste**

Keine

### **Standard für einen Dienst für geodatenverarbeitende Prozesse**

OGC-WPS, Version 1.0, OpenGIS® Web Processing Service Implementation Specification [http://portal.opengeospatial.org/files/?artifact\\_id=24151](http://portal.opengeospatial.org/files/?artifact_id=24151) (OGC# 05-007r7)

### **Standard für einen Dienst zur Berechnung von Routen**

OGC-OpenLS, Version 1.2, OpenGIS® Location Services: Core Services, Part 5-Route Service [http://portal.opengeospatial.org/files/?artifact\\_id=22122](http://portal.opengeospatial.org/files/?artifact_id=22122) (OGC# 07-074)

### **Standard für einen Dienst für die Bereitstellung von SensorDaten**

OGC-SOS Version 1.0.0, OGC Sensor Observation Service [http://portal.opengeospatial.org/files/?artifact\\_id=26667](http://portal.opengeospatial.org/files/?artifact_id=26667) (OGC#06-009r6)

### **Standard für einen Dienst zur Steuerung von Sensoren**

OGC-SPS Version 1.0.0, OGC Sensor Planning Service Implementation Specification [http://portal.opengeospatial.org/files/?artifact\\_id=23180](http://portal.opengeospatial.org/files/?artifact_id=23180) (OGC#07-014r3)

### **Standards für Dienste zur Auslösung von Benachrichtigungen aufgrund von Messereignissen**

OGC-SAL Version 0.9, OGC Sensor Alert Service [http://portal.opengeospatial.org/files/?artifact\\_id=15588](http://portal.opengeospatial.org/files/?artifact_id=15588) (OGC#06-028r3)

OGC-SES Version 0.3.0, OGC Sensor Event Service Interface Specification [http://portal.opengeospatial.org/files/?artifact\\_id=29576](http://portal.opengeospatial.org/files/?artifact_id=29576) (OGC#08-133)

### **Standard für die Versendung von Benachrichtigungen**

OGC-WNS Version 0.0.9, OGC Web Notification Service [http://portal.opengeospatial.org/files/?artifact\\_id=18776](http://portal.opengeospatial.org/files/?artifact_id=18776) (OGC#06-095)

## Standards zu Registry-Konzepten

ISO 19135 „Geographic information – Procedures for item registration“  
[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=32553](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=32553)

## Standards für Anwendungsprotokolle

Hypertext Transfer Protocol – HTTP/1.1, RFC2616, IETF 1999  
<http://tools.ietf.org/html/rfc2616>

HTTP Authentication: Basic and Digest Access Authentication, RFC2617, IETF 1999  
<http://tools.ietf.org/html/rfc2617>

Upgrading to TLS Within HTTP/1.1, RFC2817, IETF 2000  
<http://tools.ietf.org/html/rfc2817>

HTTP over TLS, RFC 2818, IETF 2000 <http://tools.ietf.org/html/rfc2818>

## Standard für den Austausch von Authentifizierungs- und Autorisierungsinformationen

OASIS Security Assertion Markup Language (SAML) V2.0 <http://docs.oasis-open.org/security/saml/v2.0/saml-2.0-os.zip>

## Standardformat zur Deklaration von Zugriffsrechten

OASIS eXtensible Access Control Markup Language (XACML) V2.0 <http://www.oasis-open.org/committees/download.php/10577/XACML-2.0-OS-ALL.zip>

## Standardformate zur Deklaration von Zugriffsrechten für Geodaten und Geodatendienste

OGC Geospatial eXtensible Access Control Markup Language (GeoXACML) 1.0  
[http://portal.opengeospatial.org/files/?artifact\\_id=25218](http://portal.opengeospatial.org/files/?artifact_id=25218)

OGC Geospatial eXtensible Access Control Markup Language (GeoXACML) Extension A – GML 2 Encoding Version 1.0  
[http://portal.opengeospatial.org/files/?artifact\\_id=25219](http://portal.opengeospatial.org/files/?artifact_id=25219)

OGC Geospatial eXtensible Access Control Markup Language (GeoXACML) Extension B – GML 3 Encoding Version 1.0  
[http://portal.opengeospatial.org/files/?artifact\\_id=25220](http://portal.opengeospatial.org/files/?artifact_id=25220)

## Standard für den integeren und vertraulichen Austausch von SOAP-Nachrichten

WS-S Version 1.1, OASIS Web Service Security Core Specification <http://www.oasis-open.org/committees/download.php/16790/wss-v1.1-spec-os-SOAPMessageSecurity.pdf>

## 2.8.1 Conclusions of Component 7

Several German SDI stakeholders are active in the field and help developing INSPIRE at EU level. The list of applied standards at GDI-DE is expressing to which extent standards are applied (from GML, sensorWeb, WMS, CSW, ..., until WPS).

Based on these conclusions we score the indicator as follows:

- The SDI-initiative is devoting significant attention to standardisation issues

## **2.9 Use and efficiency of SDI**

A major development is observed towards local SDI implementation.

A number of examples exist such as the portal of the county of Bernkastel-Wittlich in Rhineland-Palatinate state. (<http://www.geoportal.rlp.de/portal/en/geo-data.html>).

The geoportal of Rhineland-Palatinate provides access to spatial information on the complete territory of the federal state. The Geoportal offers the opportunity for federal state agencies, municipal authorities and private companies to make their data and services accessible for the whole community of internet users. Additionally users have access to a number of web map services and applications (Müller and von St. Vith, 2009).

Similarly the existing municipal e-Government portal (e.g. Hessen, Wiesbaden) developed, a prototypical Web 2.0 e-Participation instrument that enables Wiesbaden's citizens to inform the city administration about infrastructural problems such as pot-holes, garbage, road lightning, etc ( Blankenbach and Scaffert, 2009).

Moreover, TIM-online is an Internet-Application provided by the Federal State of North-Rhine Westphalia in order to display the reference data of the Surveying and Cadastre Service via Web Map Services (<http://www.tim-online.nrw.de>).

At the same time the project GDI-3D (<http://www.gdi-3d.de/>) focus on three objectives:

1. Interoperable implementation of 3D city models
2. Building up the required 3D spatial infrastructure
3. Development of prototypical applications using the 3d service infrastructure.

Within the GDI-3D a number of applications have been developed:

- OpenStreetMap-3D: [www.OSM-3D.org](http://www.OSM-3D.org) combining free and user generated data from OpenStreetMap with SRTM DEM - currently for entire Germany.
- NorthRhine-Westphalia-3D: [www.nrw-3d.de](http://www.nrw-3d.de) All - over 6 Million - LOD1 buildings from GeoBasis.NRW in GDI-3D
- Heidelberg-3D: [www.heidelberg-3d.de](http://www.heidelberg-3d.de) Official data combined with textured high resolution building models of Heidelberg.

Last but not least various German organisations and administrative divisions are participating in the X-Border-GDI (<http://www.x-border-gdi.org/en/>) project. The aim of the project is to develop and implement a structure for the supply of cross-border geographic information in North Rhine-Westphalia and the Netherlands.



### 3 Annexes

#### 3.1 List of SDI addresses / contacts for Germany

Table: SDI contact list			
SDI Name (full)	Web address	Organisational mailing address	Over-all contact person: tel./fax/e-mail
Administrative Office Inter-Ministerial Committee for Geo information (IMAGI) Geschäftsstelle des Interministeriellen Ausschusses für Geoinformationswesen	<a href="http://www.imagi.de">www.imagi.de</a>	Bundesamt für Kartographie und Geodäsie Richard-Strauss-Allee 11 60598 Frankfurt am Main	Tel.: +49-(0) 69 63 33-258 Fax: +49-(0) 69 63 33-446 Email: <a href="mailto:imagi@bkg.bund.de">imagi@bkg.bund.de</a>
Federal Agency for Cartography and Geodesy Bundesamt für Kartographie und Geodäsie	<a href="http://www.bkg.bund.de">www.bkg.bund.de</a>	Richard-Strauss-Allee 11 60598 Frankfurt am Main	Tel.: +49-(0) 69 63 33-1 Fax: +49-(0) 69 63 33-235 or +49-(0) 69 63 33-425 Email: <a href="mailto:mailbox@bkg.bund.de">mailbox@bkg.bund.de</a>
Administrative Office GDI-DE, Geschäfts- und Koordinierungsstelle GDI-DE	<a href="http://www.gdi-de.org">www.gdi-de.org</a>	Richard-Strauss-Allee 11, 60598 Frankfurt am Main	Tel.: +49-(0) 69 63 33-300 Fax: +49-(0) 69 63 33-446 Email: <a href="mailto:martin.lenk@bkg.bund.de">martin.lenk@bkg.bund.de</a>
Bundesamt für Kartographie und Geodäsie GeoDatenZentrum	<a href="http://www.geodatenzentrum.de">www.geodatenzentrum.de</a>	Karl-Rothe-Straße 10-14 04105 Leipzig	Tel.: +49-(0) 341 5634-369 Fax: +49-(0) 341 5634-415 Email: <a href="mailto:geodateninfo@bkg.bund.de">geodateninfo@bkg.bund.de</a>
Working Committee of the Surveying Authorities of the Federal states of the Federal Republic of Germany (AdV)  Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder der Bundesrepublik Deutschland	<a href="http://www.adv-online.de">www.adv-online.de</a>	Landesvermessung und Geobasisinformation Niedersachsen (LGN) Wilhelm Zeddies (AdV- Secretary General) Podbielskistr. 331 30659 Hannover	Tel.: +49-(0) 511 64609-110 Fax: +49-(0) 511 64609-116 Email: <a href="mailto:GeschaeftsstelleDerAdv@lgn.niedersachsen.de">GeschaeftsstelleDerAdv@lgn.niedersachsen.de</a>

Table: SDI contact list			
SDI Name (full)	Web address	Organisational mailing address	Over-all contact person: tel./fax/e-mail
President of AdV Vorsitzender der AdV	<a href="http://www.adv-online.de">www.adv-online.de</a>	Dipl.-Ing. Hans Gerd Stoffel c/o Ministerium des Innern und für Sport (ISM) in Mainz. Wallstraße 3 55122 Mainz	Tel.: +49-(0) 6131 16-3395 Email: <a href="mailto:hans-gerd.stoffel@ism.rlp.de">hans-gerd.stoffel@ism.rlp.de</a>

### 3.2 List of references for Germany

Table: list of references used to compile the Country Report (in order of appearance)

Web sites:	<a href="http://www.adv-online.de">http://www.adv-online.de</a> <a href="http://www.atkis.de/metainfo">http://www.atkis.de/metainfo</a> <a href="http://www.geodatenzentrum.de">http://www.geodatenzentrum.de</a> <a href="http://www.ddgi.de">http://www.ddgi.de</a> <a href="http://www.gdi-de.org/">http://www.gdi-de.org/</a> <a href="http://www.imagi.de">http://www.imagi.de</a> <a href="http://www.gdi-de.org/de/download/GDI_DE_Schutzgebiete_V1.0.pdf">http://www.gdi-de.org/de/download/GDI_DE_Schutzgebiete_V1.0.pdf</a> <a href="http://www.lv-bw.de/lvshop2">http://www.lv-bw.de/lvshop2</a> <a href="http://www.gdi.bayern.de/">http://www.gdi.bayern.de/</a> <a href="http://www.stadtentwicklung.berlin.de/geo_information/projekt-gdi/">http://www.stadtentwicklung.berlin.de/geo_information/projekt-gdi/</a> <a href="http://gdi.berlin-brandenburg.de">http://gdi.berlin-brandenburg.de</a> <a href="http://gdi.berlin-brandenburg.de">http://gdi.berlin-brandenburg.de</a> <a href="http://www.geodaten-management.bremen.de/">http://www.geodaten-management.bremen.de/</a> <a href="http://www.geonord.de/">http://www.geonord.de/</a> <a href="http://www.hmdk.de/">http://www.hmdk.de/</a> <a href="http://www.geoinfo.hamburg.de/">http://www.geoinfo.hamburg.de/</a> <a href="http://www.huis.hamburg.de/">http://www.huis.hamburg.de/</a> <a href="http://www.geoportal.hessen.de/">http://www.geoportal.hessen.de/</a> <a href="http://www.geodaten-mv.de/">http://www.geodaten-mv.de/</a> <a href="http://www.lverma-mv.de/">http://www.lverma-mv.de/</a> <a href="http://www.geodaten.niedersachsen.de/">http://www.geodaten.niedersachsen.de/</a> <a href="http://www.geobasis.nrw.de/">http://www.geobasis.nrw.de/</a> <a href="http://www.gdi-nrw.org/">http://www.gdi-nrw.org/</a> <a href="http://www.ima-gdi.nrw.de/">http://www.ima-gdi.nrw.de/</a> <a href="http://www.geoportal.rlp.de">http://www.geoportal.rlp.de</a> <a href="http://www.lkvk.saarland.de/">http://www.lkvk.saarland.de/</a> <a href="http://www.gis.saarland.de/">http://www.gis.saarland.de/</a>
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	<p><a href="http://www.umwelt.saarland.de/">http://www.umwelt.saarland.de/</a></p> <p><a href="http://www.lua.saarland.de/">http://www.lua.saarland.de/</a></p> <p><a href="http://www.gdi.sachsen.de">http://www.gdi.sachsen.de</a></p> <p><a href="http://www.lvermgeo.sachsen-anhalt.de/">http://www.lvermgeo.sachsen-anhalt.de/</a></p> <p><a href="http://www.gdi-sh.de/">http://www.gdi-sh.de/</a></p> <p><a href="http://www.umweltdaten.landsh.de/atlas/script/index.php">http://www.umweltdaten.landsh.de/atlas/script/index.php</a></p> <p><a href="http://www.thueringen.de/ikg-giz">http://www.thueringen.de/ikg-giz</a></p> <p><a href="http://geoportal.bkg.bund.de/">http://geoportal.bkg.bund.de/</a></p> <p><a href="http://www.geodatenzentrum.de/geodaten/gdz_rahmen.gdz_div?gdz_spr=deu&amp;gdz_akt_zeile=2&amp;gdz_anz_zeile=3&amp;gdz_user_id=0">http://www.geodatenzentrum.de/geodaten/gdz_rahmen.gdz_div?gdz_spr=deu&amp;gdz_akt_zeile=2&amp;gdz_anz_zeile=3&amp;gdz_user_id=0</a></p> <p><a href="http://crs.bkg.bund.de/crs-eu/">http://crs.bkg.bund.de/crs-eu/</a></p> <p><a href="http://www.stagn.de/Portals/0/020809_TOPGUIDE_ZWEISPR_MIT_ABB.pdf">http://www.stagn.de/Portals/0/020809 TOPGUIDE ZWEISPR MIT ABB.pdf</a></p> <p><a href="http://www.portalu.de">http://www.portalu.de</a></p> <p><a href="http://141.74.33.52/ngdb-liste/produkte_all_print.aspx">http://141.74.33.52/ngdb-liste/produkte_all_print.aspx</a></p> <p><a href="http://www.tim-online.nrw.de">http://www.tim-online.nrw.de</a></p> <p><a href="http://www.gdi-3d.de/">http://www.gdi-3d.de/</a></p> <p><a href="http://www.crs-geo.eu">http://www.crs-geo.eu</a></p> <p><a href="http://productive.gdi-de.org/monitoring/monitoring_2009_GDI-DE.xml">http://productive.gdi-de.org/monitoring/monitoring_2009_GDI-DE.xml</a></p> <p><a href="http://www.gdi-de.org/de_neu/download/AK/GDI-DE-Architekturkonzept-V2%28beta%29.pdf">http://www.gdi-de.org/de_neu/download/AK/GDI-DE-Architekturkonzept-V2%28beta%29.pdf</a></p>
Publications :	<p>J., Blankenbach and M., Schaffert, 2009. A SDI and Web 2.0 based Approach to Support E-Participation in Municipal Administration and Planning Strategies. FIG Congress 2010 Facing the Challenges – Building the Capacity Sydney, Australia, 11-16 April 2010.</p> <p>H., Brüggemann, 2009. Public-private SDI challenges in Germany. GSDI 11, Rotterdam, 2009.</p> <p>A., Padberg and C., Kiehle, 2009. Towards a grid-enabled SDI: Matching the paradigms of OGC Web Services and Grid Computing. GSDI 11, Rotterdam 2009.</p> <p>S., Sandmann and N., Pischler, 2008. SDI North Rhine-Westphalia. Workshop Advanced Regional SDIs, 19.-20.05.2008, Ispra.</p>

	<p>A., Wytzisk, U., Voges and A., von Domming, 2008. Technical Architecture and Implementation Plan for GDI-DE. GSDI 10 St. Augustine, Trinidad, 2008.</p> <p>H., Müller and S., von St. Vith, 2009. SDI Implementation at the Local Administration Level of Germany. FIG Working Week 2009, Eilat, Israel May 2009.</p> <p>M. Badowski, Implementation of the INSPIRE-Directive in Germany and Poland – Legal Point of View, Springer-Verlag Berlin Heidelberg 2010</p>
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