



INSPIRE
Infrastructure for Spatial Information in Europe

Member State Report: Germany, 2013

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1 Executive summary

2 List of abbreviations

AdV	Arbeitsgemeinschaft der Vermessungsverwaltungen der Bundesrepublik Deutschland (Working Committee of Surveying Authorities of the Federal Republic of Germany)
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
BKG	Bundesamt für Kartographie und Geodäsie (Federal Agency for Cartography and Geodesy)
GDI-DE	Geodateninfrastruktur Deutschland (Spatial Data Infrastructure Germany)
GeoNutzV	Verordnung zur Festlegung der Nutzungsbestimmungen für die Bereitstellung von Geodaten des Bundes (Regulation establishing the conditions for use for the provision of federal government spatial data)
GeoZG	Geodatenzugangsgesetz (Access to Spatial Data Act)
GIW	Kommission für Geoinformationswirtschaft (Geo-Business Commission)
IMAGI	Interministerieller Ausschuss für Geoinformationswesen des Bundes (Federal Interministerial Committee for Geoinformation)
INSPIRE Directive	Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community
ISO	International Organisation for Standardisation
Kst. GDI-DE	Koordinierungsstelle Geodateninfrastruktur Deutschland (Coordination Office for Spatial Data Infrastructure Germany)
LG GDI-DE	Lenkungsgremium Geodateninfrastruktur Deutschland (Steering Committee for Spatial Data Infrastructure Germany)
OGC	Open Geospatial Consortium
SIG3D	Special Interest Group 3D
WFS	WebFeatureService
WMS	WebMapService

3 Introduction

This document is the report from Germany in accordance with Article 21(3) of Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE Directive). It is based on the European Commission Decision of 5 June 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards monitoring and reporting. The report is based on the template provided by the European Commission for INSPIRE reporting. In essence, the report describes the status quo of the organisation and development of Spatial Data Infrastructure Germany (GDI-DE) as a national project and Germany's contribution to creating an infrastructure for spatial data in the European Community (INSPIRE). It provides information on the coordination structures in Germany, on the tasks and goals of participants and their working methods and in particular on the actions taken in Germany in response to the INSPIRE Directive.

The report was prepared jointly by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), which is responsible at federal level for the implementation in Germany of the INSPIRE Directive, the Steering Committee for Spatial Information Infrastructure Germany (LG GDI-DE), which acts as national contact point pursuant to Article 19(2), and the Coordination Office for Spatial Data Infrastructure Germany (Kst. GDI-DE) and adopted on a cross-administrative basis, i.e. between Federal government, Länder and local authority associations, and also interdepartmentally.

4 Coordination and quality assurance

4.1 Coordination

4.1.1 National contact point of Germany

Name	Steering Committee for Spatial Data Infrastructure Germany
Contact information	
Address	Coordination Office GDI-DE c/o Federal Agency for Cartography and Geodesy Richard-Strauss-Allee 11 60598 Frankfurt am Main Germany
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4.1.2 The coordination structure

Spatial Data Infrastructure Germany (GDI-DE) is a national network with coordination structures within the meaning of the second sentence of Article 19(2) of the INSPIRE Directive. The main organisational components of this coordination structure are a Steering Committee at the specialised political decision-making level (LG GDI-DE) and a Coordination Office (Kst. GDI-DE) with contact points in the Federal government, Länder and municipalities at operational level. Representatives of the local authority associations, the business community and the academic world are also included in the structure of the GDI-DE.

The spatial data holding entities are responsible for the provision of spatial data and services at the individual administrative levels. These use and comply with the recommendations, specifications and national technical components of the GDI-DE within the meaning of a common national infrastructure, with due regard for the requirements laid down by the INSPIRE Directive.

Roles, duties, responsibilities

The LG GDI-DE is the specialised administrative decision-making body for the development and operation of the GDI-DE. It is composed of representatives of the federal government, the 16 Länder and the three local authority associations at federal level. The chair of the LG GDI-DE alternates in a two-yearly cycle between the parties to the Agreement, the federal government and Länder. The LG GDI-DE controls and coordinates the development of the GDI-DE including the implementation of the INSPIRE Directive. In particular, it is responsible for acting as 'national contact point' within the meaning of the first sentence of Article 19(2) of the INSPIRE Directive.

The Kst. GDI-DE coordinates the implementation of the decisions and orders of the LG GDI-DE and monitors their implementation. It performs the operational tasks of the national contact point and is supported by the contact centres of the federal government, the Länder and the municipalities. The Kst. GDI-DE is based in the Federal Agency for Cartography and Geodesy (BKG) in Frankfurt/Main.

In the Länder, coordinating bodies perform organisational and operational activities at State and municipal level, including the provision of IT services for State and municipal institutions.

Interaction between federal government, Länder and municipalities in the GDI-DE is based on an administrative agreement established since 2005, which is adapted where necessary to the developing requirements. It regulates, *inter alia*, the joint financing of the Kst. GDI-DE and the coordinating and operative implementation of the INSPIRE Directive. As part of the review of the administrative agreement and to ensure the technical operation, a study on the GDI-DE operating model was commissioned in 2010. This investigated the use and the possibilities for use of the central components of the GDI-DE on the basis of specific tasks. As a result of the study, it was proposed transferring the operation to a central body, on the basis of coordinated operating processes. The existing need for further national components was identified and the resource situation highlighted. The results were incorporated in a revised administrative agreement, which entered into force in 2013. The new administrative agreement also provides financial security for the central technical operation of the national components. These currently include the Geoportal.de, the Geodatenkatalog.de, the GDI-DE Test Suite and the GDI-DE Registry. All these components are deployed to optimise the provision and use of the decentralised data and services of the GDI-DE. Responsibility for the technical operation lies with the Federal Agency for Cartography and Geodesy on the basis of a catalogue of services decided with the parties to the agreement. Furthermore, efforts are made towards the provision of further national components recognised as necessary, such as cross-organisation access control for the single sign-on procedure and a geo-coding service for automated geo-referencing of data files.

In relation to the INSPIRE Directive, the federal government, Länder and local authority associations take joint responsibility for the following functions, as part of the GDI-DE:

- 1) Coordination of the deployment and updating of metadata in accordance with Article 5(1),
- 2) Notification of the European Commission regarding cost-benefit analyses for implementing rules within the meaning of Article 7(2),
- 3) Provision of information required to ensure compliance with the implementing rules provided for in Article 7(1), in accordance with Article 10(1),
- 4) Coordination to ensure the coherence of cross-border features in accordance with Article 10(2),
- 5) Coordination of the establishment and operation of a network in accordance with Article 11(1),
- 6) Coordination of the setting of charges in accordance with Article 14(2) and the development of e-commerce services in accordance with Article 14(4), including related usage rules,
- 7) Creation of appropriate structures and mechanisms for coordinating the contributions at the various levels of government in accordance with Article 18,
- 8) Set-up and operation of a contact point and the associated coordination structure in accordance with Article 19(2),
- 9) Monitoring the implementation and use of the national infrastructure for spatial information in accordance with Article 21(1),
- 10) Involvement in the production of reports in accordance with Article 21(2) and (3) and cooperation in the notification of the European Commission regarding the main provisions of national law pertaining to the INSPIRE Directive in accordance with Article 24(2).

In the context of the development and operation of the GDI-DE, the parties to the agreement are jointly responsible for:

- 1) Coordination of objectives, concepts and tasks to be undertaken at national level,
- 2) Development, continuation and implementation of standards,
- 3) Identification of key data for the national spatial database and
- 4) Coordination of the interpretation and application of international and Union law technical rules and standards between GDI-DE and e-government at national level.

Organisation, network and involvement of third parties

Politically and technically, implementation of the GDI-DE takes place within the context of e-government (Figure 1). The background that GDI-DE is a current IT and e-government infrastructure across all disciplines and levels gives rise to the competence at political level of the IT Planning Council, which was established by State Treaty between the federal government and the Länder on the basis of Article 91c of the Basic Law (*Grundgesetz*) (as amended on 29 July 2009). The LG GDI-DE reports regularly to this body.

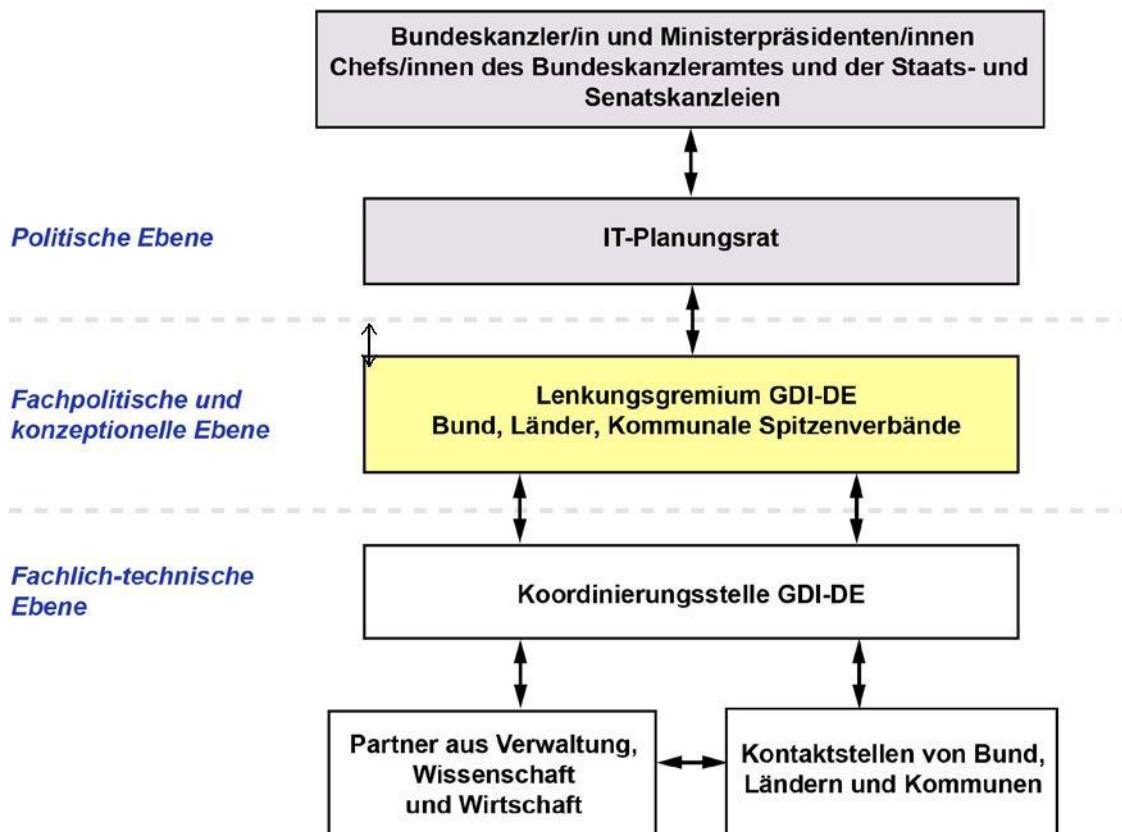


Figure 1: Organisation of the GDI-DE (March 2013)

Key

Bundeskanzler/in und Ministerpräsidenten/innen = Federal Chancellor and Minister-Presidents

Chefs/innen des Bundeskanzleramtes und der Staats- und Senatskanzleien = Heads of Federal Chancellor's Office and State and Senate Offices

Politische Ebene = political level

IT-Planungsrat = IT Planning Council

Fachpolitische und konzeptionelle Ebene = specialised policy and design level

Lenkungs-gremium GDI-DE = Steering Committee for GDI-DE

Bund, Länder, Kommunale Spitzenverbände = federal government, Länder and local authority associations

Fachlich-technische Ebene = technical level

Koordinierungsstelle GDI-DE = Coordination Office for GDI-DE

Partner aus Verwaltung, Wissenschaft und Wirtschaft = partners from public administration, academic world and business community

Kontaktstellen von Bund, Ländern und Kommunen = contact points of federal government, Länder and municipalities

The GDI-DE is an open process, whereby all documents, agreements and infrastructure elements of the business community, the academic world and the public will be made available (www.geoportal.de/DE/GDI-DE). Cooperation with the business community is encapsulated in cooperation with business organisations via the 'GeoBusiness Commission (GIW)' established at the Federal Ministry for Economy and Technology and its secretariat (www.geobusiness.org). The GIW is a permanent guest at the LG GDI-DE, as are representatives of the academic world, to contribute additional user requirements to the development of the GDI-DE.

Cross-administrative GDI-DE cooperation procedure

Decisions of the LG GDI-DE in principle must be carried unanimously – by consensus. This provides a guarantee of acceptance for the actions of the GDI-DE at all administrative levels concerned. Even before the decisions are taken, coordination processes take place in a network of contacts from the federal government, Länder and local authority associations.

At federal and Länder levels, cross-departmental coordination structures have been set up, which are in turn responsible for the development of decentralised infrastructures for spatial data as part of the GDI-DE. Federal government, Länder and local authority associations have appointed points of contact within these structures as direct contacts of the Kst. GDI-DE. They are responsible for:

- 1) passing on information to the Kst. GDI-DE, which is necessary for the performance of tasks specified under the GDI-DE Administrative Agreement,
- 2) supporting the implementation of measures determined by the LG GDI-DE, with the help of the Kst. GDI-DE, in the respective administrative units, and
- 3) disseminating information on the implementation status of the measures at the request of the Kst. GDI-DE.

A detailed overview of all the partners of the GDI-DE, with corresponding references to the coordination structures of the federal government, Länder and local authority associations, can be found on the website of the GDI-DE: www.geoportal.de/DE/GDI-DE.

Workshops and information events are held by LG GDI-DE and also individual Länder to provide the spatial data holding entities and service providers with information about current issues, such as the implementing rules and their implementation with due regard for the national framework conditions. In joint working groups of the federal government, Länder and municipalities, guidance and recommendations for the implementation of the INSPIRE Directive are drawn up, politically coordinated via the LG GDI-DE and published on the GDI-DE website (<http://www.geoportal.de/DE/GDI-DE/Media-Center/Dokumente/dokumente.html?lang=de>). The Kst. GDI-DE provides a web-based cooperation platform (Wiki) for cooperation in the network. It is in general accessible to the public (<http://wiki.gdi-de.org>) and is used intensively by working groups, experts and specialised networks of the GDI-DE for the provision of information and exchange of expertise.

A GDI-DE newsletter, published at regular intervals since 2006, keeps the network informed about current issues concerning the development of the spatial information infrastructure (<http://www.geoportal.de/DE/GDI-DE/Media-Center/Archiv/Newsletter/newsletter.html?lang=de>). Brochures and other printed materials on various topics can be ordered or downloaded from the same website.

The LG GDI-DE has set up working groups on architecture, spatial services, metadata and Special Interest Group 3D (SIG 3D). The working groups deal mainly with technical issues, for example examination and recommendation of standards to be used in the GDI-DE. A core task of the working groups is the development of policies and measures for consultation and draft resolutions for the LG GDI-DE.

The Architecture Working Group's architectural concept provides a technical and strategic basis for the GDI-DE. It examines the requirements for further developments in the context of the operation of the GDI-DE and provides specifications for the necessary direction by the LG GDI-DE. The Spatial Services Working Group is responsible within the GDI-DE for evaluating service specifications, as well as for developing and maintaining Germany-wide application profiles for spatial data services. This also includes the active support of the German technical experts in the Initial Operating Capabilities Task Force (IOC). The task of the Metadata Working Group is to develop specifications (application profiles) and interpretations for the interoperable, online exchange of metadata on the basis of the

standards and norms of the International Organisation for Standardisation (ISO) and the Open Geospatial Consortium (OGC), as well as monitoring other standardisation initiatives that affect the field of metadata and cataloguing services. The SIG 3D group actively works on standardisation for the application field of three-dimensional objects.

In parallel to the development of the INSPIRE data specifications on the 34 specialised themes of Annexes I, II and III, specialised networks are established in the GDI-DE. The specialised networks are coordinated as far as possible on a theme-related basis by the German experts who cooperate in the Thematic Working Groups (TWG) set up by the European Commission. The TWG experts thereby have the possibility of including an extended 'network' in the development and consultation process for the individual specifications. Prospectively, the specialised networks offer the possibility to guide the technical implementation of the interoperability requirements through the INSPIRE Directive.

For the dissemination of model solutions in the application fields of the GDI-DE, the LG GDI-DE drew up a concept in 2012 for 'pilot projects for the GDI-DE' and called for public participation. The pilot projects serve the purpose of making known innovative and useful GDI model solutions from the regions of Germany across the regions and possibly transferring them to the whole of Germany. In addition to the municipal spatial information standard XErleben, in 2013 the themes land-use planning and broadband deployment were dealt with and prepared for establishment throughout Germany. An up-to-date overview of the respective pilot projects is to be found at <https://wiki.gdi-de.org/display/mp/GDI-DE+Modellprojekte>.

4.1.3 Comments on the monitoring and reporting process

General comments

The basis of INSPIRE implementation in Germany – as required in recital 5 and Article 1(2) of the INSPIRE Directive – is the GDI-DE. Accordingly, LG GDI-DE is responsible for the monitoring and reporting (INSPIRE monitoring and reporting) pursuant to Article 21 of the INSPIRE Directive.

On 15.05.2010, the LG GDI-DE communicated the first result of the INSPIRE monitoring relating to the year 2009 and the first report for Germany to the European Commission and made it available to the public on the internet GDI-DE website (<http://www.geoportal.de/DE/GDI-DE/INSPIRE/Direktive/Monitoring-und-Reporting/monitoring-und-reporting.html?lang=de>). In the following years until the reporting year 2012, the monitoring was carried out continuously and communicated to the European Commission annually at 15 May and published on the GDI-DE website.

All the monitoring results and reports forwarded to the European Commission were drawn up jointly by the GDI-DE network and coordinated across administrations in the LG GDI-DE. The results serve not only for the reporting to the European Commission provided for by law, but also for quality assurance in the context of the implementation of the INSPIRE Directive in Germany.

Monitoring procedures in Germany

The 'INSPIRE monitoring procedure' within the GDI-DE has been carried out across administrations since 2009. The INSPIRE monitoring is therefore interpreted as a continuous and iterative procedure.

The spatial data holding entities at all levels of the administration are responsible for the identification and reporting of the INSPIRE-relevant spatial data sets and services. They enter this and further information necessary to calculate the monitoring indicators in a message list provided by the Kst. GDI-DE. The contact points at the federal government and Länder collect the respective information from the spatial data holding entities and add it to the Land or federal lists and update them regularly. In this respect, the Länder are also responsible for inclusion of the lowest level of the administration in the monitoring procedure.

The Land or federal lists are then returned to the Kst. GDI-DE, deposited in the GDI-DE wiki and can be updated there at any time. The lists are entered into a prototype of the GDI-DE Registry before the reporting time and the necessary formats are produced for publication and submission to the European Commission (xml, html). In future too, the GDI-DE Registry will provide support for carrying

out the monitoring in Germany It is planned, in the course of the development of the GDI-DE Registry, to automate the monitoring from 2014 in order in this way to cut the costs of all offices concerned down to the municipal level. For the automation process, the metadata are to be used to a greater extent to gather information.

A large number of regional and nationwide publicity measures have been undertaken to improve the understanding of the INSPIRE Directive by spatial data holding entities. This includes Länder-specific workshops, the production of information materials in German, such as for example 'Guidance to the identification of INSPIRE-relevant spatial data' and the GDI-DE wiki (<http://wiki.gdi-de.org>). In addition to automation of the monitoring, the LG GDI-DE will in future continue to provide and reinforce central information materials on monitoring.

The result of the monitoring forms an important basis for future action for the further development of the GDI-DE and the technical and organisational implementation of INSPIRE. In this regard, questions relating to the technical network, with the deployment of national components as a common infrastructure of the federal government, Länder and municipalities, are prominently in focus as German's contribution in Europe.

4.2 Quality assurance

The quality assurance in the GDI-DE in relation to the implementation of the INSPIRE Directive includes the following elements:

- 1) Software-based support in the assessment of the conformity of metadata and network services with the respective implementing rules by the GDI-DE Test Suite.
- 2) A year-related evaluation of the spatial data sets identified and reported in the INSPIRE monitoring for plausibility, coverage and redundancy.
- 3) Metadata-based analyses, such as, for example, comparison of the contents of Geodatenkatalog.de with the reported spatial data sets and services in the INSPIRE monitoring.

4.2.1 Quality assurance procedures

GDI-DE Test Suite

With the help of the national test environment of GDI-DE, all data suppliers and service providers can check their spatial data and services for conformity with the standards or the specifications of the INSPIRE Directive. The GDI-DE Test Suite has been freely accessible since the end of September 2011. In addition to a web application (<http://testsuite.gdi-de.org>) and a download variant, an interface is also usable for carrying tests from other applications. At present, tests for checking metadata, search services (CSW) and view services (WMS) are ready. The spatial data holding entities are required to use the GDI-DE Test Suite to check conformity with the INSPIRE requirements.

The further functional development of the GDI-DE Test Suite is being coordinated and financed jointly in the GDI-DE in the context of the technical operation and a coordinated change management process. This also includes consideration of the requirements resulting from the INSPIRE Directive. The basis for this is the performance list from the Annex to the GDI-DE Administrative Agreement, in which the change management process is defined including GDI-DE stakeholders.

Year-related evaluation (INSPIRE monitoring)

In principle, the responsibility and obligation regarding the identification of the spatial data sets and services affected by INSPIRE and their reporting to the INSPIRE monitoring lies with the entities holding spatial data.

As part of the quality assurance of the INSPIRE monitoring, the spatial data sets reported were verified with regard to plausibility, coverage and redundancy by the Kst. GDI-DE. The results are produced in the form of graphics and tables and made available in the GDI-DE wiki to the GDI points

of contact of the federal government, Länder and municipalities and to the spatial data holding entities as support in the consolidation and identification of the spatial data sets and services affected by INSPIRE.

The results of the year-related evaluations are discussed regularly at workshops organised by the Kst. GDI-DE with the contact points of the federal government, Länder and municipalities with regard to inferring necessary measures. These include transversal measures aiming to improve the coordination process and quality assurance, as well as agreements and recommendations addressed to the spatial data holding entities.

Quality assurance Geodatenkatalog.de

The quality assurance of the Geodatenkatalog.de can be divided into two parts:

- catalogue interface (search service) and
- content (metadata).

The technical quality assurance of the catalogue interfaces is confined to the transversal Land and technical catalogues, which are linked directly to the spatial data catalogue. This is carried out centrally by the Federal Agency for Cartography and Geodesy (BKG).

The content quality assurance concerning the metadata themselves is the responsibility of the data providers. The latter have the possibility to check their metadata using the GDI-DE Test Suite. Nevertheless, the Kst. GDI-DE and the BKG carry out additional investigations. At least twice a year, the INSPIRE monitoring results are compared to the metadata. This involves examining whether all data and services reported in the monitoring are also described with metadata. Furthermore, at least four times a year, cross-sectional tests are carried out of the entire database to identify general weak points in the quality of the metadata. The results are given in the GDI-DE network for the purpose of quality improvement. Further tools to improve the quality of the metadata are being drawn up by the GDI-DE Metadata working group (translation of ISO 19115, conventions document).

4.2.2 Analysis of quality assurance on the basis of the INSPIRE monitoring

The quality assurance methods presented were introduced successively and developed from the 2009 INSPIRE monitoring. They represent a first step towards reliable quality management in the course of the INSPIRE implementation.

The evaluations by the Kst. GDI-DE make a fundamental contribution to quality assurance. On the basis of uniform criteria, they provide important decision-making bases for the spatial data holding entities concerning plausibility, coverage and redundancy of the respective reports. In so doing, they support not only the individual decision-making processes with a view to identification and reporting, but also aim to improve the overall result.

Hitherto, it has not been possible to achieve the objectives of the INSPIRE Directive in full despite the quality assurance measures taken. For instance, within the monitoring results of 2010 and 2011, for example, there were still spatial data sets on the themes in Annexes I and II which were described with non-INSPIRE-compliant metadata and only about half the view services were compliant with Regulation (EC) No 976/2009.¹ However, a positive overall trend is to be seen during the past few years which is not visible from the indicators. The absolute number of the metadata and services available in the infrastructure has risen non-stop since 2009. This trend is continuing. The measures taken to support identification are of considerable importance for this process and are effective especially in the context of the participation of the lowest administrative level.

4.2.3 Measures taken to improve quality assurance

¹ At present only the monitoring results of 2010 and 2011 are available. A different picture may emerge after the close of the 2012 monitoring.

Improvements in quality assurance aim to include the tools currently used in an integral procedure (also see Section 4.2.4).

Furthermore, against the background of the increasing legal certainty for the spatial data holding entities arising from the adoption of the implementing rules, the dialogue with the latter must be intensified. In this respect, in addition to the coordinating and reporting stakeholders, technical experts on the Annex themes should be included in the assessment of the respective reports. This was already practised in the past and is to be firmly established in the INSPIRE monitoring procedure in the future with the development of the INSPIRE technical networks.

In the pan-European context, the GDI-DE Test Suite is to be extended in cooperation with bodies of the European Commission (JRC) and other EU Member States. Through this, conformity pronouncements on Germany's reports would be reliable by European comparison. To secure this development, the GDI-DE Test Suite is being developed on the basis of open source licences and with English documentation. Germany would welcome it if, in the cross-sectional INSPIRE procedure at European level, the Commission coordinates and promotes this and other test procedures from the Member States in its own interest.

4.2.4 Automated quality assurance procedures

In the GDI-DE, with due regard for the use of Geodatenkatalog.de, GDI-DE Registry and GDI-DE Test Suite, the aim is for the most extensive possible automated procedure for the INSPIRE monitoring and an accompanying quality assurance procedure. In future, INSPIRE-identified spatial data sets and services are to be read directly from Geodatenkatalog.de and on the basis of the metadata, the information necessary for the monitoring transferred to the GDI-DE Registry. The acquisition of information for the calculation of the indicators, such as for example accessibility through services and the conformity to implementing rules, is then to be automated with the support of the GDI-DE Test Suite. The spatial data-holding entities and the federal government und Länder contact points then have the possibility to examine the entries and where appropriate to amend or supplement them. Overall, through this procedure, the currently still high expenditure for the INSPIRE monitoring will be reduced and the quality assurance as a whole optimised.

5 Coordination of the infrastructure components

5.1 General overview description of the GDI-DE

The construction of the GDI-DE aims to improve the supply and use of spatial data held on a decentralised basis by various administrative branches and levels of government (federal, Länder and municipal). This is linked to the demand to simplify information, communication and transaction processes – both within the administrative structures and between administrations and individual citizens, society, the business sector and the academic community. The GDI-DE can be seen as a public infrastructure of federal government, Länder and municipalities, based on interoperable spatial data and spatial data services. Hence the GDI-DE constitutes an important pillar of both e-government and open government in Germany. The purpose and scope of the GDI-DE extend beyond implementation of the INSPIRE Directive by taking into account national requirements (also see Section 4.1.2) for an infrastructure for spatial information too (Figure 2).



Figure 2: Hierarchy of the GDI-DE taking account of the levels of federal government in Germany

Key

Geodateninfrastruktur Bund = infrastructure for spatial information of the federal government

Geodateninfrastrukturen der Bundesländer und Kommunen = infrastructure for spatial information of the Länder and municipalities

5.2 INSPIRE stakeholders

As presented in Chapter 4, the GDI-DE has an established, mandatory organisational structure with the involvement of all levels of government, the business community (GIW Commission) and the academic world. Furthermore, it enables the involvement of those affected by INSPIRE and interest groups. These include, in addition to the public authorities providing data and services and the accompanying coordination tasks,

- **private organisations**, which within the meaning of an extended definition of authorities, perform public tasks or wish to participate in the infrastructure for their own business purposes,
- **specialised policy interest groups organised at national level**, which in accordance with their competence coordinate technical findings beyond INSPIRE across administrations,
- **Neighbouring States to Germany**, which establish and administer common borders with Germany,
- **scientific institutions**, which benefit from the joint infrastructure for their own purposes or are to cooperate in its further development and
- **the general public**, who under transparent and modern administration and open governance wish to participate through the infrastructure in a simple way in improved provision of information.

5.3 Role of the various stakeholders

In the GDI-DE, there are typically the following participants and roles, to which the above-mentioned parties affected by INSPIRE can be assigned depending on their respective interests:

- Spatial data holding entities,
- Data and service providers,
- Coordinators and
- Data and service users.

Spatial data holding entities in the GDI-DE may be, but are not necessarily, data and service providers for INSPIRE. In this respect, these roles are to be distinguished in the operation of the GDI-DE and in the implementation process for INSPIRE.

As explained in Chapter 4, the coordinators are necessary in both a central and decentralised role. The central coordination roles cover across-the-board coordination and provision tasks (LG GDI-DE and Kst. GDI-DE), whereas the decentralised coordinators at federal government, Land and municipal level cooperate directly with the spatial data holding entities.

The data and service users come from various sectors of the administration, business community, academic world and general public (see Section 5.2). In the operation of the GDI-DE from 2013, a central support system or Help-Desk is being established enabling user queries to be included, processed and evaluated systematically. The Help-Desk of the GDI-DE constitutes an important basis for requirements management, which considers not only legal requirements (e.g. INSPIRE Directive and implementing rules), but also the specific needs of the user groups.

The architecture of the GDI-DE takes into account the distribution of roles described above for the provision of INSPIRE data and data services too (Figure 3). Entities holding and providing spatial data publish their resources via catalogue services, which are compiled, coordinated on a decentralised basis in local catalogues (e.g. specialised information or Land information systems) and then made available to the central body (Geodatenkatalog.de). Users can generally obtain access to the resources distributed on a decentralised basis via the GDI-DE catalogue. At present there are 30 decentralised catalogue services of Länder and specialised portals linked to the Geodatenkatalog.de. It enables research in some 130 000 metadata sets (situation March 2013).

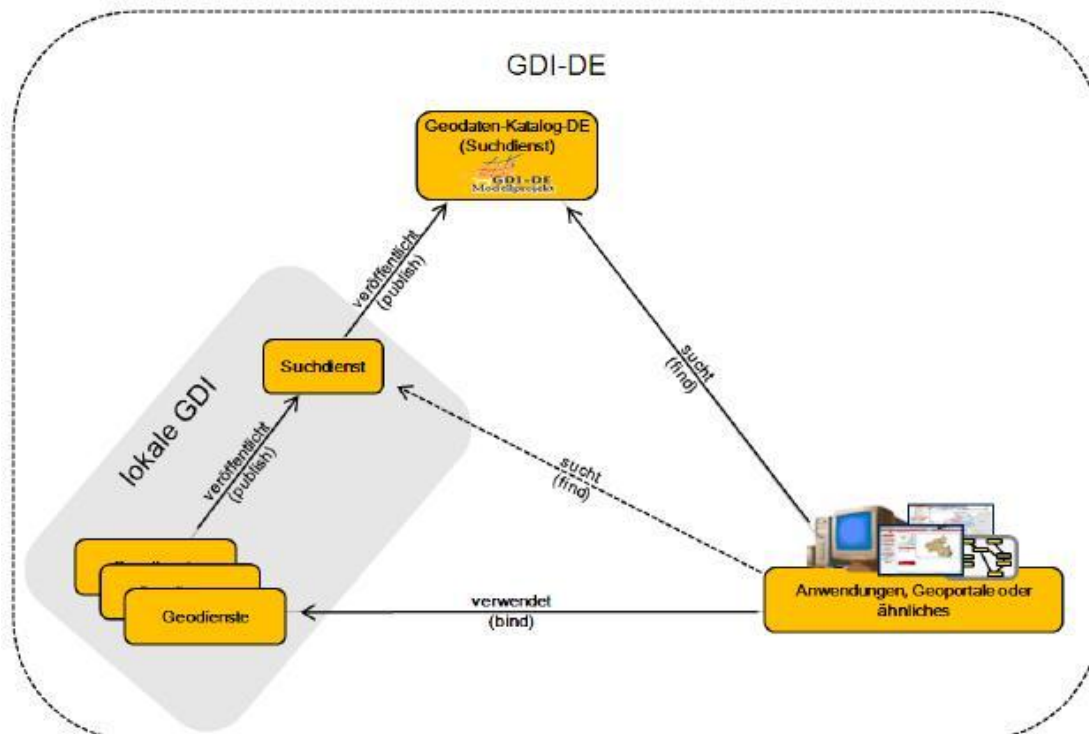


Figure 3: Role model for networking of the local GDI with the GDI-DE

Key

Geodaten-Katalog-DE = German spatial data catalogue; Suchdienst = search service; lokale GDI = local infrastructure for spatial services; Geodienste = spatial data services, Anwendungen, Geoportale oder ähnliches = applications, geoportals or similar

5.4 Measures taken to facilitate a common GDI-DE

The central measures taken by Germany to promote a comprehensive GDI-DE are set out in the joint Administrative Agreement and the coordination structure derived from it (also see Section 4.1). The architectural concept ² is a key element of the GDI-DE.

The structure of the GDI-DE has concentrated from the start on drawing up a joint understanding of the architecture, taking into account the specifications of the INSPIRE Directive. The first architectural concept V1.0, adopted by LG GDI-DE in 2007, summarised the underlying technical functions for this on the basis of common standards (e.g. search and view services). In 2010, the architectural concept was updated in a new version V2.0. In addition to the updating of recommendations on the standards contained and categorised in the concept, the architecture was extended to include national components of the GDI-DE: the Geoportal.de, the Geodatenkatalog.de, the GDI-DE Registry and the GDI-DE Test Suite. The components serve as control and optimisation functions in the service-based concept of the GDI-DE.

In 2013, the architectural concept is to be updated. The aim with the new Version 3.0 is to examine and take into account the current technical, organisational and legal requirements. These include the adaptation to new and amended implementing rules for the INSPIRE Directive.

5.5 Stakeholder cooperation

The INSPIRE Task Force Germany serves as an additional informal body for coordination above and beyond technical and administrative boundaries; its work is focused on technical accompaniment of the legislative process in the context of the implementation of INSPIRE, and especially on the gearing of the national positions to the implementing rules. It is composed of representatives of the LG GDI-DE, the Kst. GDI-DE and various federal government-Länder theme-related working groups, commissioned by the respective specialised Conference of Ministers, and is supplemented by the national experts, who are or were involved in drawing up the implementing rules for INSPIRE.

However, the necessary coordination for the implementation of the INSPIRE Directive requires not only working groups, but also direct exchanges with all stakeholders. The 1st National INSPIRE Conference was therefore held in the INTERGEO context on 9 October 2012. It was organised jointly by IMAGI, represented by the Federal Ministry of the Interior (BMI) and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), LG GDI-DE and the German Association of Cities (*Deutscher Städtetag*) and German Association of Rural Districts (*Deutscher Landkreistag*) in cooperation with the DVW – the German society for geodesy, geoinformation and land management. The joint event served as a platform for the exchange of information between users and suppliers of geoinformation. Concrete aspects of the implementation of INSPIRE were discussed in thematic forums. A follow-up event is planned for 2013.

5.6 Access to services through the INSPIRE Geoportal

The Geodatenkatalog.de (see www.geoportal.de), integrated in the Geoportal.de, offers national access to spatial data, metadata and services in Germany within the meaning of Article 15(2) of the INSPIRE Directive. It was developed, financed and operated jointly by the federal government and Länder.

The Geodatenkatalog.de has been available for INSPIRE since November 2011 and been in production since March 2012. As one of the national components of the GDI-DE, it allows access to and research in metadata and thereby makes a decisive contribution to the publish-find-bind pattern (see Figure 3). Through regular harvesting of the linked catalogues of the federal government, all the Länder and further specialised catalogues, national access is ensured to the available metadata. The metadata contained in the Geodatenkatalog.de are structured according to the ISO standards and take the INSPIRE metadata profile into account. A OGC CSW 2.0.2/ISO AP 1.0.0-compatible interface

² http://www.geoportal.de/SharedDocs/Downloads/DE/GDI-DE/GDI-DE%20Architekturkonzeptv2.pdf?__blob=publicationFile

is made available to the public for use of the catalogue, which also implements the extensions for search services required by INSPIRE.

Geodatenkatalog.de is registered in the INSPIRE geoportal as a national catalogue for Germany and is also harvested periodically. In this respect, only metadata sets are transferred which are identified by a password agreed within the GDI-DE. At present,³ the INSPIRE geoportal contains 1 366 metadata sets from Germany, describing 617 data sets and 749 services. In the 2011 INSPIRE monitoring, 2 077 data sets and 728 services were recorded. In some of the linked catalogues, not all INSPIRE-relevant metadata sets are provided with the agreed password, so they are not taken over by the INSPIRE geoportal. This shortcoming, which still exists, will be remedied in the future, under the quality assurance measures described in Section 4.2.

For the general improvement of the comparison between content from INSPIRE monitoring, the Geodatenkatalog.de and the INSPIRE geoportal, the parties concerned in Germany must coordinate closely with those of the European Commission. For the improvement of the quality management, it is desirable for the Commission to grant the Member States access to the central catalogue interface on which the INSPIRE geoportal also operates.

The non-uniform technical rules for access protection are perceived as a general problem for the use of the data and services of Germany accessible via the INSPIRE geoportal.

³ Since both the GDK and the INSPIRE geoportal are updated periodically, the figures give provide a snapshot (situation February 2013).

6 Usage of the infrastructure for spatial information

The results of the INSPIRE monitoring explain that the identification of spatial data sets concerned and accompanying services and the INSPIRE-compliant provision within the meaning of the Directive and implementing rules are to be considered not as a closed, but rather as an ongoing process. For example, at the lowest levels of government, it is essential to develop further knowledge about involvement and the necessary knowledge about all the requirements and rules of the INSPIRE Directive. The reasons for this include the very different understanding of the benefits of INSPIRE, but also the great complexity of the implementing rules. Many data providers also have concerns regarding the identification of complete data sets on account of the requirement then to make these available to the public. Also the usability of the download services is viewed critically at municipal level on account of the complex, interlinked specifications. Considering the budgetary situations in the municipalities, the personnel and cost-intensive effort to implement INSPIRE is difficult to justify. It is imperative therefore to highlight the added value of INSPIRE by means of examples and to discuss central approaches to the service provision.

In principle, it should be pointed out that a large number of further data and services are in the GDI-DE.

6.1 Use of spatial data services

The use of spatial data services is surveyed under the INSPIRE monitoring using the following indicators:⁴

- NSi3.2: annual number of service requests for all view services, divided by the number of view services (2011 approx. 770 000; 2010 approx. 558 000)
- NSi3.3: annual number of service requests for all download services, divided by the number of download services (2011 approx. 167 000; 2010 approx. 186 500)

However, these figures do not reflect reality, as the spatial data holding entities in some cases cannot make any pronouncements concerning the annual service requests and therefore in many cases a zero value is included in the calculation of the indicator. The reliability of the indicator concerning the use of the spatial data services is therefore considered to be low.

It is to be assumed that the use of the services will increase further through the provision of the spatial data on the themes listed in Annex III. The incorporation of spatial data services in complex technical procedures and processes is currently being tried out in various projects.

The existing metadata catalogues are used increasingly for the provision of spatial metadata in the open data context.

6.2 Use of spatial data

The use of spatial data is not evaluated under the INSPIRE monitoring. The harmonised provision of spatial data according to INSPIRE data models has not yet made much progress as so far few data and services are available in the INSPIRE format. It is therefore not yet possible to make pronouncements concerning the concrete use of such data files.

6.3 Use of the infrastructure for spatial data by the general public

The Geoportal.de went into pilot operation in March 2012 and has been in use in production since October 2012. It ensures national access to the GDI-DE via an intuitive graphical user interface. The public thereby has the possibility to search for the existing spatial data sets and services via the metadata and in some cases to view or download them directly. In this respect, the WebAtlasDE, a view service of the AdV, produced jointly by the federal government and Länder, is incorporated as a background map. Special theme maps provide uniform information nationwide on spatial subjects,

⁴ The figures for the 2012 monitoring are not yet available.

such as, for example, the geothermal potential of the underground. No systematic evaluation of the user behaviour or a user survey has been carried out yet.

The Länder and a large number of municipalities operate their own geoportals, which offer search, view and download functionalities, among others.

Furthermore, further possibilities for use by the public arise from the development of open data portals at both federal government and Länder levels. This facilitates the link with data of other specialised sectors and thereby promotes the use of spatial data in other contexts too.

6.4 Cross-border usage

In order to investigate the potential for cross-border exploitation of the INSPIRE infrastructure, the GDI-DE, in cooperation with GDI initiatives from Germany, Belgium, the Netherlands and the United Kingdom, organised the 'Safety, Mobility, Sustainability... Powered by INSPIRE' Conference, which took place in March 2013. The political significance of the INSPIRE Directive was expressly confirmed in the opening plenary session by the Director-General for the Environment of the European Commission and the Minister for the Interior and Municipal Affairs of the Land of North Rhine-Westphalia, as well as by representatives of the business community.

The project 'Prototype transformation of spatial data under INSPIRE in the cross-border region of Lake Constance' pursued the aim of making the basic spatial data of Baden-Württemberg, Bavaria, Austria and Switzerland available cross-border by means of uniform data models. For this purpose, the surveying authorities of Baden-Württemberg (LGL), Bavaria (LVG), Austria (BEV) and Switzerland (swisstopo) launched a joint research and development project in 2010 with the aim of deriving INSPIRE-compliant spatial data sets and services from their basic spatial data. The following themes of the INSPIRE Directive were considered in this respect (Annex I): Administrative units, Cadastral parcels, Geographical names, Administrative units, Addresses, Transport networks and Hydrography. Under the project, homogeneous INSPIRE-compliant results data were produced cross-border from the heterogeneous data models of the existing basic spatial data.

Furthermore, the Netherlands and Germany (here North Rhine-Westphalia and Lower Saxony) have been working together for years in the field of spatial information and promote the use of cross-border spatial data. For instance, in the past year, a joint service was derived and offered for a corresponding planning basis for joint projects. This service was recently extended by the view service produced jointly by the federal government and Länder, WebAtlasDE, and as a result links Germany to the Netherlands.

In addition to the above-mentioned projects, there are further examples in the Länder which involve cross-border use of spatial data sets and services and contribute to the creation of the European Infrastructure for Spatial Information (INSPIRE). Cooperation takes place, for example in the fields of basic spatial data, statistics, health management, natural resources, regional planning and flood management.

6.5 Use of transformation services

At present, a GDI-DE working group is drawing up guidance on the provision of spatial data for INSPIRE. So far, it is emerging that most data providers will first make original data files available. As a rule, secondary data files are then developed in the INSPIRE data model, which are derived from the original data. Occasionally, the original data files are provided via an on-the-fly transformation in the INSPIRE data model. In so far as transformation services are used for this purpose, these are not provided via national components of the GDI-DE, but configured and operated by the data providers themselves according to the respective requirements.

7 Data-sharing arrangements

The aim of general agreements on data-sharing in the GDI-DE is to improve and facilitate data exchange between public administrations at all levels of government and the European Commission institutions. In this respect, the possibility of application in principle in relation to third parties must be taken into account. This is especially so for the provision of public spatial data and spatial data services for the business community, which needs these for its own operations and for the development of value chains.

7.1 Arrangements between public authorities

Subject-related agreements between federal government and Länder or between Länder with one another are explained below. Agreements between public bodies in the Länder are presented briefly which cover the regulations in the respective field of competence. On account of the complex structure of individual competences for data and use rights in Germany at federal, Land and municipal levels, a comprehensive list is not given.

Environment

Under an administrative agreement between the federal government and the Länder on the exchange of data in the environmental field of 25 November 1994, the federal government and Länder make available environmental data necessary to perform their duties on a reciprocal basis. The data concerned are specified jointly by the federal government and Länder with regard to detailed configuration of the characteristics, spatial and temporal aggregation including the manner of communication, and are laid down in Annexes to this agreement. In this respect, priority is given to the processing of data which are necessary to produce an overall picture and to meet supranational and international reporting obligations.

Geotopography and basic spatial data

An administrative agreement has existed between the Federal Ministry of the Interior (BMI) and the Länder since 1 September 2006 on the provision of digital geotopographical and cartographical data of the surveying authorities of the Länder via the Federal Agency for Cartography and Geodesy (BKG). Official topographical data of the ordinance survey (ATKIS data) are in this way made available comprehensively nationwide to users by the Geodatenzentrum of the BKG, commissioned by or with the permission of the Länder, in accordance with the provisions of the agreement.

Furthermore, there is an administrative agreement of 9 February 2009 between the BMI and the Länder on the continuous transfer of official digital basic spatial data for use at federal level. The Länder accordingly provide the federal government with spatial data for non-commercial use for the fulfilment of its national and international public duties.

The administrative agreement of the Länder on cooperation in the official surveying sector entered into force on 8 December 2010. Through this administrative agreement with the AdV (Working Committee of the Surveying Authorities), the Länder optimise their nationwide cooperation and strive to make the basic spatial data available in standard form, with the required quality, to all administrative sectors in the federal government and Länder, as well as to the business community, the academic world and individual citizens.

In many Länder, there are also contractual agreements and/or regulations and decrees regulating the conditions for the use of basic spatial data by executive bodies and subordinate administrative units. These stipulate the scale of the data provision, for example, and promote shared use of data by standardising conditions for use. Whereas some agreements (regulations, decrees) provide for provision free of charge, others lay down a scale of charges.

7.2 Arrangements between public authorities and Commission institutions and bodies

There are no known framework agreements within the meaning of providing across-the-board access by European Commission institutions to the spatial data sets and services of Germany. Furthermore, there are a large number of individual bilateral agreements between individual organisations and the European Commission.

7.3 Barriers to the sharing and actions taken to overcome them

At present, a large number of cost regulations and conditions for use complicate the use of spatial data and services. Simple regulations, harmonised nationwide, would significantly increase acceptance.

Current solutions in Germany are based, *inter alia*, on an amendment to the Federal Spatial Data Access Act (*Geodatenzugangsgesetz*) in respect of open data and a pilot project on the development and testing of a standard licensing model and a simple cost model for spatial data.

At Länder level, Baden-Württemberg and Rhineland-Palatinate, for example, have released certain basic spatial data and web services of the survey authority under open data for commercial and non-commercial use. The data and services can be used free of charge under the conditions of creative commons licence CC-BY 3.0. This makes a contribution to the development of the infrastructure for spatial information and the open government in Baden-Württemberg and Rhineland-Palatinate.

In Hamburg, the Transparency Act (*Transparenzgesetz – HmbTG*) entered into force on 6 October 2012, on the basis of which a large amount of information and data of the public administration, including all spatial data, must be made accessible to the general public free of charge. Therefore, extending beyond INSPIRE, spatial data sets and services of Hamburg were made available for commercial and non-commercial use via an open data licence.

In the context of the transposition of the INSPIRE Directive in national law, Saxony has already incorporated rules on data-sharing normatively in the Saxon Spatial Data Infrastructure Act (*Geodateninfrastrukturgesetz – SächsGDIG*) and in the Saxon Surveying and Land Registry Act (*Vermessungs- und Katastergesetz – SächsVermKatG*). In particular, the basic and specialised spatial data are made available free of charge in the Saxon GDI.

Example of a normative solution: Amendment of the Federal Spatial Information Access Act

The amendment of the Federal Spatial Information Access Act (*Geodatenzugangsgesetz*) entered into force on 16 November 2012.

Key elements of the legislative amendment are:

1. The federal government spatial data sets and services, including the accompanying metadata, are available free of charge for commercial and non-commercial use and reuse;
2. The power to issue statutory ordinances in § 14 GeoZG is extended so that conditions for the use/reuse of spatial data sets and services can be defined at federal level uniformly and with binding effect by regulation.

The basic idea behind the legislative amendment is that data of the public administration (here: the federal government) can be used without the user having to pay for this. This takes account of the principles of open government and open data supported by the Federal Government.

The Regulation establishing the conditions for use for the provision of federal spatial data (*Rechtsverordnung zur Festlegung der Nutzungsbestimmungen für die Bereitstellung von Geodaten des Bundes – GeoNutzV*) entered into force on 23 March 2013. The GeoNutzV serves to reduce

bureaucracy, ensures equal treatment for commercial and non-commercial use of the spatial data and creates legal certainty concerning the reuse of spatial data and spatial data services of the federal government. It will be possible in future to renounce the conclusion of individual contractual agreements on use.

Example of normative solution: Federal E-Government Act

The Act serves the purpose of facilitating electronic communication with the administration and of enabling the federal government, Länder and municipalities to offer simpler, more user-friendly and more efficient administrative services. Dismantling barriers in federal law will facilitate electronic communication with the administration.

The Bill was approved by the Federal Cabinet on 19 September 2012 and is currently passing through the parliamentary procedure. The Act is to enter into force in 2013.

Example of tried and tested solution: IMAGI pilot project 'licensing and cost issues regarding spatial data'

The IMAGI carried out a pilot project in 2011 and 2012, under which a standard licence model, a simple cost model for spatial data services and a payment method within the meaning of electronic commerce were developed and tested under a click licensing process. The practical test was carried out together with partners from all levels of government (federal government, Länder, municipalities) and business organisations and representatives from the academic world, which cooperated actively in the pilot project in the role of service provider and/or service user.

Considered as a whole, the project led to the following results:

- The electronic business process for the licensing of spatial data services could be carried out successfully and tested.
- The click licensing process converted into the application www.GeoLizenz.org received a positive assessment overall and demonstrated a high level of user acceptance.
- The tested 'GeoLizenz' licence model, consisting of eight licence variants, was assessed as good to medium.
- The aim to develop a simple cost model under the pilot project could not be achieved.
- It was possible to integrate a payment component successfully in the application www.GeoLizenz.org.

The IMAGI pilot project was completed in December 2012 and the project results have been published: (http://www.imagi.de/themen/navl_modellvorhabenimagi.html).

On the basis of the assessment of the IMAGI pilot project by the project partners and the general public interest existing in a simplification of the licensing process, an extended test of the approaches investigated in the pilot project is in principle strived for. On this subject, it is planned that under a follow-up project, the electronic commerce process and a payment component will be implemented, taking into account the results of the pilot project, and operated under a pilot project with voluntary participation. In addition, the cost model drawn up is to be made more flexible and developed further.

Example of joint solution: Datenlizenz Deutschland

In the context of the open government projects of the Federal Government and the IT Planning Council, a data licence was developed, the so-called 'Datenlizenz Deutschland'. The development of the Datenlizenz Deutschland was necessary as there are no uniform conditions for use for data. The study 'Open Government Data Deutschland', which was commissioned by the BMI and drawn up by Fraunhofer FOKUS, investigated this question and recommended the production of a data licence. The Datenlizenz Deutschland is to lead to simplification of the conditions for use.

The use of the Datenlizenz Deutschland is voluntary. For constitutional reasons, the federal government, Länder and municipalities take decisions to a large extent independently concerning the provision of data and the conditions of data provision. The Datenlizenz Deutschland can be used for spatial data of the Länder and municipalities.

Example of technical solution: cross-organisational access control

In the case of many commercial processes, authorisation and authentication of the actors are a prerequisite for the conclusion of a transaction. In the GDI-DE context, the e-government specifications in Germany play an essential role in terms of practical implementation. It is conceivable that, based on e-government standards, cross-organisational access control will become possible. A corresponding test environment was developed in 2011, which included the GDI-DE network. The further development of the procedure is currently under examination in the e-government context and is put forward as a practical solution in international standardisation bodies.

Basic pronouncements on barriers to data-sharing:

- With the specifications assuming more concrete form and the associated financial and human resources efforts, it is precisely at municipal level that the added value and usability of the INSPIRE network services are questioned. The INSPIRE network services to be provided give rise to considerable annual costs at federal, Land and municipal levels, whereas the use of these data cannot yet be proved conclusively. In practice, the complex services seem to be applied only to a limited extent, so their implementation against the background of the current budgetary situations is also questioned.
- The complexity of the INSPIRE network services gives the impression that their use becomes more difficult and regional users will avail themselves of the existing data and services offer.
- It should be noted that even leading manufacturers of spatial information systems still do not offer the integration of INSPIRE network services in their standard systems and apparently are not planning to offer these in the near future. This constitutes a major barrier to use for the INSPIRE network services.

From the aspects portrayed, the following demands are to be inferred regarding future development:

- Under the budgetary constraints of the federal government, Länder and municipalities, instructive examples of the use of INSPIRE network services and their added value are needed as a matter of urgency.
- Considering the federal structure in Germany, work must therefore be intensified on cross-organisational approaches to data provision in order to reduce the INSPIRE-relevant expenditure for the entities holding spatial data.
- The European Commission is asked, within the realms of its possibilities, to include software manufacturers accordingly in the INSPIRE process.

8 Cost/benefit aspects

8.1 Costs resulting from implementing INSPIRE specifications

From the experience of the past three years, illustrative statements can be made concerning the cross-sector costs of the coordination and first estimates for the development of specialised knowledge, the operation of the IT infrastructure and the establishment of interoperability. In this respect, it must be noted that the estimates mentioned are based on information from individual federal or Land authorities and are not directly transferable to other administrative bodies. This information is therefore to be assessed accordingly.

In principle, it should be noted that a substantial proportion of the costs are to be allocated to the initial development of an IT infrastructure for the interoperable provision of spatial data and services. Accordingly, it is assumed that the current cost estimates including initial development are considerably above the anticipated pure operating costs occurring later.

Cross-sector costs for coordination and central operation

Cross-sector costs for the central coordination by the Kst. GDI-DE and the technical operation of national GDI-DE components, as stated in the GDI-DE administrative agreement between federal government and Länder, amounted to EUR 800 000 per year up to 2012. In the course of the evaluation and on account of the need to operate the national components Geoportal.de, Geodatenkatalog.de, GDI-DE Test Suite and GDI-DE Registry on the basis of a reliable computer operation, there was a clear increase in these funds from 2013 by the federal government and Länder. In 2013, they amount to EUR 1 835 000.00 per year for coordination and operation and will rise to a total of EUR 2 308 000.00 per year by 2017. The increase in funds from 2013 goes hand in hand for all four components with an agreed performance catalogue, the technical requirements of which have to be met by the operator (the BKG) in relation to the contracting parties.

The contributions are paid by the federal government and the Länder, half each. In addition to fulfilling the operational tasks of the central hub, these funds are used, *inter alia*, for the processing and dissemination of information necessary for the implementation of the INSPIRE Directive at all levels of government. This creates the necessary transparency concerning rules and measures of the European Commission regarding the INSPIRE Directive and the approach taken for its implementation in Germany. All measures under central coordination and operation serve the purpose of enabling the contracting parties to make savings on their own investment funds and to reliably optimise the implementation process for INSPIRE and the GDI-DE.

In addition to the expenditure necessary for the central hub for the coordination of GDI-DE and INSPIRE processes, considerable expenditure arises at the entities holding spatial information and service providers. Given the large number of bodies concerned, it is not possible to make a general calculation of a total amount. Instead, examples sought of expenditure of individual bodies are provided:

Statement by a federal authority:

According to the statement of a federal authority (specialised body), the expenditure needed for the build-up of know-how for the implementation of INSPIRE, by comparison is the highest compared to further costs. This expenditure is understood as ongoing expenditure for the INSPIRE implementation phase. The federal authority estimates personnel costs for the implementation of INSPIRE at about 0.5 full-time equivalent.

For the operating costs of the IT infrastructure, annual costs of EUR 5 000 to EUR 20 000 per spatial data service is assumed as a realistic order of magnitude.

Statements Land 1: a)

Building up of know-how

A considerable proportion of the costs for the implementation of INSPIRE arise from the building up of the necessary know-how at all levels of government. Depending on the complexity of the data models for the individual themes, in-depth methodological and IT knowledge must be accumulated. The Land indicated that one-off costs in the order of EUR 0.5 million are expected.

b) Operating costs of the IT infrastructure

Considering the Service Level Agreements, costs must be estimated for the operation of the IT infrastructure for the guaranteed performance and for the monitoring of the spatial data services. Depending on the complexity of the spatial data or spatial data services, annual costs of EUR 5 000 to EUR 20 000 per spatial data service are assumed.

c) Production of interoperability

By way of example, for the INSPIRE theme 'Population Distribution', the expenditure for the production of interoperability is estimated at about EUR 20 000. The expenditure for the production of interoperability can be reduced, however, provided that established data structures (for example, 3A-data model) can be used as a basis. Here only slight reworking is expected.

Statements Land 2:

According to a further Land, it is difficult to put a figure on the concrete costs for the implementation of INSPIRE specifications, since INSPIRE is consistently implemented in the e-government context. INSPIRE hereby represents a specific use case of e-government, so INSPIRE-specific cost shares cannot be clearly determined. The following statements can be made:

a) Business model for the implementation of INSPIRE

INSPIRE services of this Land are in principle made available only through central IT components of e-government. For this purpose, the entities holding spatial data supply the source data to the GDI service centre (GSZ) of the Land. The spatial data are processed at the GSZ, described by metadata and made available as INSPIRE services. The services provided by the GSZ are in principle free of charge for the entities holding spatial data. However, the costs for the operation of the IT components in the computer centre are shared among all municipalities.

b) IT structure

In e-government, the following individual components are made available with regard to INSPIRE-relevant individual components:

- Metadata catalogue,
- Spatial data service server (including view and download services),
- Spatial data storage (including upload),
- Spatial data processing (ETL tool),
- Spatial data security (including licence enforcement).

The operation of the IT components takes place in an external computer centre on the basis of defined Service Level Agreements, which ensure INSPIRE-compliant provision of the spatial data services.

The following costs can be estimated for the above-mentioned IT components (apart from spatial data processing):

- Development of the specialist software: approx. EUR 700 000 (one-off),
- Maintenance of the specialist software: approx. EUR 130 000 (per year),
- Operation of corresponding Service Level Agreement: approx. EUR 350 000 (per year).

c) Processing of spatial data

By means of this IT component, the INSPIRE-compliant services are derived from the source data of the entities holding spatial data. The following estimates can be made for this:

- Development: approx. EUR 50 000 (one-off),
- Maintenance: EUR 10 000 (per year),
- Operation: EUR 25 000 (per year).

d) Personnel

At the GDI service centre, about 7 full-time equivalents (FTEs) are allocated directly to the INSPIRE-related IT components and the associated services. A further 0.1 FTE is allotted to each entity holding spatial data (primarily as talking partner and for internal processing).

In principle no further expenditure of their own arise for the entities holding spatial data with regard to the implementation of INSPIRE.

8.2 Benefits

There is a lack of relevant examples of application to present a directly quantifiable benefit within the meaning of a calculable added value of INSPIRE data and services. In this respect, it has to be taken into consideration that interoperable INSPIRE data will be made available, according to the INSPIRE timetable, only in the second half of the present decade by 2020.

The project 'GDI-DE operating model' was carried out by the Kst. GDI-DE in coordination with the LG GDI-DE in 2010 to estimate the general benefits of the GDI-DE on the basis of the technical architecture. Further partners from the federal government, Länder and municipalities levels of administration and the business community and academic world were involved in the project. The aim was to develop a concept for the development, expansion and operation of the GDI-DE. The focus lay on the concrete definition of user requirements regarding the national components, i.e. the Geportal.de and the Geodatenkatalog.de, the GDI-DE Registry, the GDI-DE Test Suite and possibly further components.

For this purpose, business processes at the federal, Land and municipal authorities and business undertakings, chosen as examples in cooperation with the project partners, were examined and evaluated with regard to the benefit potential of spatial data sets and services of the GDI-DE. These included traditional administrative procedures, such as the building permit, but also the implementation and carrying out of the cross-administration INSPIRE monitoring. In addition to deriving a business and operating model for the GDI-DE, an economic efficiency analysis of the investment and operating costs was carried out. No direct monetary benefit could be derived from this. From experience, the monetary efficiency of an infrastructure measure such as the GDI-DE appears only if more applications become available which represent a measurable benefit for the public. This had not yet occurred at the time of the investigation. Furthermore, in the analysis, the project was acknowledged as having a high degree of urgency on account of the legal framework and high significance for the modernisation of the administration.

The data and services offered under the spatial data infrastructure are already tried and tested in the business models of the business world. For instance, under the pilot projects of the GIW Commission, a series of data and services are used, usually at great expense, in some cases via agreements for the time used for testing. The data and services are often also used here to support own business processes, such as in the pilot projects GeoRisiko in the insurance sector or GeoRohstoff in the extractive industries sector. Despite the progress in the field of technical standards and central approaches to data provision, the greatest barriers to use still arise from the heterogeneous regulations on licences, prices and data protection (see Section 7.3).

Overall, it emerges that for the necessary reliability of the data and services made available, which is required for use in business models, further efforts are needed towards harmonisation of the general conditions in the future.

With the extension and establishment of the operation of the GDI-DE, including the implementation of INSPIRE, considering use cases and calculating benefits will be attributed increasing importance in the future.

9 Outlook

The construction and operation of a cross-administrative spatial data infrastructure in a federal State such as the Federal Republic of Germany requires a high degree of coordination. Particular importance is attributed to the development of structures enabling on the one hand timely decisions to be taken on the further development of the GDI-DE and their implementation across all administrative levels and on the other hand taking into account the constitutional division of powers between federal government, Länder and municipalities. These structures, which have been set up since 2005, are now firmly established in Germany and are also linked through the LG GDI-DE, as national contact point for INSPIRE, to the European level too. This has been confirmed in the first years of implementation of INSPIRE.

Taking account of this circumstance, the Federal Government has placed the emphasis in its third report on progress towards developing the various fields of geoinformation in the national, European and international context (3rd spatial information progress report), alongside the pending tasks for the further development of geoinformation in the national and international context, especially on the development of the GDI-DE. The report shows the need to draw up a national and cross-level geoinformation strategy through the LG GDI-DE.

The most important future fields of action from the German point of view are:

- The incorporation of all INSPIRE measures in specific applications at national level, as in the international standard. The European Commission, as user of cross-border spatial data and services has special responsibility and a key role in this respect.
- The creation of a structure (maintenance), which enables nationwide INSPIRE findings to be evaluated and optimised in regulations and implementation guidance on the basis of practical application.
- The promotion of cross-organisational solutions to simplify general barriers to automated access to spatial data and services. These include standard-based single-sign-on procedures, among others.

Annex 1: List of organisations – Names and contact details

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Annex 2: References for the compilation of the report

GDI-DE	http://www.geoportal.de
Newsletter GDI-DE	http://www.geoportal.de/DE/GDI-DE/Media-Center/Archiv/Newsletter/newsletter.html?lang=de
Publications GDI-DE	http://www.geoportal.de/DE/GDI-DE/Media-Center/Flyer-und-Broschueren/flyer-und-broschueren.html?lang=de
Documents GDI-DE	http://www.geoportal.de/DE/GDI-DE/Media-Center/Dokumente/dokumente.html?lang=de
FAQ of the GDI-DE for INSPIRE	http://www.geoportal.de/DE/GDI-DE/INSPIRE/FAQ/faq.html?lang=de
Architectural concept V1.0	http://www.geoportal.de/SharedDocs/Downloads/DE/GDI-DE/GDI-DE%20Architekturkonzeptv1.html
Architectural concept V2.0	http://www.geoportal.de/SharedDocs/Downloads/DE/GDI-DE/GDI-DE%20Architekturkonzeptv2.html
Architectural concept V3.0 beta	
Networking of spatial information services	http://www.geoportal.de/SharedDocs/Downloads/DE/GDI-DE/Vernetzung%20von%20Geodiensten.html
Interministerial Committee for Spatial Information (IMAGI)	http://www.imagi.de/start.html
Spatial data infrastructure Baden-Württemberg (GDI-BW)	http://www.geoportal-bw.de/
Spatial data infrastructure Bavaria (GDI-BY)	http://www.gdi.bayern.de/
Spatial data infrastructure Berlin-Brandenburg (GDI-BE/BB)	http://gdi.berlin-brandenburg.de/
Spatial data infrastructure Bremen (GDI_FHB)	http://www.gdi.bremen.de/sixcms/detail.php?qsid=bremen02.c.730.de
Spatial data infrastructure Hamburg (GDI-HH)	http://www.hamburg.de/gdi-hh
Spatial data infrastructure Hessen	http://www.geoportal.hessen.de/
Spatial data infrastructure Mecklenburg-Western Pomerania (GDI-MV)	http://www.geoportal-mv.de/land-mv/GeoPortalMV_prod/de/Startseite/index.jsp
Spatial data infrastructure Lower Saxony (GDI-NI)	http://www.geodaten.niedersachsen.de/live/live.php?navigation_id=8654&psmand=28
Spatial data infrastructure in North Rhine-Westphalia (GDI-NW)	http://www.geoportal.nrw.de/;
Spatial data infrastructure Rhineland-Palatinate (GDI-RP®)	http://www.geoportal.rlp.de/portal/informationen.html
Spatial data infrastructure Saarland (GDI-SL)	http://geoportal.saarland.de/portal/de/
Spatial data infrastructure Saxony	http://www.gdi.sachsen.de/
Spatial data infrastructure Saxony-Anhalt	http://www.lvermgeo.sachsen-anhalt.de/de/wir_ueber_uns/aufgaben/geodateninfrastruktur/main.htm
Spatial data infrastructure Schleswig-Holstein (GDI-SH)	http://www.gdi-sh.de/
Spatial data infrastructure Thuringia (GDI-Th)	http://www.thueringen.de/ikg-giz/ bzw. http://www.geoportal-th.de/
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