

SDI Implementation at the Local Administration Level of Germany

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SUMMARY

Germany is a federal republic consisting of 16 states (so called "Laender"). At the local level the Federation comprises more than 300 counties and more than 13,000 municipalities. The tasks of local authorities in Germany are complex. A large number of employees care about the needs of the citizens in many fields of life: education, sports, civil protection, nature conservation, preservation of ancient monuments, building inspection, motorcar permit, social welfare, youth matters, decrees, to name a few of them. The economic success of a country intertwines with the efficiency of its public administration. E-Government has the potential to considerably improve the efficiency of administration processes. A well functioning spatial data infrastructure can provide for a basis for spatial data discovery, evaluation, download and application for users and providers within all levels of government, the commercial sector, the non-profit sector, academia and the general public. The paper describes the current status of local SDI implementation in Germany with an emphasis on already captured spatial data, realized applications and used software. Application of land tools like urban planning, land-use regulations and property registration are shown. A case study is given for the county of Bernkastel-Wittlich in German State Rhineland-Palatinate. Integration of preparatory and legally binding land-use plans into the spatial basic data infrastructure as well as other practical results of a working SDI at the German local level are explained.

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1. INTRODUCTION

Germany is a federal republic consisting of 16 states (so called "Laender"). One of these federal states is Rhineland-Palatinate with 4 million inhabitants. Rhineland-Palatinate itself consists of 24 counties (see Figure 1). The tasks of a local authority which is responsible for the administration of a county in Germany are complex. Several hundred employees care about the needs of the citizens in many fields of life: education, sports, civil protection, nature conservation, preservation of ancient monuments, building inspection, motorcar permit, social welfare, youth matters, decrees, to name a few of them.

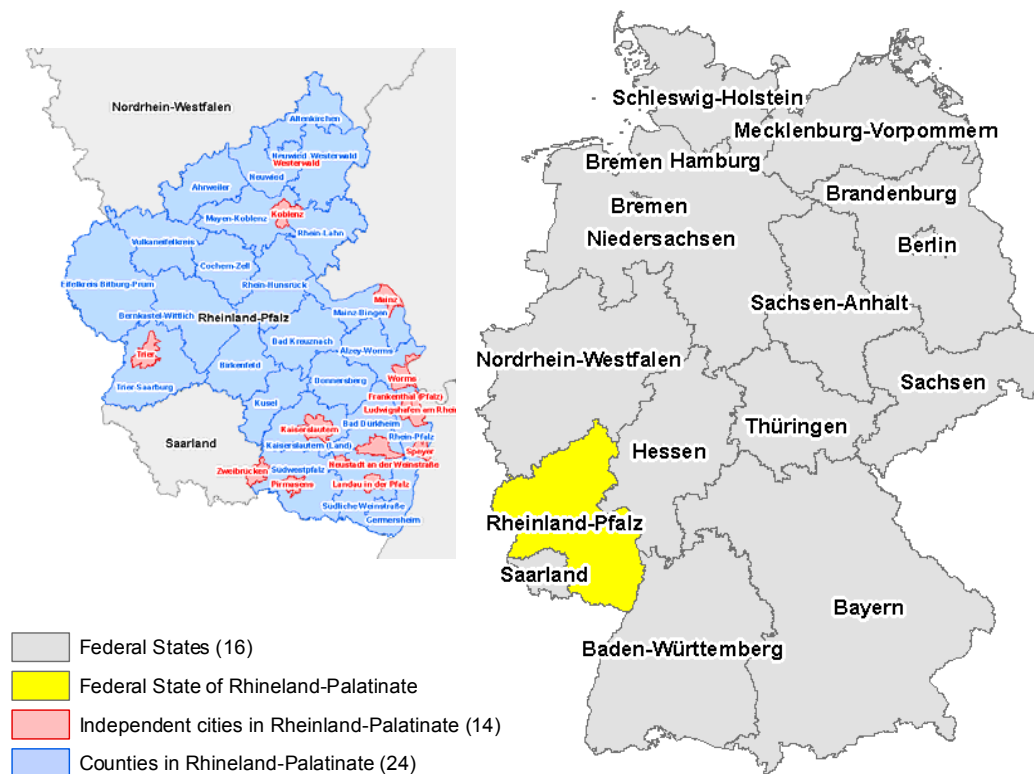


Figure 1 Federal Republic of Germany,
Federal State of Rhineland-Palatinate consisting of 24 counties

2. E-GOVERNMENT AND SPATIAL DATA INFRASTRUCTURE

The economic success of a county intertwines with the efficiency of its public administration. E-Government has the potential to considerably improve the efficiency of administration

processes. Horizontal and vertical integration of administration processes where different administration agencies are involved is difficult at the moment because of many heterogeneous IT systems driven at the Federation level, at the Federation States level comprising 16 states, at the County level comprising more than 300 counties and at the Municipality level comprising more than 13,000 municipalities. Actually, in Germany several initiatives are in progress to improve the integrated electronic support of workflows. The government of the federal state Rhineland-Palatinate intends to promote the GIS-implementation in context of an overall e-government solution. Figure 2 provides for an overview of the organisational structure of Deutschland-Online, Germany's national eGovernment strategy of the federal government, federal-state governments and municipal administrations.

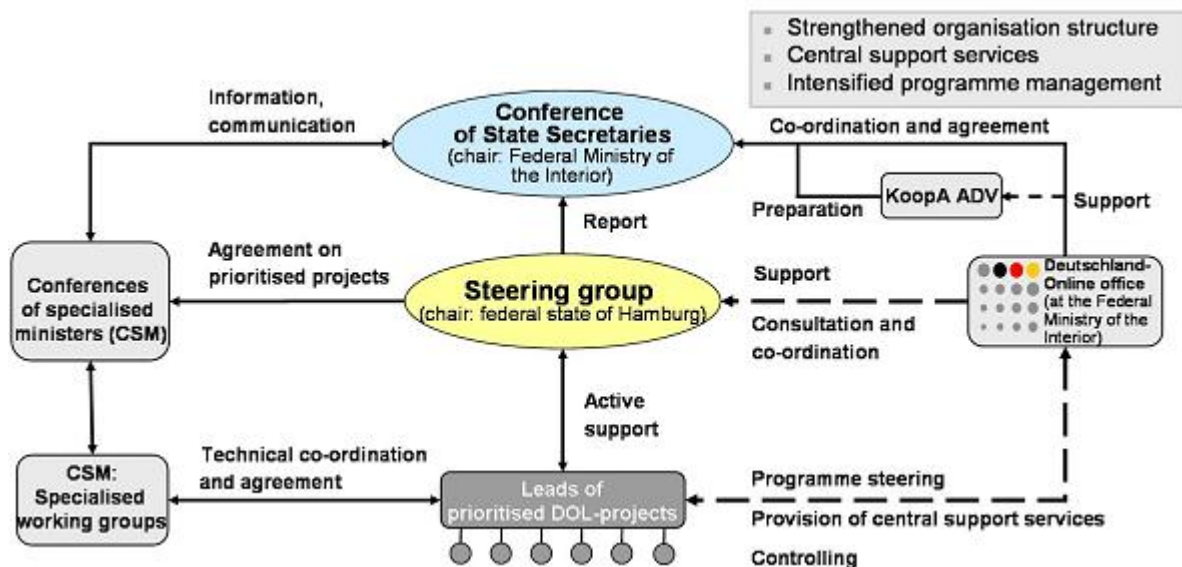


Figure 2 Organisational structure of Germany's national eGovernment strategy Deutschland-Online. Source Deutschland-Online, 2009.

A spatial data infrastructure provides for a basis for spatial data discovery, evaluation, download and application for users and providers within all levels of government, the commercial sector, the non-profit sector, academia and the general public. Figure 3 gives an overview of INSPIRE – Infrastructure for Spatial Information in Europe system architecture which yields an example of an SDI conception.

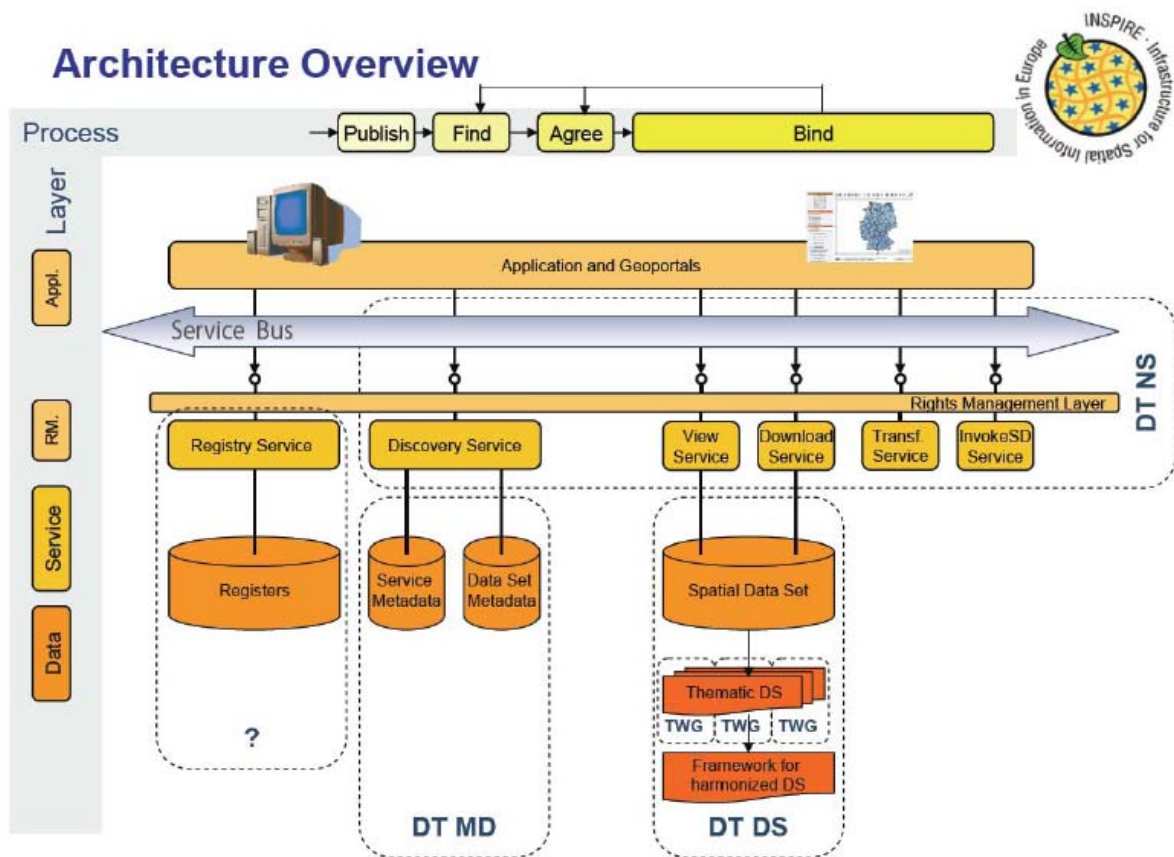


Figure 3 SDI approach of INSPIRE – Infrastructure for Spatial Information in Europe
(Source Bernard, 2008, see also INSPIRE, 2007)

2.1 Provision of Geospatial Basic Data in Germany

In Germany, the surveying, mapping, and cadastral authorities of the Federal States provide for the fundamental data for spatial referencing (Spatial Basic Data) to support public, industrial and private users. Spatial Basic Data concerning property registration and topography of the earth's surface are recorded and provided in different digital formats (see Figure 4, Figure 5).

Further efforts have to be made to bring together those elements of an SDI which are already available with all other SDI components provided by a broad community of current and potential users. Improvements are necessary at both, technical and organisational, levels. Integration of SDIs from different levels is a core part of functionality. Guidelines on how to achieve this integration can help to promote the integration work in practice.

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Flurstück und Eigentümername					Seite 1
Katasteramt	0221	Vermessungs-Katasteramt Bernhards-Luis am Markt 24 5470 Bernhards-Luis Tel: 0430 31 1342 Wittlich			
Gemarkung	07251	Wittlich			
Gemeinde	07251134	Bernhards-Wittlich			
Ortsname	0043	Bernhards-Wittlich			
Ortsgl.	Flz.	Flurstück	P.	Status	0
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				Lageplankarte	02.04.08 A.24
Lage	11826	Ablicher Weg			
	11845	Kurtznerstraße 10			
Tatsächliche Nutzung	7319 m ²	21-111		Gebäude- und Freifläche -	
	105 m ²	21-421		öffentliche Verkehrsfläche	
	262 m ²	21-612		Park	
	7738 m ²			Erbbauangelegenheiten	
Klassifizierung	33	Städterflächennutzungsplan			
	330 m ²	23-200		Gemeindefläche	
	320 m ²				Einzel
Hinweise	41	Denkmalschutz			
Anteilsgemeinschaft	0430	Wittlich			
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Figure 4 Geospatial basic data countrywide available in Germany, Real estate record (left), Real estate map (right)



Figure 5 Geospatial basic data countrywide available in Germany, Digital orthophoto (left), topographic map (half left), digital height model (half right), digital landscape model (right)

2.2 SDI Implementation at the German local level

A broad survey took place to explore the current situation in local administration bodies in the south-western part of Germany. The result of this survey was a documentation concerning the current status of the use of geoprocessing software tools and the users' needs with regard to spatial data structures and spatial data processing routines. Implementation of a spatial data infrastructure including all needed data, IT functionality, personnel skills, etc. is an ample task, sometimes long lasting and costly. That is why, usually, a step by step approach has to be used (see Table 1). Cost benefit considerations were made to identify the potential benefits

obtainable through an SDI. Currently, the implementation of the developed strategy takes place at several involved institutions.

System analysis	System selection	System implementation
Strategic planning	Public tender	System installation, system acceptance
Field research and analysis	Offer rating	Data acquisition, data migration
Conceptional modelling	Functional tests	System use
Professional concept	System rating, system recommendation	
IT-concept		
Cost benefit analysis		

Table 1 Principal work plan

3. CASE STUDY OF BERNKASTEL-WITTLICH, COUNTY OF GERMAN FEDERAL STATE RHINELAND-PALATINATE

The following section will describe the current status of local SDI implementation with an emphasis on already captured spatial data, realized applications and used software. Application of land tools like urban planning, land-use regulations and property registration will be shown. The case study is given for the county of Bernkastel-Wittlich. Integration of preparatory and legally binding land-use plans into the spatial basic data infrastructure as well as other practical results of a working SDI at the German county level will be explained.

3.1 The County of Bernkastel-Wittlich

Bernkastel-Wittlich, the second largest county of German Federal State Rhineland-Palatinate, covers an area of about 1.200 square kilometres having a population density of about 100 inhabitants per square kilometre. In that way Bernkastel-Wittlich represents quite well the German rural areas. The county consists of 106 small municipalities which form a number of 7 associated municipalities plus 2 townships. The county administration body consists of a number of about 20 departments which all have to fulfil their specific tasks. In the following paragraphs some of the departments will be named to show in which way they profit from and contribute to a working SDI.

3.2 Use of Geospatial Basic Data across County Administration Departments

One of the most often posed questions is ‘who owns which parcel?’ This question can be answered very quickly by querying the Geospatial basic database as provided by the

Surveying Authorities (see section 2.1). Therefore, this application is widely acknowledged within the administration office and is used very frequently. Technically spoken, the information has to be retrieved from the automated land survey register (ALK) and from the automated register of real owners (ALB), see Figure 6.

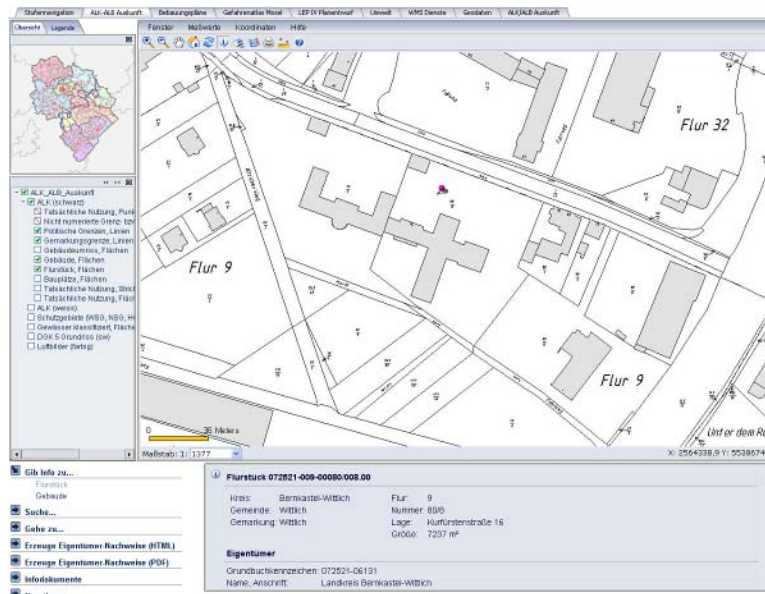


Figure 6 Information retrieval from automated land survey register (ALK) and automated register of real owners (ALB)

3.3 Applications in the Department of Buildings and Environment

Figure 7 shows how habitats and reserves can be retrieved both in graphical and textual form by using a feasible Wep Map Service. In that way any person in charge has the information showing protected areas instantly available. If any and in which way a specified area has a protected status is an indispensable information which is crucial for many spatially related decisions.

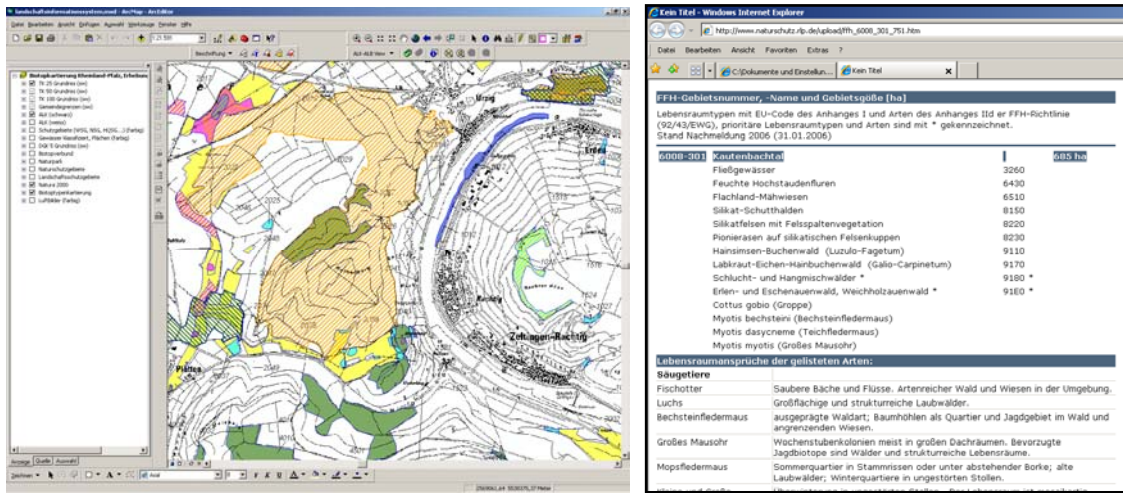


Figure 7 OGC Web Map Service WMS Protection areas (left), direct link to describing information (right)

Citizens have to apply for a building permit to erect a new or to change an existing building. Permits will be granted only if the application is in accordance with the land-use regulations which are defined by the planning authorities in the course of a democratic participatory well defined process. Legally binding land-use plans provide for the base to compare applications for building permits with the legal land-use regulations which are valid in the area under discussion. Figure 8 shows how this check can be done very easily by using a WMS which is connected with the software used for the administration of building permits.

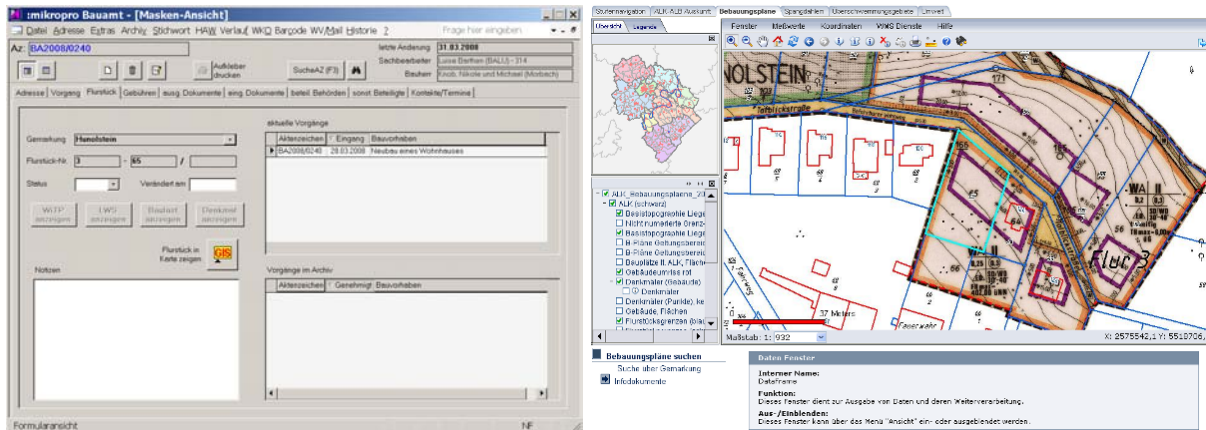


Figure 8 Interactive Processing of building permit applications by using a WMS providing for legally binding land-use plans

3.4 Applications in the Health Department

Health prevention is one of the tasks of a public administration. Actions have to be taken as fast as possible in case of an avian influenza case, for instance. To minimise processing times in an emergency case it is highly desirable to get a list of possibly affected locations of domestic animals on stock at a push of a button. Geocoding of locations in conjunction with standard GIS functions like buffering and intersection of spatial datasets provides for the solution of the information problem. Figure 9 shows a simulated avian influenza case together with possibly affected locations.

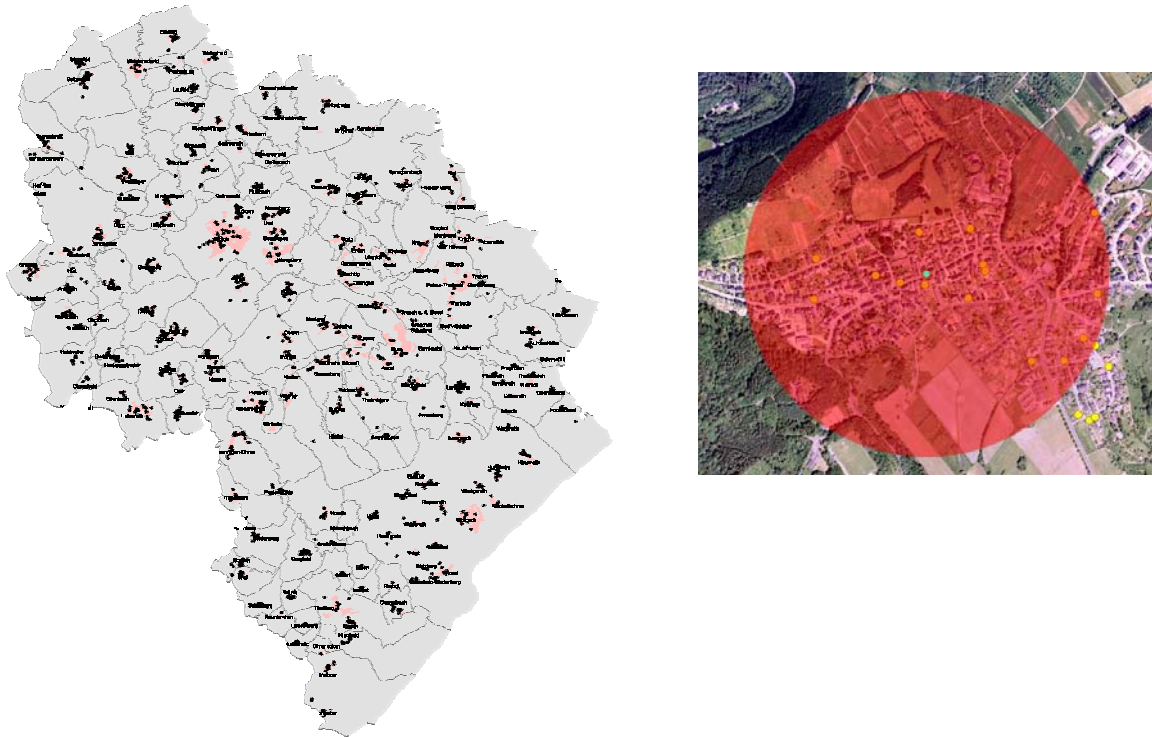


Figure 9 Simulation of avian influenza case and resulting possibly affected locations

3.5 Applications in the Planning Department

Potential locations for wind power stations have to meet certain criteria, like a minimum distance from built areas and from roads, they do not have to be within areas which are preserved for other purposes, etc. The examination of potential locations can be sped up considerably by having the needed spatial information laid down in maps and textual documents available (see Figure 10).

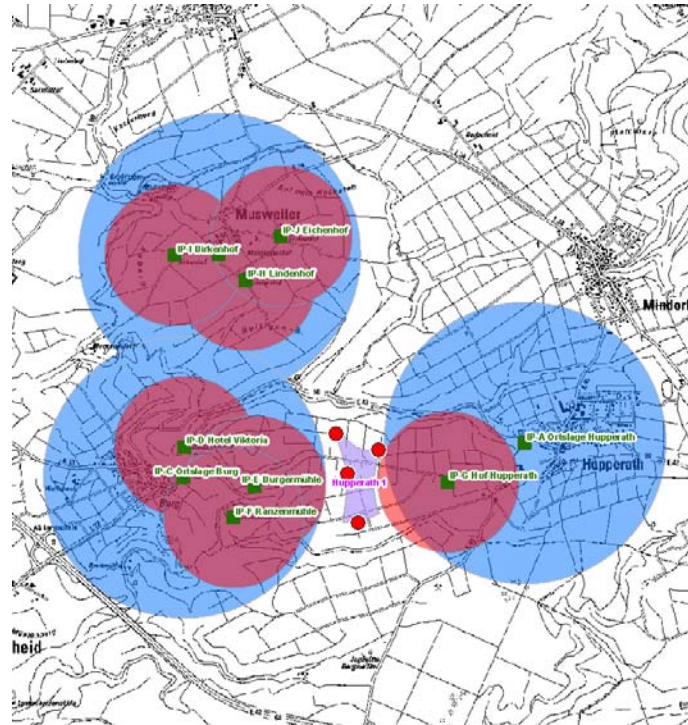


Figure 10 Examination of potential locations for wind power stations

3.6 Integration of preparatory land-use plans in the federal state SDI

In Germany the process of building its national SDI is in full operation. At the national federation level the implementation takes place under the name GDI-DE, at the regional level the 16 German Federal States implement their own SDI's by using corresponding acronyms like GDI-RP, which represents the regional SDI of the Federal State Rhineland-Palatinate, for instance. Implementation of local SDI's takes place at the level of municipalities. Local SDI's are closely linked to the regional SDI of their respective state territory. Figure 11 shows the design of the future European wide SDI defined by the INSPIRE initiative.

The geoportal of Rhineland-Palatinate GeoPortal.rlp provides for access to spatial information on the complete territory of the federal state. 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. Geospatial data are available at the involved institutions in a wide range of formats, partly in analogue form, or, if digitally available, filed in a considerable number of different file formats.

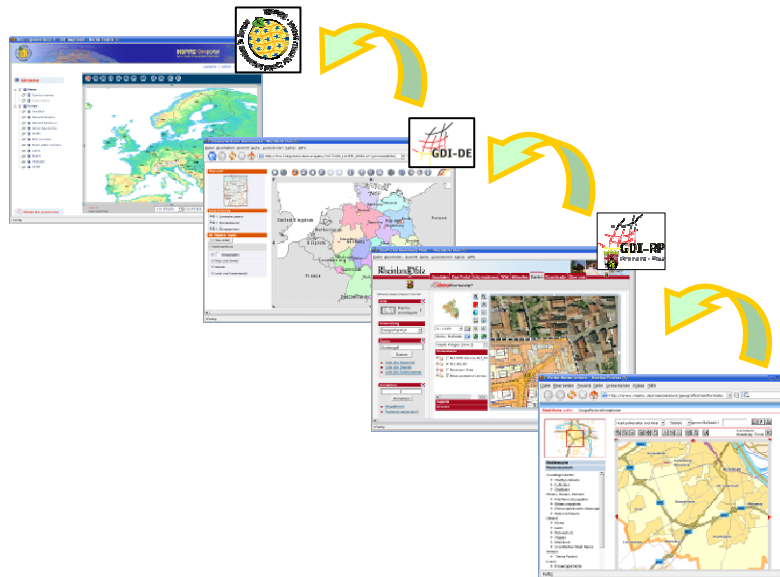


Figure 11 Cascading Services from EU level over National and State level to local level



Figure 12 Preparatory land-use plan provided by county administration as a service within federal state SDI

Figure 12 shows a preparatory land-use plan of the pilot authority Bernkastel-Wittlich which is provided in the Geoportal.rlp as a Web Map Service. In that way, valid planning regulations are accessible by any interested person. The combination of land-use regulation and appraisal issues is of particular interest. From Figure 13 it can be seen how such a combined view to an area of interest may look like. In this way potential investors can retrieve valuable information needed within their decision process.

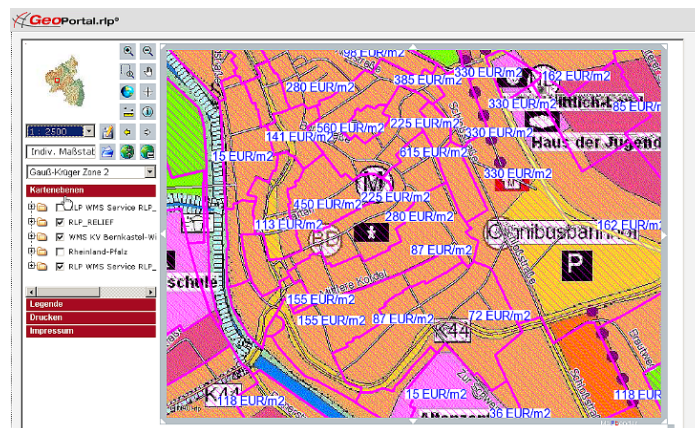


Figure 13 combination of preparatory land-use plan and land values within federal state SDI

4. CONCLUSIONS AND FURTHER WORK

SDI implementation at the local level on the one hand is closely related to and is able to fulfil many basic needs of citizens and public administration by providing huge amounts of basic spatial data. On the other hand careful SDI design and implementation at the local level is an indispensable prerequisite for establishing a working SDI at all higher level. Consideration of standards, mainly those defined by OGC makes it possible to integrate local SDI bricks smoothly into an overall SDI. Many questions concerning semantic interoperability, metadata specification and maintenance are still not answered in a sufficient way and, therefore, remain as a challenge for future work.

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BIOGRAPHICAL NOTES

Hartmut Müller got his diploma and doctoral degree at Karlsruhe University. After 8 years of research he turned into the marketing and software development departments of international enterprises for 6 years. Since 1991 he has been working as a professor at Mainz University of Applied sciences. Since 1998 he has been a member of the board of i3mainz, Institute for Spatial Information and Surveying Technology. In the DVW – German Association of Geodesy, Geoinformation and Land Management he is the chair of working group 2 –Spatial Information and Spatial Data Management.

Stephan von St. Vith holds a diploma in Geography. From 2000 to 2005 he worked with a German ESRI partner company. Since 2005 he is the GIS administrator of the administration of German county Bernkastel-Wittlich.

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