

Framework Conception for the Environmental Information System of Baden-Württemberg (Germany)

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Abstract: The Environmental Information System of the federal state of Baden-Württemberg in Southwest Germany is the organisational, technical and content-related framework for the processing of environmental information within the state and municipal administration in Baden-Württemberg. It also provides the basis for reporting to the public. The main emphasis of the Framework Conception 2006 for the Environmental Information System is to describe the structures and processes which were developed due to a major reform of the administrative structures in Baden-Württemberg – as a joined solution for a comprehensive UIS operated in partnership by state and municipal administrations.

The most important factors for the success of the Environmental Information System of Baden-Württemberg (UIS BW) are outlined with concrete examples of organisational and technical solutions.

Keywords: Environmental Information System.

1. GOAL OF THE FRAMEWORK CONCEPTION AND ITS AREA OF APPLICATION

The Environmental Information System of the state of Baden-Württemberg in Southwest Germany is the organisational, technical and content-related framework for the processing of environmental information within the state and municipal administration in Baden-Württemberg. It is part of the e-Government Concept Baden-Württemberg as well as of the ICT cooperation between the state and the municipalities on the one hand and the state, the Federation and the European Union on the other hand.

The Framework Conception 2006 (RK UIS 06) describes the functional, legal, political and organisational factors – effective at the time of its development – which determines the operation of the Environmental Information System (UIS BW). The RK UIS 06 shows the potentials of the application of modern information technology and makes recommendations for the further development of the UIS BW.

A special characteristic of the UIS BW is its cross-departmental scope and area of application. An appropriate project organisation guarantees the constant participation of all involved departments through the Ministry of the Environment, which is in charge of the

UIS BW. Like the preceding Framework Conceptions of the years 1986, 1990 and 1998, the RK UIS 06 has been approved by the government of Baden-Württemberg.

Due to a reform of administration in 1995, which caused the devolvement of environmental tasks from the state to the municipalities – especially in the field of water management and waste management – the communities and the rural districts already took part in the development of the Framework Conception of 1998. At the same time, the municipalities were committed by public law agreement to the implementation guidelines of the conception.

At the beginning of 2005 a law came into force, which caused a major reform of the administrative structures in Baden-Württemberg, and an even greater transfer of responsibilities from the state authorities to the administrative authorities on the regional and the district level. As a result it was necessary to rearrange the collection, management and exchange of environmental data within the UIS BW and to provide appropriate ICT services, suited best under these circumstances. The RK UIS 06 is significantly characterised by the new demands of the ICT cooperation between the state and the municipalities.

The data management and communication within the UIS BW also has to ensure, that environmental information can be passed on from the UIS BW to other federal states and the federal government, especially in order to fulfil the obligation of reporting to the European Union.

In addition to the collection and provision of data for the law enforcement in the environmental authorities of the state and the required reporting to national and supra-national authorities, there is an obligation to inform the public comprehensively about the environment. The Environmental Information Act of Baden-Württemberg, which implements the demands of the directive 2003/4/EC of the European Parliament and of the Council on public access to environmental information on the state level, places further demands on the UIS BW. These also had to be taken into account by the RK UIS 06.

2. CONTENTS OF THE FRAMEWORK CONCEPTION

The chapter Inventory (Bestandsaufnahme) shows the important information systems and services of the UIS BW. About 75 different well matched hardware and software components are described in three categories: base systems, specialised applications and comprehensive components. The registry of services comprises of 18 services, which are either used by several specialised systems or made available as web services.

The chapter Technical Design (Technisches Konzept) describes the service architecture of the UIS BW in detail. Further emphasis is put on the processing of spatial data as well as on common technical standards and safety issues.

The chapter Information Management (Informationswesen) deals not only with technical and organisational aspects of the management of data, documents, information (especially metadata), knowledge and business processes, but also with workflow management and data quality assurance.

A separate chapter concerns with the diverse cooperations (Kooperationen) between the state and the municipalities, between the federal states and the federal government and between the public administration, research institutes and companies. All these cooperations are essential for an economical development of the UIS BW.

Two further chapters, Data Privacy and Economy (Datenschutz, Wirtschaftlichkeit), focus on the special demands concerning data privacy and profitability of the UIS BW, with a view to e-Government.

Last but not least, the chapter Implementation (Umsetzung) of the RK UIS 06 makes recommendations on how the strategic goals can be transformed into concrete solutions, which benefit the users of the UIS BW on all levels.

3. MANAGEMENT AND EXCHANGE OF ENVIRONMENTAL DATA WITHIN THE ICT COOPERATIVE BETWEEN THE STATE AND THE MUNICIPALITIES

The uniform gathering and management of environmental data, derived from the execution of environmental tasks, is regulated within two major ICT projects, in which the responsible ministries, the urban and rural districts and the governmental districts take part. The Information System for Water, Immission control, Soil, Waste, and Occupational safety and health (WIBAS) – under the responsibility of the Ministry of the Environment – and the Nature Conservation Information System (NAIS) – under the responsibility of the Ministry of Food and Rural Area – were introduced into usage for all concerned authorities of the state and the municipalities.

WIBAS and NAIS have a joint software architecture and data organisation. They comprise about 35 different specialised applications and 12 services, used by both systems.

The specialised applications and the services are developed and maintained by the Centre for Information Technology of the State Institute for Environment, Measurements and Nature Conservation (LUBW) and the Data Centre Baden-Württemberg (DZBW) in a coordinated approach. Usually the software is updated once a year. Together with the specialised data and the spatial data from the central database of the LUBW, the software is delivered to all institutions in a unique setup. The on-site support for the local authorities is carried out by the DVV BW, a group of institutes, providing ICT services especially to the municipalities. The Information Technology Centre for the State Administration of Baden-Württemberg undertakes the support of the governmental district authorities.

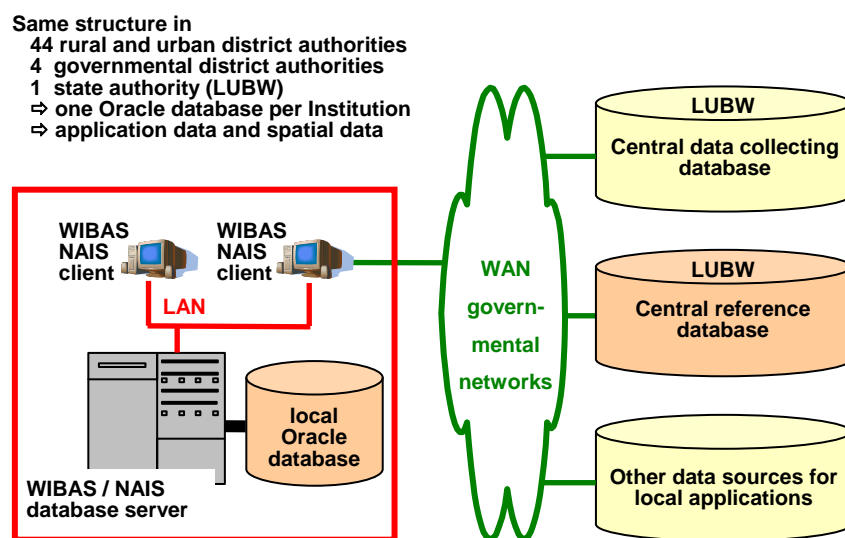


Figure 1. WIBAS / NAIS: System architecture and data access

The WIBAS Data Catalogue (WIBAS-OK) provides the policy for the data management regarding the content and organisational measures. It defines in detail, which data have to be collected by whom, how the collection should be carried out, and where the data should be sent.

The data collection and the primary data management take place mostly in the local databases of the authorities. The schema of the Oracle database is distributed in combination with the yearly WIBAS software update (Fig. 1).

Once a month the data from the local databases, which is destined for the data exchange between the administrations, is transferred to the central UIS reference database, located in the LUBW. The technical and organisational aspects of the data exchange are precisely stipulated in the WIBAS-OK. All users of the institutes can access the reference database read-only with the UIS Reporting System, according to their rights appointed in the WIBAS-OK. Currently 3,200 users are able to access the reporting system by use of the administrative networks of the state and the municipalities. The UIS-BRS is based on the Software CADENZA, which is developed in cooperation with the disy Informationssysteme GmbH, a company located in Karlsruhe, Germany. In Germany, CADENZA is used by six federal states, three larger administrations of the federal government and partly in the municipalities.

Like WIBAS the processing of spatial data within the UIS BW includes central and local components (Fig. 2). The Centre for Information Technology of the LUBW merges spatial base data from the land survey offices with specialised spatial data from the LUBW and other sources in a central data pool (RIPS-Pool). Oracle Locator is used for the data management, ArcGIS/ArcSDE for the central organisation of spatial data and the provision of appropriate services.

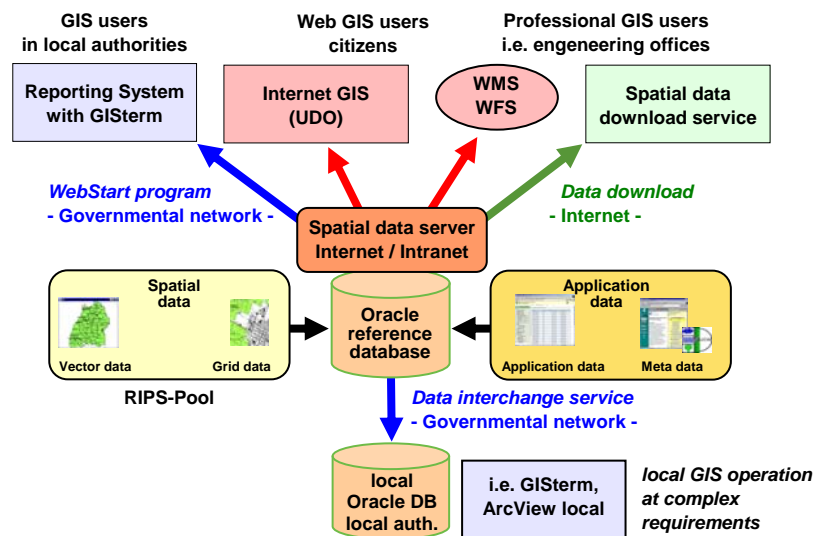


Figure 2. Management and distribution of spatial data

The environmental spatial data of the RIPS-Pools are provided by the LUBW and other authorities with a state-wide responsibility as well as from the monthly data exchange of the enforcing authorities. The data is disseminated from the central spatial data server to the different user groups in the following ways:

- to users of GIS (geographic information systems) in the offices through the UIS Reporting System or GISterm and GISterm Web, components based on the CADENZA software,
- to citizens with their own GIS infrastructure by means of web services (WMS, WFS) or the download service for ESRI shapefiles,
- to the common citizens with help of the web application Environmental Databases and Maps online (UDO), which is also based on the CADENZA software.

RIPS makes a significant contribution to the Spatial Data Infrastructure of Baden-Württemberg (GDI-BW), which is currently developed and serves the implementation of the directive of the European Parliament and of the Council establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) on the state level.

4. CENTRAL MANAGEMENT AND DEPLOYMENT OF DATA BY THE LUBW

The LUBW not only runs the UIS reference database and the RIPS-Pool, as a central data pool for spatial data, but also the central database for measuring series – the Measuring Series Operation System (MEROS). MEROS, which was put into operation several years ago, provides a uniform modelling for all measuring data of the state-wide monitoring networks operated by the LUBW, covering various areas like water, soil, air and radioactivity.

A unique characteristic of the UIS BW is the fact, that the three major data bases – the UIS reference database, the MEROS measuring series database and the RIPS-Pool – have been combined by ER modelling to one logical database, the Database for the Comprehensive UIS Components (Fig. 3). All application data and spatial data of this encompassing reporting data base can be accessed by the UIS Reporting System.

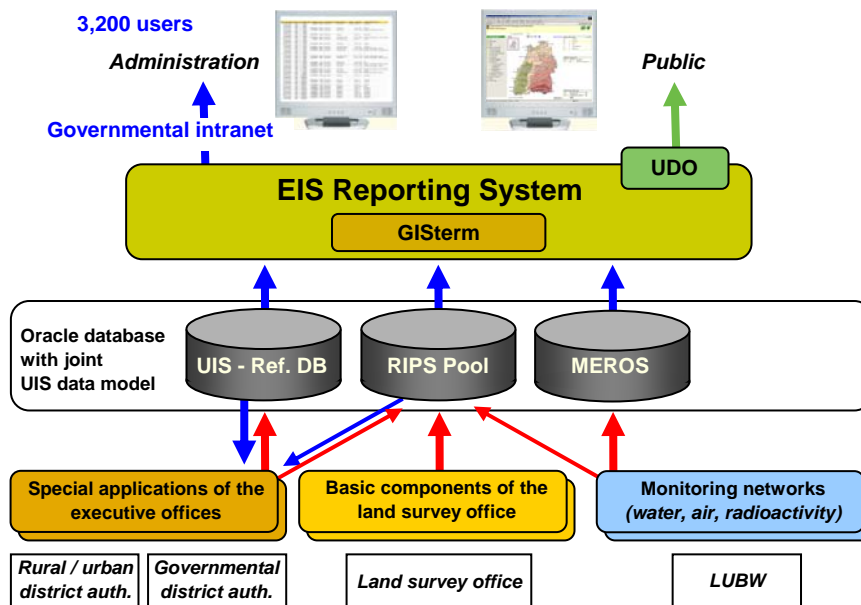


Figure 3. Central databases and Reporting System of the UIS BW

According to the status and the special needs of the users working with the UIS Reporting System, three different versions of the system have been deployed:

- A full version for specialists in the environmental administration, who need specific data analysis.
- A less complex web version (BRSSWeb) for occasional users in the administration without special knowledge, who want to access and visualise data quickly over the administrative networks.
- A particular version of the BRSSWeb, called Environmental Databases and Maps online (UDO), which offers public access to a limited amount of application data and spatial data over the internet. This version especially helps to fulfil the demands of the Environmental Information Act of Baden-Württemberg.

5. INFORMATION PORTALS – SERVING THE ENVIRONMENT AND THE CITIZENS

The legal basis for the reporting of environmental issues to the public is the Environmental Information Act of Baden-Württemberg. The obligation to provide environmental information demands a high level of quality and transparency of the data presentation. It is very important, that the information is comprehensible not only for the specialists. Considering the amount of data, features like a clear structure, intuitional user guidance and convenient search functions have a great significance.

The means of choice in this case is the implementation of internet portals, which enable transparent presentation with a combination of reports, documents, catalogue information like metadata, databases and news.

The prime example for an environmental information portal is the German Environmental Information Portal (PortalU) which is developed and operated by a cooperation between the federal government and the federal states.

PortalU regularly collects all environmental information of the state authorities in Baden-Württemberg available on the internet and provides the public with different options to arrange and search these data.

A main characteristic of PortalU is that the public data provided by the various authorities all over Germany are described in a uniform manner in the Environmental Data Catalogue. The data descriptions (metadata) from the UIS BW naturally can be found in this catalogue.

At present it is not the intention of PortalU to provide data from the municipalities. This gap is filled by the Environmental Information Portal of Baden-Württemberg (Portal Umwelt-BW), in which all providers of environmental information on the state level as well as the larger cities in Baden-Württemberg take part with their specific websites. Stringent regulations prevent inconsistencies and duplication of work concerning PortalU. Therefore all information providers on the state level are held in the same way both in Portal Umwelt-BW and PortalU. The structuring, the metadata and the tagging of PortalU have been adopted by Portal Umwelt-BW.

Portal Umwelt-BW also helps the municipalities to fulfil their obligations regarding the Environmental Information Act of Baden-Württemberg in the best way possible. In the meantime this concept – including the administration tool and the search engine (Google Search Appliance) – has been adopted by the responsible ministries of the Federal States of Saxony-Anhalt and Thuringia. A corresponding cooperation between these two ministries and the Ministry of the Environment of Baden-Württemberg was started.

6. WEB SERVICES

Environmental information is disseminated by the use of web services at an increasing rate both to users within the administration and to public users over the internet. The underlying technique allows transmitting data – and partly functions as well – without redundancy and always up-to-date. But it is necessary to set up the services in accordance with the standards of the World Wide Web Consortium (W3C) for web services in general and the Open Geospatial Consortium (OGC) regarding web map services.

Today the LUBW already provides a selection of about 60 standardised web map services (WMS). Anyone running a web server, therefore, can integrate corresponding up-to-date maps from the UIS BW dealing with subjects such as nature conservation, water management and climate protection into their own website.

Due to the increasing amount of web services, provided by the UIS BW to environmental offices in Baden-Württemberg, an automated registry had to be established. Consequently, the LUBW has developed such a registry in conformity with the UDDI standard, and especially for the reporting services. The web map services, which are at the same time developed for the Spatial Data Infrastructure of Baden-Württemberg (GDI-BW) according to the INSPIRE standards, are also registered in a special Catalogue of Metadata and Services (RIPS-OK), which conforms to ISO 19115.

One service of the LUBW, frequently used by environmental offices of the municipalities, concerns the reporting services of the web application Environmental Databases and Maps online (UDO). This service enables the environmental administrations of the district authorities to integrate reports, which are generated using the corresponding data of the UIS reference database (see chapter 3) within the area of the district, into the websites of the municipal information providers (Fig. 4).

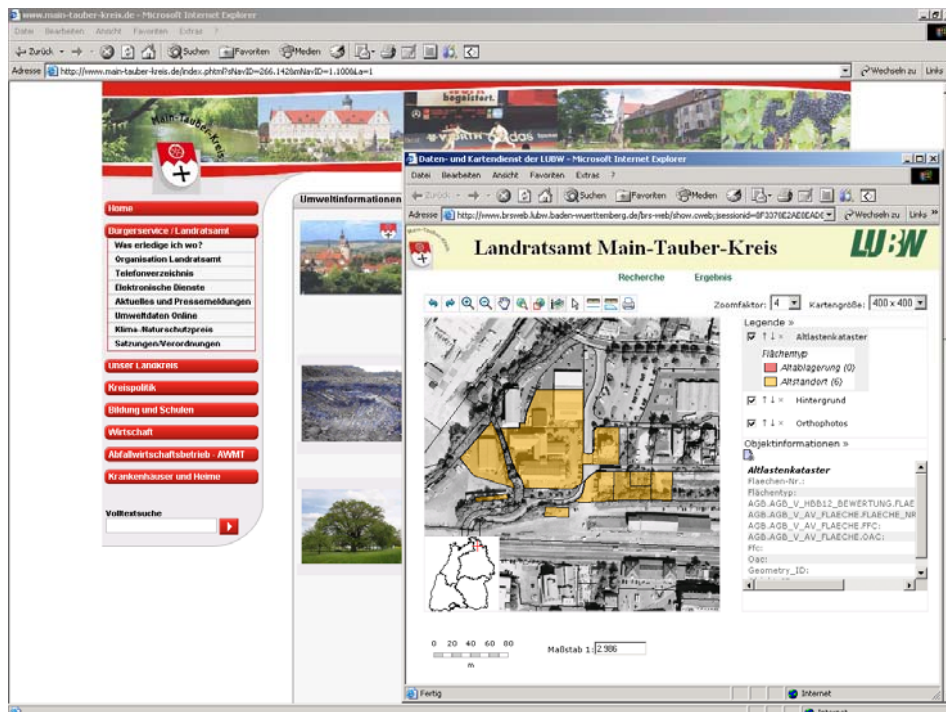


Figure 4. Thematic map from UDO in a web presentation of a rural district authority

7. PERSPECTIVES

The Framework Conception for the Environmental Information System Baden-Württemberg (RK UIS) contains guidelines and recommendations, which shall either be implemented gradually over the next years or taken in to account when components of the UIS BW need to be developed or modified. A major update of the conception is conducted normally every five to ten years.

The demand for an update is primarily owed to a modification of the determining factors, such as new laws or further changes in the administrative structure, which causes a shifting of responsibilities.

The technological progress and the market trend in ICT open up new possibilities, which in the first instance have to be considered in a timely manner as well as in pragmatic way, but in the medium term need to be evaluated in a strategic and conceptual manner.

The RK UIS 06 is based on a long-term experience of developing and operating an environmental information system in an intensively structured federal administration with distinctive cooperative elements. Therefore, it may be of use for institutions and authorities of member states of the European Union with a comparable allocation of responsibilities.

ABBREVIATIONS

LUBW	State Institute for Environment, Measurements and Nature Conservation (Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg)
MEROS	Measuring Series Operation System (Messreihen-Operationssystem)
NAIS	Nature Conservation Information System (Naturschutz-Informationssystem)
PortalU	German Environmental Information Portal (Umweltportal Deutschland)
RIPS	Spatial Information and Planning System (Räumliches Informations- und Planungssystem)
RK UIS 06	Framework Conception for the UIS BW of the year 2006 (UIS-Rahmenkonzeption 2006)
UDK	Environmental Data Catalogue (Umweltdatenkatalog)
UDO	Environmental Databases and Maps online (Umwelt-Datenbanken und -Karten online)
UIS BW	Environmental Information System of Baden-Württemberg (Umweltinformationssystem Baden-Württemberg)
WIBAS	Information System for Water, Immission control, Soil, Waste, and Occupational safety and health (Informationssystem Wasser, Immissionsschutz, Boden, Abfall, Arbeitsschutz)

BIBLIOGRAPHY

Rahmenkonzeption 2006 des Umweltinformationssystems Baden-Württemberg:

<http://www.uis.baden-wuerttemberg.de/servlet/is/29835/>

Konzeption RIPS 2006: <http://www.uis.baden-wuerttemberg.de/servlet/is/29847/>

Konzeption WIBAS 2006: <http://www.uis.baden-wuerttemberg.de/servlet/is/29852/>

Kooperative Entwicklung wirtschaftlicher Anwendungen für Umwelt, Verkehr und benachbarte Bereiche in neuen Verwaltungsstrukturen (F+E-Vorhaben KEWA) – Forschungsbericht Phase III (2008):

<http://www.uis.baden-wuerttemberg.de/servlet/is/41180/>