

# **The Official Surveying and Mapping in Germany and its Contribution to the National SDI (GDI-DE)**

Klaus KUMMER, Germany

**Key words:** official surveying and mapping, task of the State level, national SDI, geospatial reference data, service provider

## **SUMMARY**

The federal States are responsible for official surveying and mapping in the Federal Republic of Germany. With the exception of Bavaria, licensed surveyors participate in performing the tasks for legally specified areas with joint responsibility with the authorities. There are special surveying departments for particular surveying tasks of individual federal administrative agencies, the States and the municipal authorities. The official surveying and mapping provides the ownership and geotopographic basic information of Germany based on the official area wide spatial reference in a standard and accurate way for the State, the economy and society. As producer of the geospatial reference data and central state geoservices provider, the official surveying and mapping makes a decisive contribution for the expansion of the national geospatial data infrastructure. In order to ensure the standardisation for the national geospatial reference data in Germany, the states collaborate with the Federal Government in the AdV. This makes it possible to maintain the diversity by co-ordination and to use the benefits of federalism. The German coordination competence obtained in this way is required for the merger of Europe. In core areas of the spectrum of tasks, it is necessary to proceed in a reliably matched way and to agree on a balanced price policy.

## **ZUSAMMENFASSUNG**

In der Bundesrepublik Deutschland liegt die Zuständigkeit für das amtliche Vermessungswesen im Verantwortungsbereich der Länder. Daneben wirken mit Ausnahme von Bayern für gesetzlich bestimmte Bereiche Öffentlich bestellte Vermessungsingenieure, in gemeinsamer Verantwortung mit den Behörden, an der Aufgabenerledigung mit. Für besondere Vermessungsaufgaben einzelner Verwaltungszweige des Bundes, der Länder und der Kommunen existieren Sondervermessungsdienststellen. Das Amtliche deutsche Vermessungswesen stellt die eigentumsrechtlichen und geotopographischen Basisinformationen Deutschlands auf der Grundlage des amtlichen Raumbezugs flächendeckend, einheitlich und rechtssicher für den Staat, die Wirtschaft und für die Gesellschaft bereit. Als Produzent der Geobasisdaten und zentraler staatlicher Geodienstleister kommt dem Amtlichen deutschen Vermessungswesen ein entscheidender Beitrag für den Aufbau der nationalen Geodateninfrastruktur zu. Um die Einheitlichkeit für die staatlichen Geobasisinformationen in Deutschland sicherzustellen, arbeiten die Länder mit dem Bund in der AdV zusammen. Hierdurch wird ermöglicht, die Vielfalt durch

Koordination zu erhalten und die Vorteile des Föderalismus zu nutzen. Die so erworbene deutsche Koordinationskompetenz wird bei der Zusammenführung Europas gefragt sein. Notwendig ist, in Kernbereichen des Aufgabenspektrums verlässlich abgestimmt vorzugehen und sich auf eine ausgewogene Preispolitik zu verständigen.

# The Official Surveying and Mapping in Germany and its Contribution to the National SDI (GDI-DE)

Klaus KUMMER, Germany

## 1. INTRODUCTION

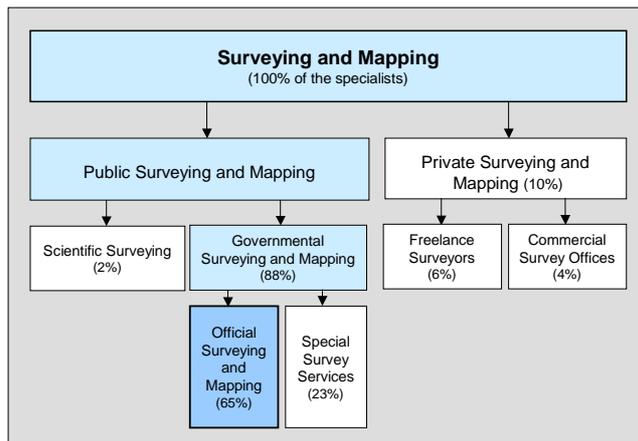
*AdV* – this acronym has been a fixed, well-known term for more than half a century in foreign and German geodesy, including the national geoinformation service and its technical publications. As an organisational entity, it stands for the *Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder der Bundesrepublik Deutschland (Working Committee of the surveying authorities of the States of the Federal Republic of Germany)* – a correctly formulated, long-worded phrase with great tradition, but with the disadvantage that it is less suitable today for PR standpoints. *AdV* as the area of responsibility and field is the abbreviation for the *Amtliches deutsches Vermessungswesen (official German surveying and mapping)*. This more concise phrase can be significantly better used for politics, economy and society and abroad without renaming the Working Committee in doing so. Thus: *AdV* – for official German surveying and mapping.

## 2. OFFICIAL GERMAN SURVEYING AND MAPPING

In accordance with the FIG technical dictionary, the term *Vermessungswesen (surveying and mapping)* means the totality of all organisations, actions and equipment for surveying, its processing and presentation of its results (Kummer, Möllering 2005). Taking account of the task structure, the complete surveying and mapping is subdivided into public and private surveying and mapping. “Governmental surveying and mapping is performed by authorities (official surveying); this also includes licensed surveyors (“Öffentlich bestellte Vermessungsingenieure”) as office holders according to the “administrative authorities” term. The objective of official surveying and mapping is to provide surveying services stipulated by public law. The universities with their mandate for research and education (scientific surveying) must also be assigned to the governmental surveying and mapping. The private surveying is implemented in the framework of private law; survey services here are performed without public law effects (e.g. engineering survey) by freelance surveyors and commercial survey offices” (Kummer, Möllering 2005). The official surveying and mapping services are subdivided into the fundamental basic tasks of the surveying, mapping and cadastral system which can be designated as official surveying and mapping and into special surveying services. Thus, official surveying and mapping is the collective term for all the sovereign functions of land surveying and real estate cadastre including their performance and their office holders. These core tasks of the state basically contribute to the economic, technological and infrastructure development of Germany in Europe. The federal States are responsible for performing the official surveying and mapping tasks. With the exception of Bavaria, licensed surveyors participate in performing the tasks for legally specified areas with joint responsibility with the authorities (*AdV*, BDVI 2006). There are special surveying departments for particular surveying tasks of individual federal administrative agencies

(waterways, defence, and coastal survey), the States (land consolidation, road building, forest survey) and the municipal authorities (town surveying).

With respect to the complete surveying and mapping, approx. 90 per cent of the approx. 50,000 specialists in the governmental surveying and mapping are predominantly employed in the authorities. Two thirds of all specialists perform the sovereign surveying, mapping and cadastral tasks in the official surveying and mapping (Kummer 2002). This makes clear the central position of official surveying and mapping. The context as a whole is shown in Figure 1 (Kummer 2002).



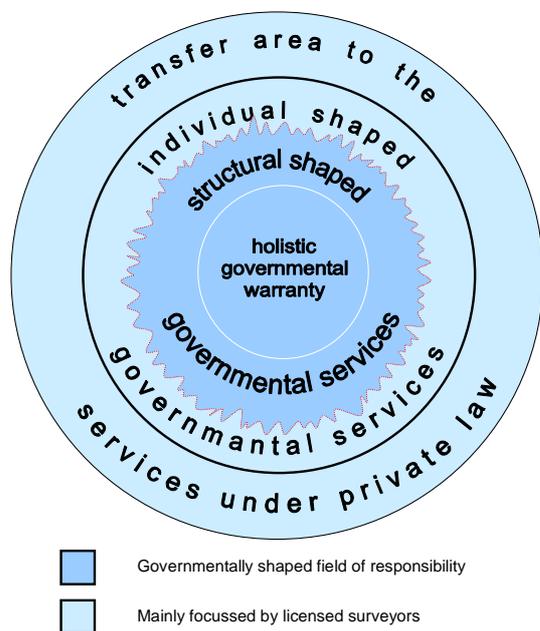
**Fig. 1** Assignment of the official surveying and mapping

The task structure of official surveying and mapping has fundamentally changed with the requirements of the information and communication society and the extensive eGovernment approach. While maintaining both the tasks of land surveying and management of the real estate cadastre, the new task block of integration with the geospatial reference data system has been added. Basically, official surveying and mapping has already changed to the official surveying and mapping and geoinformation (Kummer 2004a). This is also expressed in the legislation in some States. However, the AdV has unanimously decided to maintain the concise acronym of official surveying and mapping.

### 3. THE TASKS AND THEIR PERFORMANCE

The national official surveying and mapping provides the ownership and geotopographic basic information of Germany based on the official area wide-spatial reference in a standard and accurate way for the State, the economy and society. The three fundamental objectives of a modern country follow from this. These are the *guarantee* of the national basic provision by official surveying and geoinformation services, the *activation* of the geodata market for intensification of economic growth and investments, and the *effective* and *efficient* interaction of all social sectors, particularly as the basis for social decision processes. The spectrum of tasks of the official surveying and mapping with its core areas is based on this.

Within the official surveying and mapping area of responsibility, AdV and the German Association of Publicly Appointed Surveyors (BDVI) have jointly agreed on a structure model of the national performance of tasks which contains the general task distribution between authorities and publicly appointed surveyors (AdV, BDVI 2006). Accordingly, the profile and image shaping tasks of the surveying and geographic information authorities are guaranteed in the complete spectrum of tasks. These are coverage and standard, State-wide actuality of state survey and management of the real estate cadastre and the geospatial reference data information system. The specialist authorities also provide commercial activation (spatial data infrastructure, online services, geographic data portals, geonetwork, providing, sales, GIS consultancy) with structured national services. The licensed surveyors are responsible for the individually characterised services (application areas such as the majority of real estate surveying, services for construction projects, data refinement) and the transfer to private law services (Figure 2) (AdV, BDVI 2006).

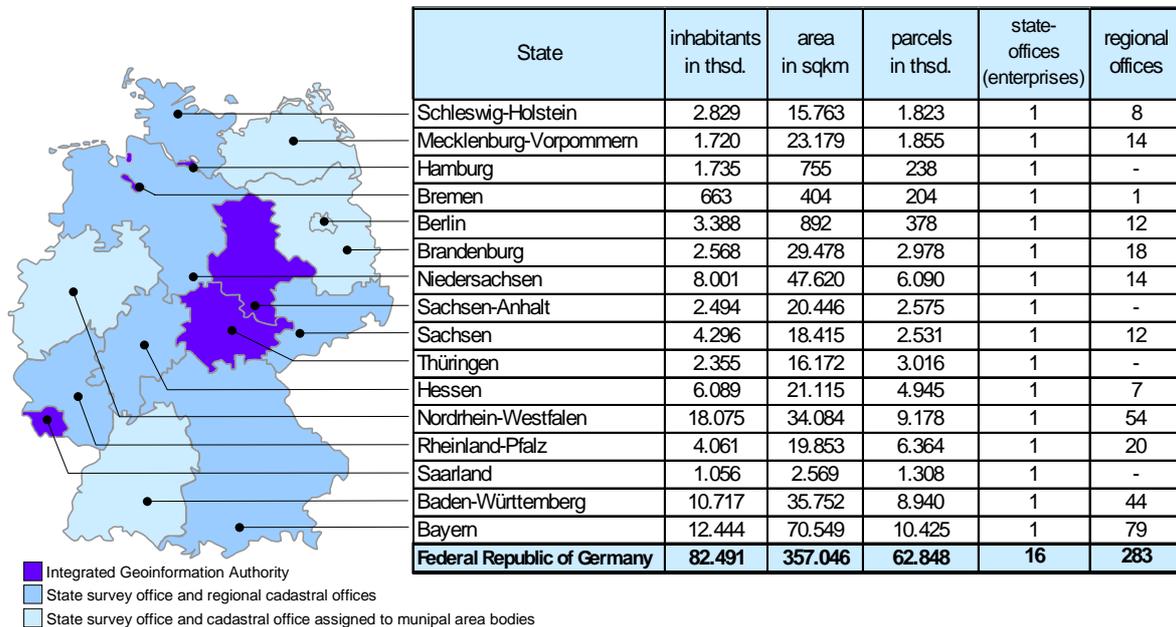


**Fig. 2** Structure model of the national performance of tasks in official surveying and mapping

#### 4. THE ORGANISATION

The responsible specialist authorities for surveying, real estate cadastre and geographic information in most *federal States* are assigned to the Interior Ministries and usually have a three-level administrative structure. The administration of topographic geospatial reference information lies in the area of responsibility of the respective State authorities / enterprises. At regional level, cadastral authorities handle real estate cadastre tasks and provide large-scale geospatial reference data information. They are generally set up as State specialist authorities or assigned to municipal area bodies in certain cases. In the course of the administration reform and organisational implementation of the specialist integration approach, some Federal States have merged their State survey office and their regional

cadastral authorities into an integrated geoinformation authority and are making use of the synergy effects produced from this. Figure 3 makes clear the organisational approaches in the federal States.



**Fig. 3** Authorities and agencies at the State level

It must be emphasised that official surveying and mapping has been in a fundamental structural reorganisation process for some years which is characterised by integration and merger of the authorities. In some States, this process is not yet complete. Within only 10 years, the number of regional official surveying and mapping agencies has dropped from more than 600 to only 283 today. Further amalgamations are already becoming tangibly apparent. It is significant that somewhat more than half of the regional agencies are assigned to municipal area bodies and that there are only 140 State regional authorities nationally. On average, a regional geographic information agency in Germany is responsible for approx. 300,000 inhabitants, 1,300 km<sup>2</sup> surface area and 225,000 land parcels.

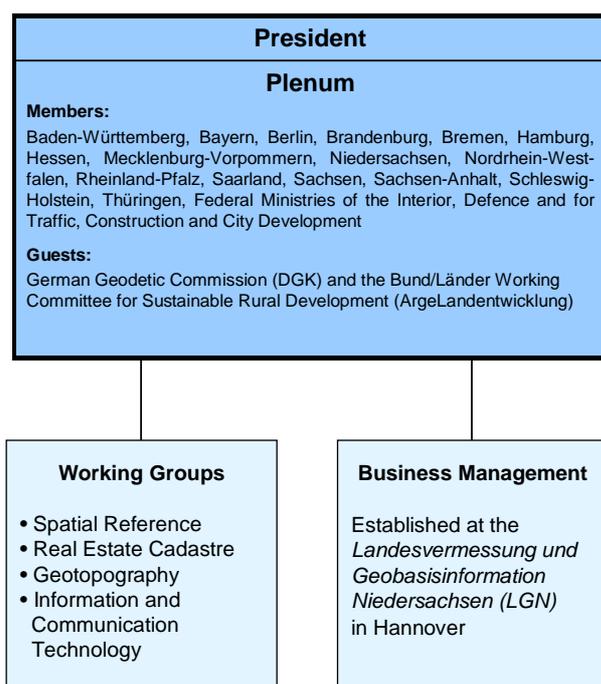
For the *federal authorities*, the Federal Agency for Cartography and Geodesy (BKG) is assigned to the Federal Ministry of the Interior. In co-operation with the federal States, the BKG fulfils tasks in the field of geographic information and geodesy. These are the provision and representation of analogue and digital topographic-cartographic information for the federal area, the provision and maintenance of the geodetic reference networks of the Federal Republic of Germany and participation in the specification and maintenance of global reference systems and representing the interests of the Federal Republic of Germany internationally in the area of geodesy and geographic information.

The task of the Bundeswehr Geoinformation Office (BGIO) is to merge all geosciences relevant to the Bundeswehr (geodesy, geography, geology, remote sensing, cartography, geoinformatics, meteorology, climatology, ecology, biology). Under the slogan *geoinformation from one source*, the BGIO provides the spatial reference basis for deployment of the armed forces based on the official surveying and mapping.

The Federal Water and Shipping Authority (WSV) is assigned to the sector of the Federal Ministry for Transport, Construction and City Development. It maintains the federal waterways which have a length of 7,300 kilometres. The surveying field of the WSV includes geodetic and cartographic work with close reference to official surveying and mapping and geoinformation.

*State laws* define the tasks to be fulfilled here based on the responsibility of the German federal States for national official surveying and mapping in the context of the federal State structure. In order to achieve, further develop and maintain extensive harmonisation and standardisation, representatives of the American Zone surveying and mapping authorities met as early as 1948. In October 1949, AdV, expanded by the surveying authorities of the British and French Zone was formed and has borne the name it has today since this time. Later, West Berlin (1952), Saarland (1957) and the five new federal States after the reunification joined the AdV (Bohlmann 2002). *AdV* is responsible for the coordination of official surveying and mapping.

As well as the specialist authorities of the States responsible for official surveying and mapping, the Federal Ministries of the Interior, Defence and for Traffic, Construction and City Development are cooperating in the AdV. The German Geodetic Commission (DGK) as representative of geodetic education and research and the Bund/Länder Working Committee for Sustainable Rural Development (ArgeLandentwicklung) have guest status in the AdV. The AdV is assigned to the permanent Conference of Ministers of the Interior. Its organs are the plenum and the President. The plenum defines the technical and strategic alignment of the AdV and makes decisions of fundamental importance. The plenum elects a State representative as President every two years. The President ensures that the AdV objectives are continuously pursued and that its tasks are completed. He chairs the annual plenum meetings and represents the AdV to the outside world. The plenum uses specialist working groups and a business office to support the work (Figure 4) (AdV 2006).

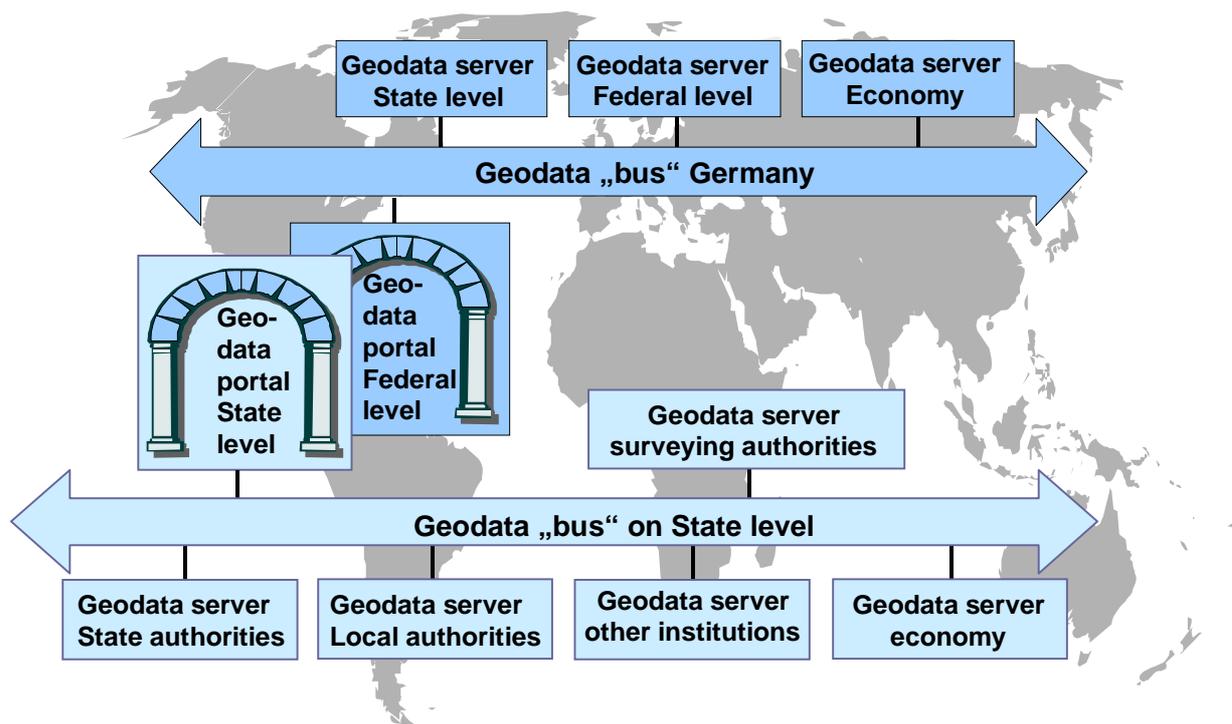


**Fig. 4:** AdV organisation structure

## 5. THE CENTRAL FUNCTION

Basic portal, basis and activation functions for the complete field of geoinformation are assigned to AdV as a new area of responsibility. Provision of standardised and integrated geospatial reference data, expansion of the geonetwork, setting up the geodata portals and development of the geographic data services. These are the supporting elements of the spatial data infrastructure ((AdV 2002), (Kummer 2004)). Thus, a central function in collaboration with the geo specialist authorities and the GIS business for expansion of the national spatial data infrastructure (GDI-DE) is accorded to AdV.

Spatial data infrastructures merge geospatial reference data, geo specialist data and metadata in defined standards to the geodata basis. The provision of the standardised geodata basis is done via the geodata portals. The expansion of the spatial data infrastructure is achieved via the merger of the GDI in the States and with that of the federal government. The geodata portals, which the respective geodata servers are assigned to via *geodata buses* are networked for this. The connection to the European and global spatial data infrastructure is made with this national network (see Figure 5) (Kummer 2004b).



**Fig. 5** Spatial Data Infrastructure networking

## 6. THE STRENGTHS

About ten years ago, national GIS associations rightly started to expressly promote more standardisation in German geoinformation both for the geospatial reference information as well as for the geo specialist information and consequently carried this into the political arena. In this way, the complete subject has gained weight in its perception in politics, the economy and administration. Other undisputed successes of this campaign are the establishment of the Federal Interministerial Committee for Geoinformation (IMAGI), the establishment of a national Steering Committee for the GDI-DE and a start in the AdV to the development of a forward-looking, ideal modelling of the geospatial reference information system.

AdV has made a development surge which is exemplary in comparison with the specialist GIS areas. This technological innovation concept is flanked by the establishment of an AdV central, national geodata centre at the BKG. Other central distributors such as the central SAPOS<sup>®</sup> agency and the community of the States for distribution of house coordinates round off the picture. AdV is currently working on the development of standard Web Mapping Services (WMS) and is piloting the first geodata portal networking so that decentralised distribution channels will be made possible for customised geospatial reference data which crosses State borders. AdV has also made progress in the digitally managed range of products. The following are available for the whole of Germany: the ATKIS<sup>®</sup>-Basis-DLM,

high-resolution DLM, area wide high-resolution DOP and by the end of 2006 the standard level ATKIS<sup>®</sup>-DLM 50 standardised for all of Germany.

Furthermore, the surveying authorities are closely collaborating in the area of providing topographic-cartographic presentations. The previously separately managed civil and military topographic 1:50,000 scale maps are now published as a joint civil-military edition. In 2006, the BGIO and all States also agreed on a 1:100,000 scale civil-military map. AdV ensures provision of a connection to a national standard control point field via a 3D marked basic network and SAPOS<sup>®</sup>. The control points and the SAPOS<sup>®</sup> stations have satellite-geodetic highly precisely defined coordinates in ETRS89, the standardised reference system for Europe and are also part of the official height and gravity control point field.

The introduction of the new measures mentioned naturally requires expenditure resources and the necessary time – with understandable impatience for everyone (GeoBIT 2006). The AdV start has obviously not been sufficiently recognised from the outside as federal responsibility is still required in public for the complete geoinformation. One reason for this probably lies in the not sufficiently standardised, conventional analogue products of German land surveying which of course can no longer be additionally invested in and which cannot be completely replaced due to the difficult budgetary position in the federal government and the States. Obviously, the particular strength of the States competence in official surveying and mapping has not been seen yet. It will only be made possible by the responsibility of the States that the high-resolution, large-scale geospatial reference data (real estate cadastre, DOP, house coordinates, geotopographic reference data) will be brought into the complete system under an assignment of responsibility. For the purpose of eGovernment, it is a matter of maintaining the available diversity, of making it capable of integration and not a matter of disposing of it. The high-resolution, large-scale geospatial reference data should sustainably have a special importance for the GIS business because quickly-produced, space-related, low-resolution data alone will sooner or later hit the limits of multiple usage requirements.

## **7. THE CHALLENGES**

Whoever conceptionally advances future-oriented as consistently as AdV first points the finger at the inconsistency of its own analogue characterised past. It seems as if one had only worn one of the shoes which everyone wears. Therefore, it is necessary that member authorities of the AdV implement the transition to setting up the digital processes in a standardised way and preferably at the same time. There is currently still a weak point here which the AdV must address. The note that the other national GIS actors will also execute this process with time delay does not help.

Furthermore, it would also be important to make the precise high-resolution German geospatial reference data linkable with space-related data in order to provide the wealth of the AdV with an extensive, integrated usage.

It follows from the IT-supported, barrier-free distribution approach that the surveying and geoinformation authorities should agree on a standardised conditions policy. A balanced price

structure is a prerequisite for the success of the complete distribution approach. As in other states, certain low-resolution, geotopographic overview presentations with viewing processes and metadata of the official geospatial reference data could be made available throughout Germany at no cost under certain circumstances.

AdV is pursuing the aspiration of actively performing the role of central geoservices provider as producer, supplier, co-ordinator and GIS moderator. Thus there is the task of providing products and services matched to the customer for covering the basic need. This results in the definition of standardised core products. This is a matter of assigning suitable, standardised priorities. In order to satisfy the commercial requirements with these products, there should be standardised online services available for a powerful front office architecture whose components are active in a network crossing State boundaries.

Finally, it would be beneficial if the potential users implement the conversion to ATKIS<sup>®</sup> and ALKIS<sup>®</sup> even if they have used raster data from analogue managed conventional map books to date. These products are being phased out and cannot also remain available. Requirements for optimising these conventional processes do not lead in the right direction. The users should be intensively advised for this purpose.

## REFERENCES

- AdV 2002: Geodateninfrastruktur in Deutschland (GDI) – Positionspapier der AdV. zfv 127, S. 90-96, Augsburg 2002.
- AdV 2006: Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder der Bundesrepublik Deutschland. Homepage, [www.adv-online.de](http://www.adv-online.de), (Juni 2006).
- AdV, BDVI 2006: Klöppel, R. (AdV) und Teetzmann, V. (BDVI): Gemeinsam für Staat, Wirtschaft und Gesellschaft, Memorandum über die Zusammenarbeit von AdV und BDVI im amtlichen Vermessungswesen in Deutschland. zfv 131, S. 1-6, Augsburg 2006.
- Bohlmann, T. 2002: Zusammenarbeit im amtlichen Vermessungswesen der Bundesrepublik Deutschland. Zeitschrift für das Öffentliche Vermessungswesen des Landes Sachsen-Anhalt (LSAVERM) 2002, Heft 2, S. 101-118, Magdeburg 2002.
- GeoBIT 2006: Geduld und Erfahrung, Interview mit Professor Klaus Kummer, dem neuen AdV-Vorsitzenden. GeoBIT 2006, Heft 1/2, S. 21-23, Heidelberg 2006.
- Kummer, K. 2002: Management im Öffentlichen Vermessungswesen: Eine Aufgabe für Geodäten. Schriftenreihe des Geodätischen Instituts der Technischen Universität Dresden, Heft 1, S. 45-59, Dresden 2002.
- Kummer, K. 2004a: Das neue Profil des amtlichen Vermessungswesens: Der Weg zur Geoinformationsverwaltung. Festschrift Hans Pelzer, Wissenschaftliche Arbeiten der Fachrichtung Vermessungswesen der Universität Hannover, Nr. 250, S. 155-169, Hannover 2004.
- Kummer, K. 2004b: Grundlagen für die Geodateninfrastruktur in Sachsen-Anhalt. Zeitschrift für das Öffentliche Vermessungswesen des Landes Sachsen-Anhalt (LSA VERM) 2004, Heft 2, S. 95-104, Magdeburg 2004.

Kummer, K., Möllering, H. 2005: Vermessungs- und Geoinformationsrecht Sachsen-Anhalt, Kommentar, 3. Auflage 2005. Kommunal- und Schul-Verlag, Wiesbaden 2005.

## BIOGRAPHICAL NOTES

- Geodesy Studies at the University of Applied Sciences in Hannover, diploma degree „Dipl.-Ing.“ and Ph.D. degree “Dr.-Ing.”, Second state examination;
- Head of the Official Surveying Sector of the federal state of Saxony-Anhalt;
- President of the integrated surveying, geoinformation and real estate cadastre authority of the federal state of Saxony-Anhalt (Landesamt für Vermessung und Geoinformation – LVermGeo);
- Teaching at the University of Applied Sciences in Dresden (chair of the Geodetic Institute), appointment as a professor;
- More than 60 publications in all fields of the Official Surveying; work centres presently: real estate cadastre, management, administration reform, efficiency, law;
- Pricewinner “Gerhard-Eichhorn-Preis” of the German Association of Surveying (DVW);
- Member of the Study Group 1 (Professional Standards and Practice) of the German Association of Surveying (DVW) (1993 – 2002);
- Co-autor of the book “Kommentar Vermessungs- und Geoinformationsrecht” (surveying and geoinformation law);
- Co-editor of the specialist journal “Flächenmanagement und Bodenordnung – FuB” (Landmanagement);
- Member of the “Kuratorium des Oberprüfungsamtes für die höheren technischen Verwaltungsbeamten” in Frankfurt/Main and examiner in the division “Vermessungs- und Liegenschaftswesen” (Surveying and Landmanagement);
- Representative of the federal state of Saxony-Anhalt in the Plenum of the Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany (AdV);
- President of the Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany (AdV) since 1<sup>st</sup> January 2006;
- Representative of the federal state of Saxony-Anhalt in the national Steering Committee for the national SDI (GDI-DE).

## CONTACTS

Prof. Dr.-Ing Klaus Kummer  
Landesamt für Vermessung und Geoinformation Sachsen-Anhalt  
Otto-von-Guericke-Straße 15  
39104 Magdeburg  
GERMANY  
Tel. + 49 391 567 8500  
Fax + 49 391 567 8599  
Email: klaus.kummer@lvermgeo.sachsen-anhalt.de  
Website: [www.lvermgeo.sachsen-anhalt.de](http://www.lvermgeo.sachsen-anhalt.de)