Working Committee of the Surveying Authorities
of the Laender of the Federal Republic of Germany

National Report

2017 / 2018

AMTLICHES DEUTSCHES VERMESSUNGSWESEN

Chair
2018/2019
Siegmar Liebig
Ministerialrat
Lower Saxonian Ministry of the Interior and Sport
- Department 15 - Surveying and Geoinformation
Lavesallee 6
30169 Hannover
E-Mail: AdV-Vorsitz@mi.niedersachsen.de

Deputy Chair
2018/2019
Tobias Kunst
Ministerialrat
Bavarian State Ministry of Finance, Regional Development and Regional Identity
Department 71
Odeonsplatz 4
80539 München
E-Mail: AdV-Bayern@stmflh.bayern.de

Secretary General
Marcus Wandinger
Vermessungsdirektor
Alexandrastraße 4
80538 München

Internet www.adv-online.de

Further information at

Federal Agency for Cartography and Geodesy	www.bkg.bund.de
Geoinformation Service of the Bundeswehr (Federal Armed Forces)	zgeobwiii11nat-intkooperation@bundeswehr.org
Federal Waterways and Shipping Administration	www.wsv.de
German Association of Publicly Appointed Surveyors	www.bdvi.de
German Federal Working Group Sustainable Rural Development	www.landentwicklung.de
German Geodetic Commission	www.dgk.badw.de

Composition, Layout and Production Bavarian Agency for Digitisation, High-Speed Internet and Surveying

Updated 08/2018

Table of Contents

Dear Readers,

The 2018 CEBIT, one of the world's biggest fairs for information technologies, has shown quite impressively that digitisation with smart, innovative technologies is accompanied by fundamental changes in economy and administration. Digital information with spatial reference is becoming more and more a key resource in our modern-day society. Geoinformation has become an integral part for every-day applications of economy, politics, administration and society and can, for example, be found on almost every mobile device. Geoinformation is therefore providing, nowadays, the most important basis for building efficient geospatial data structures.

The Working Committee of the Surveying Authorities of the Laender of the German Federal Republic (AdV) assumes a central role within this structure. It provides official geospatial reference data that is available extensively throughout Germany in a uniform, high-quality, up-to-date data model.

This year AdV is celebrating its seventieth anniversary. It can reflect back on seven decades of successful collaboration between the surveying and geoinformation authorities of the federal government and the Laender. Over time it has evolved to an institution which provides, in a nationwide coordinated and demand-oriented manner, reliable, high-quality geospatial reference data and products which derive from it. The official German surveying sector contributes a quite important part to the national infrastructure, the development of the country and the safeguarding of the real estate property. For this purpose, AdV is providing a secure data base for the political and economic decision-making processes as well as services for the people.

Because of the progressive digitisation the significance of local, regional as well as national borders is decreasing. Even more, a public understanding has been established that data is available anytime and anywhere. This fact also poses increasing challenges for AdV.

AdV is well prepared for it. Their strengths lie within the transnational exchanges in coordination with the federal government – true to the motto "Unity in Diversity". On the base of the coordinated approaches and uniform standards it is possible to fulfil the multifaceted requirements that transcend the boarders of the country widely. With this current national report, a deep insight into the broad task spectrum of the official German surveying authorities is given.

I would like to express my gratitude and respect to AdV for the last 70 years. Stay open to innovative developments.

Boris Pistorius

Minister for the Interior and Sports, Lower Saxony

Dear Readers,

For more than 70 years now, the Working Committee of the Surveying Authorities of the Laender of the Federal Republic of Germany (AdV) have been working together to apply standardised rules for technical matters of fundamental and supra-regional importance for the Official Surveying and Mapping Authorities. With the progressing digitisation, technical developments are accelerating immensely. The spectrum of tasks that the official German surveying authorities have to fulfil is changing and solutions to these imposed tasks need to be found in increasingly shorter time spans.

The surveying and geoinformation authorities are offering a broad and comprehensive range of geospatial data; therefore, providing an elementary component for a plethora of applications for politics, administration, economy and society. The spatial reference is the basis for any kind of geospatial reference data. A cornerstone for the monitoring of the spatial reference with regards to time has been laid by the implementation of the re-measurements in the German Hight Reference System through the GNSS measurement campaign 2020.

The progressing digitalisation suggests that the processes used for the derivation of cartographic products from geospatial reference data need to be further automated, products then made available via flexible output types and, through that, reach a high level of performance and topicality.

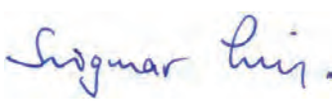
The intertwining of political and environmental decision-making processes on a national, European and global level requires data to be comparable. This also includes analysis and time series analysis for climate, energy, mobility, sustainability and demographic-related topics. AdV is approaching this requirement under consideration of the semantic division of data into Land Cover and Land Use in the AAA® data model.

The increasing demand for freely available geospatial data is of high strategic relevance for AdV. At the moment these very significant developments can be tackled by means of intelligent licensing and pricing schemes.

With the above-mentioned tasks and data, the surveying and geoinformation authorities contribute immensely to Germany's infrastructure. Due to demographic changes, an increasing demand of qualified new recruits is to be expected, in the years to come. The economic, as well as science and administration, sectors are expected to also be affected by this. The intensive recruitment of young talent is therefore of high strategic importance for the Official German Surveying Authorities. AdV has taken up the issue.

"The whole is greater than the sum of its parts". AdV is confronting Aristotle's finding in order to master future challenges which are presently foreseeable and for whose attainment the use of technical and organisational synergy effects on a Laender and federal governmental level are vital, together with the sum of the member authorities represented within AdV.

In this sense I hope you will find in this present national report 2017/2018 an exciting read and deeper insight into the comprehensive range of tasks of AdV.



Siegmar Liebig
AdV Chairman

1. Organisation and Performance of Tasks

In the Federal Republic of Germany, the Laender are responsible for accomplishing official surveying and mapping tasks. Since 1948, the responsible authorities of the Laender and the Federal Ministries of the Interior, Building and Community, of Defence as well as for Transport and Digital Infrastructure have been cooperating together in the Working Committee of the Surveying Authorities of the Laender of the Federal Republic of Germany (AdV) to deal with technical matters of fundamental and national importance. The German Geodetic Commission (DGK), as a representative of geodetic teaching and research, and the German Federal Working Group Sustainable Rural Development, representing the field of land consolidation, have guest status in AdV.

Organisation of AdV

Figure 1 shows the organisation of AdV. Chair and plenum are its steering bodies. AdV is supported by the working groups and the management.

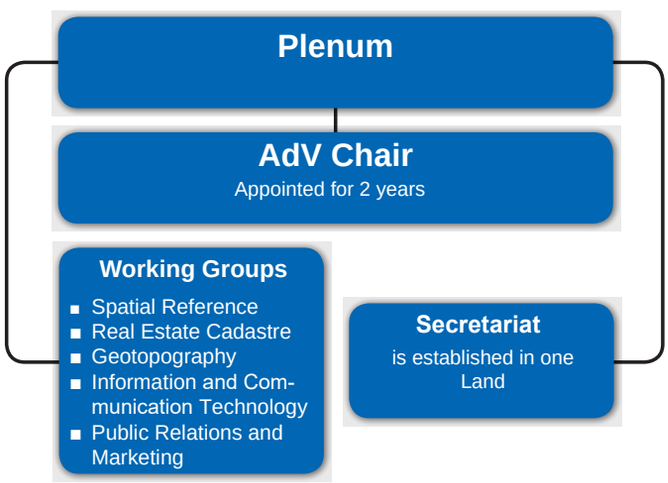


Fig. 1: Organisation of AdV

Objectives and Tasks of AdV

The member authorities collaborate within AdV to:

- regulate field-related matters of fundamental and cross-regional importance for official surveying and mapping in a standardised manner
- create a pool of geospatial reference data that is essentially standardised and geared towards meeting the requirements of the information society
- provide the infrastructure for geospatial reference data as an important component for modern e-Government architectures.

In order to achieve these objectives, AdV performs the following tasks:

- creation and coordination of future-oriented collaborative concepts for the nationwide standardisation of the real estate cadastre, surveying and mapping and the geographic reference information system in order to meet the needs of politics, industry and administration
- promoting the joint execution of projects of cross-regional importance
- steering and coordination of standardisation procedures in order to record and manage geospatial reference data as well as the corresponding access and distribution methods
- support in the establishment and development of the national and European geospatial data infrastructure and the corresponding electronic services
- external representation of the official surveying and mapping
- participation in international specialist organisations for the transfer of know-how
- collaboration with organisations and agencies from related fields and with institutions of geodetic research and teaching
- coordination on issues of specialist training

Geobasis Steering Committee

In 2010 by means of the administrative agreement for cooperation in the Official Surveying and Mapping in Germany, the Geobasis Steering Committee (LA Geobasis), in which all Laender are represented, was established. The administrative agreement aims to further improve the operational implementation of the strategies agreed on in AdV and to further optimise cooperation across Germany. Furthermore, it is the objective that the Geobasis Steering Committee ensures that the geospatial reference data is provided in standardised form to all users in the required level of quality.

The Geobasis Steering Committee has, in order to implement the strategic resolutions adopted by AdV, the following tasks and competences:

- monitoring and analysis of work and developmental progresses, including compliance with the defined quality standards and norms
- analysis of cooperation possibilities and processing proposals towards their realisation
- steering and collaboration between individual or multiple Laender
- quality control based on AdV standards regarding content and format consistency.

Mapping and Cadastre Authorities of the Laender

The development of the surveying and cadastre sector into a modern geoinformation system is a process that has been accompanied by comprehensive reforms throughout the last decade. The key to modernising the administrative procedures of the mapping and cadastre authorities in the Laender is the opening of the administrative bodies to adjacent areas in order to provide a basis for infrastructural and spatial planning policy in the network.

The mapping and cadastre authorities are split into various departments in the individual Laender, the department of the interior being most frequently represented. Structural changes have been made in many authorities. In certain Laender, the real estate cadastral authorities and in some cases also the regional development / land consolidation authorities are now integrated into the higher-level geoinformation authorities. In other Laender, local areas of responsibility have been expanded by the amalgamation of real estate cadastral authorities.

The key aspects of the geoinformation system – management of the real estate cadastre and geotopography as well as first order control and the provision of official reference systems – are the responsibility of the Laender. The original services offered include:

- the nationwide provision of spatial reference data via reference networks in the Authoritative Control Point Information System (AFIS®), consisting firstly of terrestrial control points and their documentation and, secondly, based on the satellite-supported positioning service SA*POS*®,
- maintaining a nationwide image of the surface of the earth through geotopographic products in the Authoritative Topographic-Cartographic Information System (ATKIS®) using landscape and terrain models, official topographic cartography and orthophotos
- the nationwide digital documentation of buildings and approx. 64 million cadastral parcels for the property rights in the real estate cadastre, which will be managed throughout the Federal Republic using the Authoritative Real Estate Cadastre Information System (ALKIS®)
- the harmonisation of the real estate cadastre and surveying and mapping data.

The following table provides an overview over the statistical data in reference to the official surveying and mapping of the Laender.

Land	Inhabitants	Land area in km²	Land parcels in thousands	Number of authorities		Publicly Appointed Surveyors (ÖbVI)
				Laender authorities (and Laender enterprises)	Regional offices	
Baden-Württemberg	10.951.893	35.677	8.884	1	58	166
Bavaria	12.930.751	70.550	10.794	1	51	—
Berlin	3.574.830	892	402	1	12	54
Brandenburg	2.494.648	29.654	3.136	1	17	150
Bremen	678.753	420	207	1	1	8
Hamburg	1.810.438	755	255	1	—	7
Hesse	6.213.088	21.115	4.980	1	7	80
Mecklenburg-Western Pomerania	1.610.674	23.213	1.931	1	7	64
Lower Saxony	7.945.685	47.616	6.197	1	—	99
North Rhine Westphalia	17.890.100	34.113	9.308	1	53	405
Rhineland-Palatinate	4.066.053	19.854	6.290	1	6	80
Saarland	996.651	2.569	1.292	1	—	10
Saxony	4.081.783	18.449	2.749	1	13	97
Saxony-Anhalt	2.236.252	20.452	2.680	1	—	49
Schleswig-Holstein	2.881.926	15.802	1.914	1	—	41
Thuringia	2.158.128	16.202	3.170	1	—	63
Total for Germany	**82.521.653**	**357.334**	**64.189**	**16**	**225**	**1.373**

Table 1: Number of Inhabitants – source: Federal Statistical Office, as of 31.12.2016. results based on the 2011 census. Land area – source: Federal Statistical Office, as of 31.12.2015, area in Rhineland-Palatinate: including the area "Joint German-Luxembourgian territory of 6,20km². Differences in areas due to rounding of figures possible. Cadastral parcels, number of authorities, ÖbVI: as of 31.12.2017

Federal Agency for Cartography and Geodesy

The Federal Agency for Cartography and Geodesy (BKG) is a federal authority that reports to the Federal Ministry of the Interior, Building and Community. As a competence centre for geodesy, cartography and geoinformation, BKG is responsible for "Maps and Coordinates" within the sphere of the federal government. BKG is the central service provider of the federal government for topographic base data, cartography and geodetic reference systems.

On the basis of the Federal Geospatial reference data Act (Bundesgeoreferenzdatengesetz – BGeoRG), which went into effect in November 2012, BKG performs service and coordination tasks for federal authorities. In this context, BKG operates a Service Centre (DLZ) in Leipzig, which is the federal government's main location for official geospatial data.

Various federal institutions, public administration, the business and academic spheres – and almost every citizen in Germany – benefit from the work of BKG. For example, the work of BKG forms the basis for efficient satellite navigation, such as via GPS or GALILEO. Experts from various sectors such as transport, disaster reduction, domestic security, energy and the environment make use of these geospatial data, maps, texts, reference systems and information services for their planning and research. Therefore geoinformation – information with spatial reference – are existential for our everyday life. They are the foundation of strategic planning, informed decisions and political actions. They also are an elementary prerequisite for innovations. Here reliable partnerships and networks are necessary in order to learn from one another, make use of synergies and to create something new together.

An elementary aspect in regard to the support of innovative developments is the intended provision of geoinformation of the federal government, the Laender and the municipalities on the basis of a standardised spatial reference from address to coordinate: easily accessible and useable, completely linked, combinable and reliable. A pioneering step in this direction was taken by BKG with the web-based map TopPlusOpen: In the course of the INTERGEO® 2017 the internet service, which is based on open data sources, was made available for public use by BKG, whereby special attention was paid to the usage of official data sources. This is why in the TopPlus product the open data of the Laender Berlin, Hamburg, North-Rhine Westphalia and Thuringia are being used. Also pleasing is the fact that, with Brandenburg, Mecklenburg—Western Pomerania and Rhineland Palatinate additional Laender made their data available in the TopPlusOpen requested conditions, in the meantime. With that, data from seven out of 16 Laender is included.

Furthermore, BKG performs in cooperation with the Laender the following tasks in the field of geoinformation and geodesy:

- the provision and mapping of up-to-date analogue and digital topographic and cartographic information, as well as the advancement of the appropriate procedures and methods
- the provision and maintenance of the geodetic reference networks in the Federal Republic of Germany
- the representation of interests of the Federal Republic of Germany in the field of geodesy and geoinformation on an international level.

In the field of geodesy, BKG provides a standardised spatial reference framework (coordinate system) for all of Germany. Therefore, it operates in cooperation with certain partner institutions three geodetic observatories – Wettzell, La Plata (Argentina) and O'Higgins (Antarctica). By means of various technologies, BKG monitors here, among other things, the movements of the earth satellites. With the aid of measurements carried out worldwide, satellite orbits, station coordinates and changes to the earth's surface are determined in the context of international cooperation.

At the geodetic observatory Wettzell, engaging in its operations and technological development, BKG and TUM are working quite successfully together, for now more than 45 years. The fundamental station, equipped with all the important spatial geodetic technologies, is, as one of the world's leading players in its field, the central cardinal point of the German geospatial data infrastructure which safeguards the national geographic spatial reference seamlessly, continuously and with the highest precision within the global framework.

University Professor Dr. phil. nat. Urs Hugentobler
Institute for Astronomical and Physical Geodesy, Technical University of Munich (TUM)

In the field of geoinformation and cartography, BKG is responsible for processing, providing and updating topographic and cartographic information.

Through the Service Centre (DLZ), BKG advises its customers and offers practice-oriented solutions and a multitude of geospatial data, web services and web applications. These include digital maps, terrain models, elevation models, aerial images, administrative boundaries, geographical names and additional topographic data. All the geospatial data is also made available as online services. In addition, the DLZ supports its customers via consulting services and needs-based applications.

The Spatial Data Infrastructure Germany (GDI-DE) represents the comprehensive networking of geospatial data at federal, Laender and municipal authorities. BKG coordinates the development, the expansion as well as the maintenance of the federal part of the GDI-DE and operates its central components, such as Geoportal.de (**www.geoportal.de**).

Beyond the German borders, in close cooperation with its European and international partners, BKG contributes to the implementation and provision of a standardised spatial reference frame and the development of a European and global geospatial data infrastructure.

Further information regarding the current work, services and products of BKG can be found on the website **www.bkg.bund.de** as well as on the Twitter channel **https:/twitter.com/BKG_Bund**.

Figures – Dates – Facts 2017

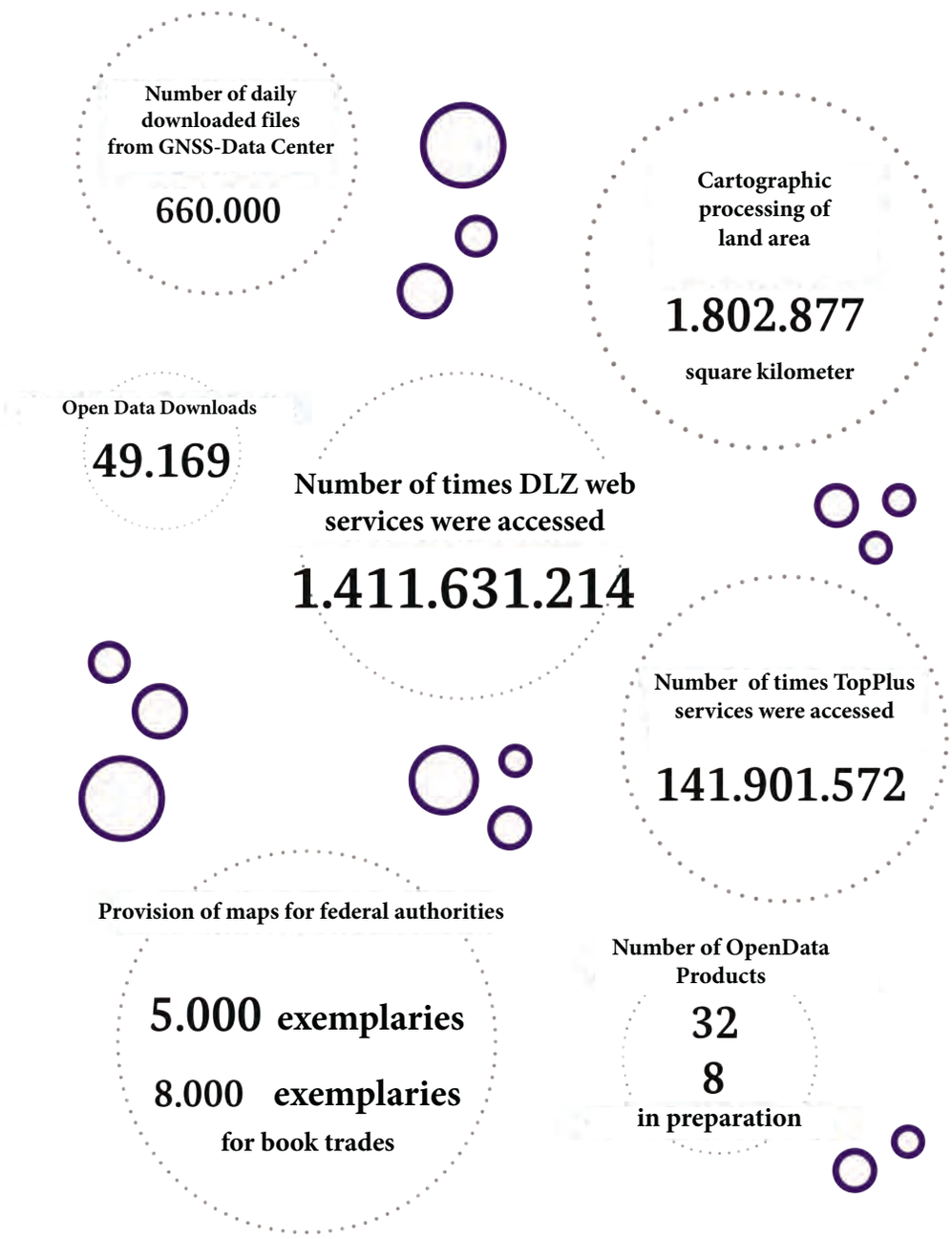


Fig. 2: Figures – Dates – Facts 2017 *Illustration: BKG*

Federal Ministry of Defence
Bundeswehr Geoinformation Service (BGIS)

Within the Working Committee of the Surveying Authorities of the Laender of the Federal Republic of Germany (AdV), the Federal Ministry of Defence (FMOD) is represented by the Director of the Bundeswehr Geoinformation Service (BGIS) and Bundeswehr Geoinformation Centre (BGIC).

The mission of the BGIS is to ensure "GeoInfo support to the Bundeswehr" in and for military action abroad and for domestic operations. In accordance with the policy of "geoinformation from a single-source provider", BGIS forces are responsible for the availability of quality-assured geoinformation in the theatre and for the identification and assessment of the impact of geofactors (e.g. terrain, weather, transportation, economy, climate, water).

The BGIC is the central agency of the BGIS and under the direct administrative control of the German Cyber and Information Domain Service Headquarters. It was designated by the Interministerial Committee for Geoinformation (IMAGI) to have the federal responsibility for the release of geoinformation covering crisis regions and areas of operations abroad. Taking an interdisciplinary approach, the BGIC develops, shapes and implements the processes of GeoInfo data collection, GeoInfo data management and GeoInfo production that are relevant for GeoInfo support.

These tasks are accomplished in collaboration with a large variety of civilian institutions from the domains of industry, research and teaching as well as public administration. The BGIC is involved in both national and international technical cooperation projects. At the national level, it works closely together with more than 60 authorities, institutions, universities, research institutes, industrial partners, Non-Governmental Organizations (NGOs) etc. The aim is to obtain a standardised, current and verified picture of three-dimensional space. Outer space and cyber and information space have added further dimensions.

Figure 3: Map depot of the BGIS in Euskirchen
Picture credits: Bundeswehr/Martina Pump

For the territory of the Federal Republic of Germany, comprehensive use is made of the data and products provided by the Federal Agency for Cartography and Geodesy (FACG) and the land survey organisations in the German Laender.

This civil-military cooperation ensures, inter alia, that Bundeswehr forces operating on the German territory have the same 1:50,000 and 1:100,000 maps as civilian relief or security personnel that may be committed simultaneously. For digital geoinformation, the BGIS accordingly aims at transferring current geodata models and data over the German territory to the Bundeswehr GeoInfo Database with a Laender-wide standardised structure and in a single step, so that they can be used for military purposes.

For further information about the BGIS and the BGIC, see **http://cir.bundeswehr.de/ZGeoBw**.

Federal Ministry of Transport and Digital Infrastructure (BMVI)

Bundesministerium für Verkehr und digitale Infrastruktur

The Federal Ministry of Transport and Digital Infrastructure (BMVI) has been a member of AdV since 1950, represented by the Spatial Information Coordination Body. This body coordinates the multi-layered use of the geospatial reference information of the German Laender at BMVI and its executive agencies with more than 15 higher level authorities, as well as the transfer of know-how from the surveying and mapping units of the "wet" directorates-general (i.e. waterways and shipping) to AdV.

The Federal Waterways and Shipping Administration (WSV) is responsible for the maintenance (in terms of traffic and water management) of the federal waterways (around 7,300 km of inland waterways and around 17,800 km^2 of waterways navigable by sea-going ships). In addition to its maintenance obligations, the Administration is also responsible for ensuring traffic safety on federal waterways. The surveying/geospatial information sections provide, inter alia, geo-referenced data, processed to form user-focused products, for instance data on water depths and the topography of the river bed.

Official surveying and mapping tasks are performed nationwide and they require close coordination in the AdV. The WSV provides its own basic network along the waterways (location and elevation benchmarks) and keeps a set of 1:2,000 scale digital charts whose contents inform the evolution of the ATKIS®-basic digital landscape model.

For the maritime sector, the Federal Maritime and Hydrographic Agency (BSH) performs maritime surveys in the German North Sea and Baltic Sea – the most heavily navigated waters in the world. Maritime surveys and maritime cartography provide necessary basic information for environmental protection, the construction of offshore installations, coastal protection and hydraulic engineering. The area surveyed by BSH covers around 57,000 km², which is equivalent to one sixth of Germany's land area. This is displayed on a set of nautical charts with around 150 datasets for electronic navigational chart systems plus 60 nautical charts in paper format. In addition, comprehensive datasets on the current and historical, chemical, physical and biological condition of the water column in the German territorial sea plus operational information and forecasting services for water levels, the tides, swell and drift are provided via a web-based geospatial data portal as the maritime component of GDI-DE.

The "Geodesy" division of the Federal Institute of Hydrology (BfG) currently supports the WSV in performing functions in the field of geodetic reference systems, geokinematics, surveying of water bodies, geotopography and construction surveying. The expertise required for the provision of specialist scientific advice is present within the scope of applied research and project implementation. In this context, intensive cooperation with universities and other research institutions is obligatory.

All agencies and higher level authorities cooperate closely with the surveying authorities of the German Laender and within the AdV working groups. Their activities focus on the exchange of information regarding topography, information technology and spatial reference as well as the use of the SA*POS*® services, especially in the oversea reception range.

In addition, BMVI, on behalf of the Federal Government, has lead responsibility in coordinating the European Union's Copernicus earth observation programme, previously known as Global Monitoring for Environment and Security (GMES). Through the implementation of a national "Copernicus Programme of Action", the general public and businesses in Germany are to derive tangible benefit from the European Copernicus earth observation programme, because it will be possible to exploit the potential generated to provide more effective and efficient public services.

More detailed information on geospatial information at BMVI and its executive agencies can be found on our website **https://www.bmvi.de** under the following heading: Topics/Digital Matters.

Why is the BMVI a member of AdV?
BMVI as a catalyst for AdV

As AdV celebrates its 70th anniversary, the Federal Ministry of Transport and Digital Infrastructure (BMVI) can look back over a long history of cooperation. The Ministry joined AdV only two years after its foundation. Since then, the geospatial experts of BMVI have been cooperating very closely with the other authorities that are members of AdV, and both sides benefit mutually from the close exchange of ideas and experience. This continues to be reflected today in the wide range of functions performed by the higher level executive agencies of BMVI.

As a member of AdV, BMVI benefits from the standards of the official geospatial reference data and the geodetic spatial reference in both its "wet" directorates-general and its "dry" (i.e. roads, railways and aviation) directorates-general. We will continue to use the official geospatial data products and consider ourselves and our multi-layered cross-cutting topics to be a driving force for the community of the Laender.

Dr. Tobias Miethaner
Head of the "Digital Society" Directorate-General at the Federal Ministry of Transport and Digital Infrastructure

The multi-faceted surveying relations include, for instance, making regular contributions to the external borders of the Federal Republic of Germany to the extent that they are in the Oder, Ems or Rhine inland waterways or affect the Exclusive Economic Zone. The national responsibility for the Galileo and Copernicus satellite missions provides a major impetus to earth observation and navigation. One distinctive feature is the positioning service for the security authorities (called Galileo-PRS). In the future, sensor and survey data will also become increasingly important for automated and connected driving. In the following, a closer look is taken at water depth measurement as a type of official special surveying as well as at the role of geospatial reference data for research. Cases in which Copernicus is applied to the official geospatial reference data will complete the picture.

Maritime surveying and AdV

Hydrographic surveying distinguishes between maritime and inland waterway surveying. Both are official surveying and mapping functions assigned to the Federal Government. Whereas inland waterway surveying takes place on the free-flowing waters and impounded rivers, maritime surveying concerns the coastal waters of Germany including the Exclusive Economic Zone of the Federal Republic of Germany. Here, maritime surveying performs several important functions in close cooperation with AdV.

Compared with land surveying, maritime surveying uses almost exclusively hydroacoustics. Water as a medium poses special challenges to the topographic surveying of the seabed and the search for, and examination of, submerged obstructions (including wrecks). The standards used in maritime surveying are usually coordinated internationally. The reasons for this are: a) the main user is worldwide shipping, and b) the "hydrographic community" in Germany is very small and specialized.

With its satellite-based SA*POS*® positioning service, AdV makes a major contribution to the surveying platforms at sea. This is indispensable for ships or boats as well as aircraft and autonomous surface and underwater vessels. As the distance from the coast increases, the requirements to be met by good GNSS (Global Navigation Satellite System) connectivity and the reliable transmission of correction data pose a special common challenge.

Another important point is the precise determination of depths and their allocation to the vertical datum. The chart datum, as a vertical datum, requires an exact quasigeoid at sea, which is also calculated through joint sea gravimetric measuring campaigns. Determination of the coastline is considered to be a collective and complex task. Because of the tidal influence, the coastline is not easy to determine and, moreover, is subject to great changes.

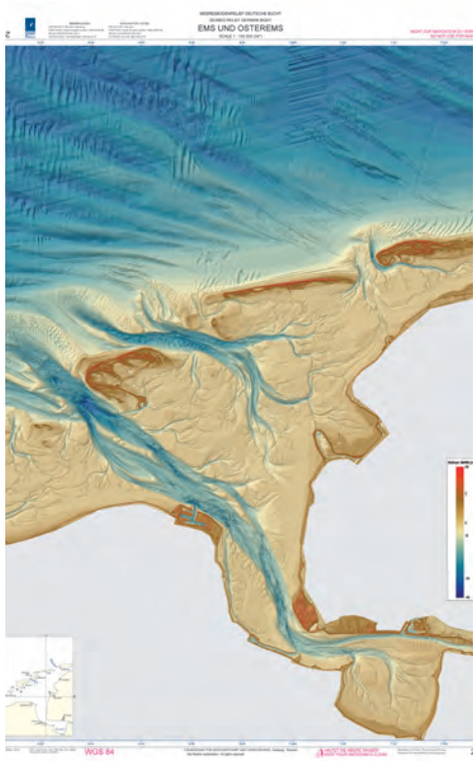


Figure 4: Seabed relief of the Ems and Osterems on a scale of 1:100,000. The extensive stripes visible in the north are attributable to systematic errors in the hydrographic analysis of older measurements. They have been included for information purposes.
(© Federal Maritime and Hydrographic Agency, Hamburg and Rostock)

DGM Nordsee (North Sea DTM)

The North Sea digital terrain model (DGM Nordsee) is a joint product of BSH, WSV and the Laender departments for nature conservation and coastal protection. It provides topographic reference data for all maritime tasks and applications within the German offshore zone.

The DGM Nordsee is the basis for almost all tasks in the coastal and offshore sector, ranging from the planning of building projects for coastal protection, environmental monitoring, and maritime shipping to the planning and approval of offshore activities.

Because the sea bed has a high change dynamic, the near-coastal area of the North Sea is completely resurveyed and remodelled every six years. In the offshore zone, areas are updated every 25 years, although centres of activity such as wind farms have more up-to-date data.

The DGM Nordsee covers the area of the Exclusive Economic Zone of the German Federal Republic – an area that is not represented by almost any AdV product. The topographic information of the seabed model is recorded by airborne laser scanning (ALS) with a resolution of 3 to 4 dots/m² in the area of emerged tidal flats and the coastal strips and is complemented in wet areas by echo sounding. Visual sensors, such as laser scanners or imaging sensors, do not work here, since the turbidity level of the North Sea is largely too high to be adequately penetrated by light. However, by means of modern acoustic multibeam echo sounders, similarly high accuracy and resolutions comparable to onshore light scanner measurements can be achieved. The DGM Nordsee provides a resolution of 1 m in the coastal area and a resolution of 50 m in the offshore area.

Maritime surveying depends on AdV and the individual institutions of the Laender and the Federal Government. The North Sea digital terrain model (DGM Nordsee), derived from maritime surveying, is an important product for the numerous maritime tasks along the German coastline; an area that is gaining importance more and more rapidly as a result of diversified uses and the growing need for protection.

Monika Breuch-Moritz

President of the Federal Maritime and Hydrographic Agency and Maritime Ambassador for Germany, appointed by the International Maritime Organization (IMO)

Data of the DGM Nordsee are made available free of charge to the public as an INSPIRE-compatible 50 m raster via the GeoSea portal of the BSH and the portal of the European Marine Observation Data Network (EMODnet) of the EU.

2. Working Group Spatial Reference

The new understanding of the geodetic spatial reference

In the classic approach the geodetic reference frames were provided by more or less separate control point framework of position, height and gravity.

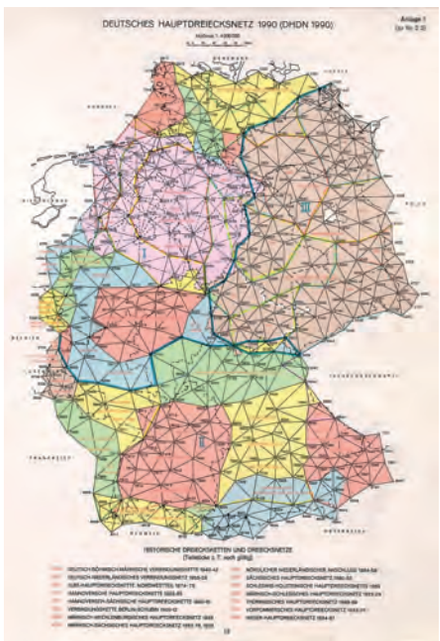


Fig. 5: Former German main triangulation grid (Hauptdreiecksnetz) (1990))

Fig. 6: Today's : SAPOS®-Satellite Positioning Service of the German Land Surveying Authorities (2018)

This viewpoint has gradually changed since about the beginning of the 1990s with the increasing use of the GNSS measurement technique. It became possible to create control point frameworks that met the requirements of the new measurement technology and of a standardised Europe-wide reference system.

Consequently, the classic triangulation networks were gradually replaced, i. e. they ceased to be used. By establishing permanent GNSS reference stations nationwide starting in the second half of the 1990s, it became possible, for the first time, to provide the spatial reference in the form of the operational satellite positioning service SA*POS*® in real time, which allows a position to be determined with an accuracy range of 1 to 3 centimetres and thusly meets the requirements of legally secure real estate surveys. Through the coupling of the SA*POS*® services of individual Laender and the nationwide coverage of the GREF network of BKG, a national standardised spatial reference can be established. In a standardised evaluation (DREF-online) the necessary link to the superordinate European and global reference networks can be created.

The committees of AdV coordinate the standardised course of action of all parties of the federal government and the Laender and define nationwide standards. During a time when product and quality consciousness were gaining ground in governmental action, the geodetic spatial reference frame with its satellite positioning services, had already established appropriate standards. Quality management, transparent to the public, already documented, at an early stage, the capacities of the national infrastructure. This transparency is a stand-out feature of the Official Surveying and Mapping authorities.

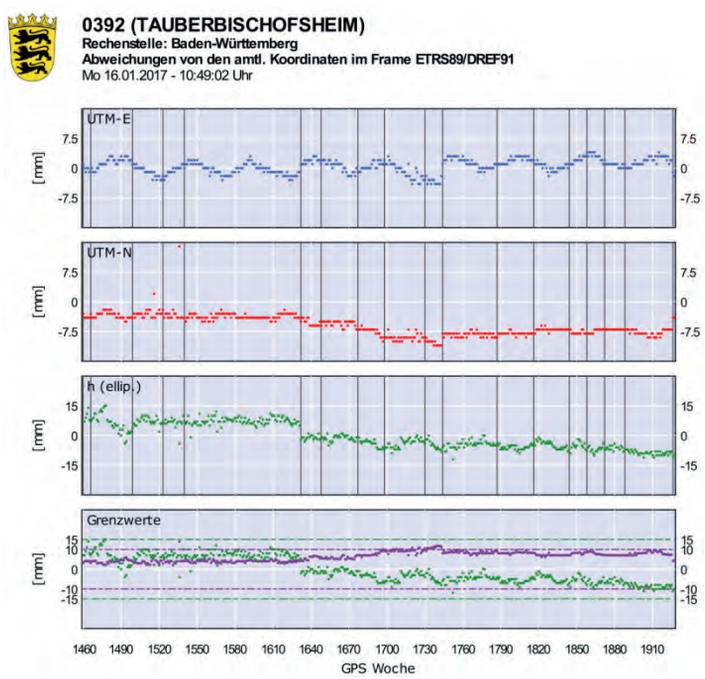


Fig. 7: Quality management at the satellite positioning service of the German land survey

SA*POS*®-Quality Management

With the help of the so-called “Guidelines for a standardised integrated geodetic spatial reference of the official surveying and mapping of the Federal Republic of German” the product vision, including a quality security framework, is being applied to the entire product range of the geodetic spatial reference. The surveying and mapping authorities put a holistic approach of the geometrically and physically defined components of “Location, 3D position, height, respectively geopotential altitude and gravity” into effect which has been kept separately until now. The AdV project “Re-measurements in the German Height Reference System (DHHN) – a worldwide unique measurement campaign between the years 2006 and 2017 – forms the framework for the new understanding of the geodetic spatial reference. With this, Germany has laid the base for a geodetic infrastructure, which is prepared for future applications, like e. g. centimetre-level accurate vehicle navigation as a component for autonomous driving or for so-called “precision farming”. The geodetic spatial reference opens up rapidly for new fields of operations. High-precision positioning will no longer be a discipline for specialists but will instead be “daily business”.

With Galileo a further satellite positioning system is currently incorporated into the national infrastructure which then will strengthen the overall system in regard to all aspects – reliability, accuracy and speed.

Galileo as a European flagship programme is being handled by all Member States together, in particular to provide benefits for Europe. With the incorporation of Galileo via SAPOS®, lots of users are going to benefit from a more precise and more reliable positioning and navigation. The accompanying market analysis of the European Union shows that the geodetic sector has recognised this potential.

Reinhard Blasi

European GNSS Agency (GSA), Prague

The entire development is part of the e-government. With significantly smaller personal resources a notably better national infrastructure is being provided today, which also contributes on the behalf of users like the Publicly Appointed Surveying Engineers (ÖbVI), to more efficient measurements.

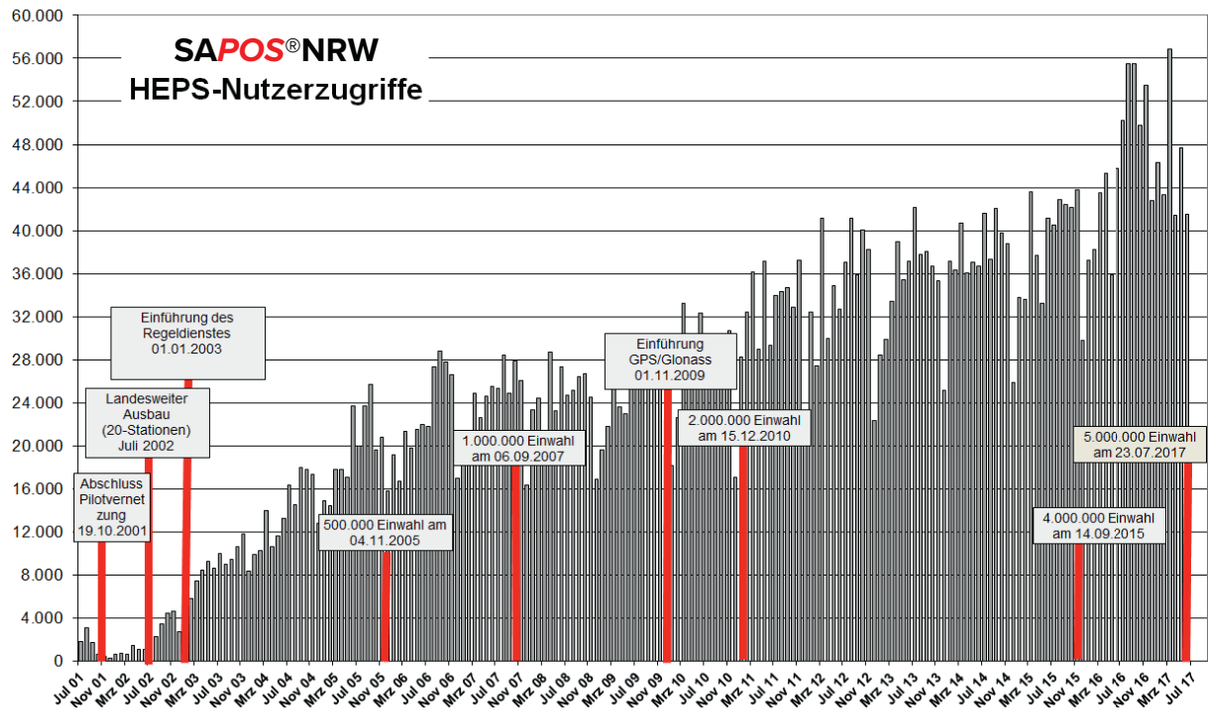


Figure 8: Use of the high precision real-time positioning service (HEPS) of SAPOS® on the example of North Rhine-Westphalia

This will be also underlined through the joint position paper of AdV and of the Association of Publicly Appointed Surveying Engineers (BDVI), in which SAPOS® is described as being indispensable for the legal security inside the real estate cadastre.

The determination and restoration of property boundaries during e. g. border disputes is, without exact coordinates, becoming increasingly impossible. Local reference points have, out of economic reasons, been rightly abandoned, since satellite-supported positioning is technically and economically the method used for measurements, today. For legal compliance it is vital that official authorities offer an appropriately accurate satellite reference system like SAPOS®. For freelancers SAPOS® is an indispensable element of the governmental guarantee of land and property.

Dipl.-Ing. Michael Zurhorst

President of the Association of Publicly Appointed Surveying Engineers (BDVI)

3. Working Group Real Estate Cadastre

“From six to seven”

The nationwide availability of ALKIS® has been appraised as a milestone in the history of the real estate cadastre and rightly so, since in hindsight it was the conclusion of an unprecedented effort and in foresight it is a future-proof contribution of the official surveying and mapping to the German digital infrastructure. Today, with the operational start of production and after the elimination of unavoidable teething problems every new software comes with, the surveying and cadastre authorities are bringing in the promised gains in efficiency. The horizontal integration, the merger of the automated real estate book (ALB) and the automated real estate map (ALK) is completed. Where earlier two systems had to be maintained partially redundantly, today there is ALKIS® instead.

The description of what all ALKIS® constitutes, can be found in the GeoInfoDok. ALKIS® was introduced nationwide on the base of GeoInfoDok 6. The surveying authorities, however, did not stop with the completion of this work. In fact, the model has been developed even further especially with view to a range of major users.

With the introduction of LEFIS the “common-law marriage” between cadastre and land consolidation authorities ended. The coming version of ALKIS® is now very well attuned to the needs of the land consolidation authorities, especially those working with land development information systems. Much of what, from the view point of the data model and software, slows down collaboration will be a thing of the past. From the perspective of the land consolidation authority the new ALKIS® is a necessary and desirable advancement. This is the only realistic way to build an efficient, digital workflow between cadastre, land register and land consolidation.

Andreas Wizesarsky

Head of working group III – Technology and Automatisation – German Federal Working Group Sustainable Rural Development

Especially the land consolidation authorities with their land development information system concept (LEFIS) and the land registry are working on fundamentally restructuring their working processes. While these developments are highly desirable from the viewpoint of the surveying authorities, they also pose new challenges to the system of the surveying authorities, ALKIS® A striking example for this: for communication between the data base land register, which is still under construction, and the real estate cadastre is the exchange of cadastral parcel information absolutely necessary. This is listed and exchanged in ALKIS® as objects of the class AX_Flurstueck. Naturally it is obligatory for cadastral parcels listed in the real estate cadastre to have a geometry. For the land register the geometric data is irrelevant. In order to facilitate an optimal exchange with the data base re, the new category AX_FlurstueckGrundbuch has been created for this very purpose, which does not need any geometry and reduces the cadastral parcels down to the feature data (Figure 9).

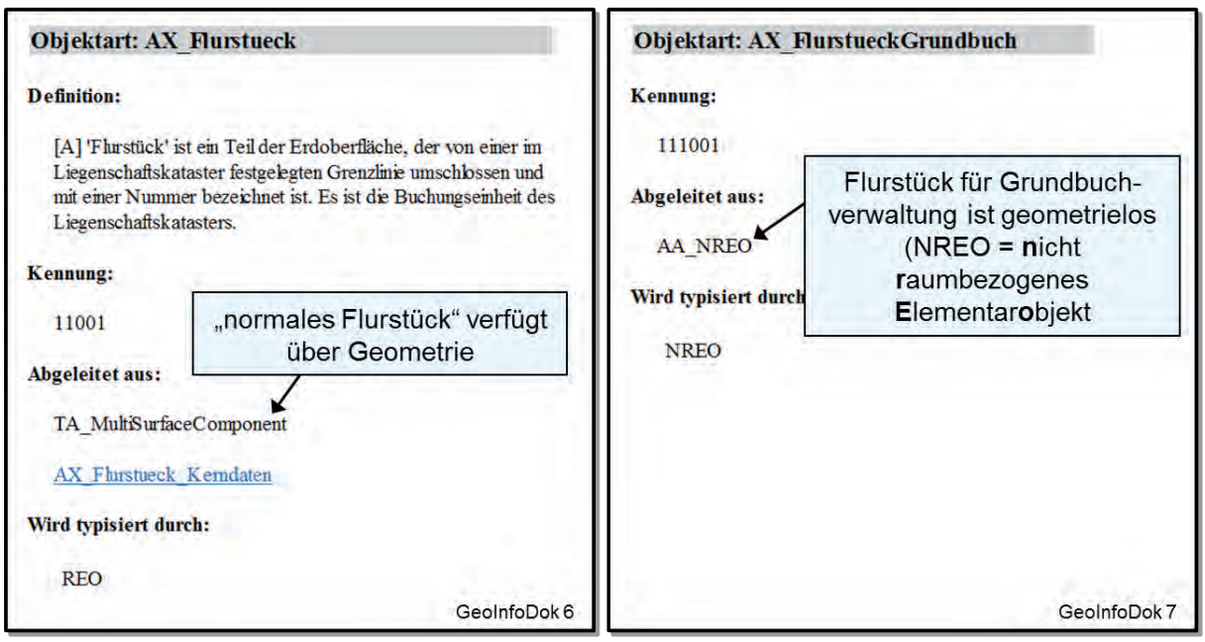


Fig. 9: left: Modelling of the conventional cadastral parcel with geometry; right: Modelling without geometry

It is planned to integrate these changes into the GeoInfoDok.

The implementation of Land Cover and Land Use

Based on the assumption that real estate cadastre and geotopography, ALKIS® and ATKIS®, need to grow closer together, the AdV plenum ordered, already in 2012, a project group to investigate to what extent these geospatial reference data can be harmonised. One of the project group's ideas has then been singled out and was given priority for further development: The division of the Actual Use (TN) in Land Cover and Land Use.

For literally decades, the surveying authorities have described the surface of the earth by means of the TN. However, a closer analysis shows, that the TN mixes two aspects that should actually be kept strictly separate from one another: in particular these are Land Cover and Land Use. The difference between the two can be described rather easily: a cadastral parcel with the coverage "grass" can be either used agriculturally as a pasture or for recreational purposes as a park. The TN cannot resolve these kinds of ambiguities. The dilemma is already apparent during the data acquisition process: Should a landscape scenario be coded using the aspects of Land Cover or of Land Use for the geospatial reference data? Too often both are valid. The results lack the desired uniqueness.

Conversely, the only way to describe the earth's surface accurately is to implement Land Cover and Land Use as new geospatial reference data. Ultimately this would mean abandoning the TN. Even after considering all of the shortcomings of the current TN it should be noted that it still plays a major part with many users, like e. g. during the production processes of the surveying authorities themselves. A premature decision to supersede the TN would involve a high risk to the functionality of follow-up processes. Following these considerations of the member authorities, the plenum of AdV has, in the last year, determined the direction towards the conservation of the TN and to develop additional application schemes for Land Cover and Land Use. The project group has implemented this, and a concept has been presented in which the expansion of the current TN and subsequent data entries are intended as a first step. As a second step, the new application scheme Land Use could be filled by means of data migration from the new TN. For the filling of the Land Cover one counts on the possibilities of remote sensing in particular. The concept will be further discussed in the plenary meeting in the autumn of 2018.

Quality Assurance

AdV is aware that the provision of plain data does not suffice and that an accompanying quality statement is obligatory.

This is why the GeoInfoDok, for years now, includes a quality control model (Figure 10) in which all steps from modelling to data output are being stored with an appropriate quality control aspect. In addition to this, AdV, respective its member authorities, are committed to ensure the quality of geotopographic and real estate cadastre products of the Official Surveying and Mapping authorities by means of defined descriptive and quantitative quality attributes of a nationwide standard.

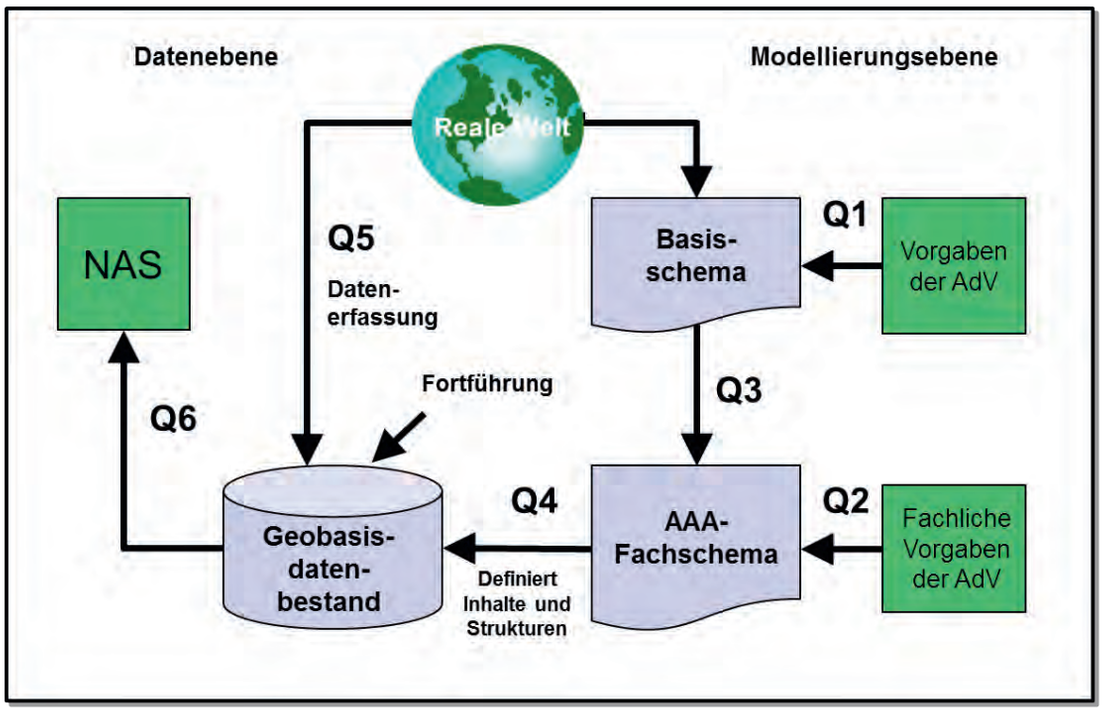


Fig. 10: Quality Assurance Model of AdV according to GeoInfoDok

Hitherto a user's point of view this quality assurance scheme might seem rather abstract. Quite clear, however, is the quality of data that is actually available for the user. They have to hold up to AdV's quality assurance. To ensure exactly that, the member authorities are currently working on the so-called AdV-Testsuite. This is supposed to be a software tool which verifies a data set according to the Norm-based Exchange Interface (NAS data set) by means of a specified, extensive list of test cases. Approx. 350 test cases are defined for the immediate area of the real estate cadastre. They check, for example, whether or not there are any overlaps or gaps between two neighbouring cadastral parcels and/or whether the building code has a valid coding.

The cadastre authorities will in the future be able to carry out assessments before the handover of the dataset to the user. Out of the quality assurance arises a quality guarantee.

4. Working Group Geotopography

Using the Authoritative Topographic-Cartographic Information System (ATKIS®), the surveying and mapping authorities of the Laender manage geospatial reference data that describes landscape in the product groups Digital Landscape Models, Digital Terrain Models, Digital Topographic Maps and Digital Orthophotos. The individual products of these product groups are kept current with regular updates. For key topographic features in the Digital Landscape Models, the updates take no more than a few months. During the reporting period the Working Group Geotopography continued the in-depth discussion of the product portfolio of official geotopography that it had begun in the previous years, so as to be able to continue providing the data from the ATKIS® product range in the future in a customer-oriented way, with contents that are sufficiently up-to-date; of the required quality, and within the scope of the staffing and financial capacities of the AdV member authorities: Decisions on the final results shall be made by the AdV plenum in the autumn of 2018 after coordination with the respective Working Group Public Relations and Marketing . Another main focus, aside to the real estate cadastre domain, was the division of the Actual Use (TN) into Land Cover (LB) and Land Use (LN), with the goal of introducing these new feature types into the next reference version of the GeoInfoDok. Ultimately, the geotopography puts its main focus on the development of modern and suitable mapping products. Originating from the idea for a "Map of the Future" the AdV plenum agreed upon the project "Smart Mapping". First concepts as prerequisites for the practical implementation are being expected by autumn of 2018.

Digital Landscape Models

One of the key tasks of the surveying agencies in the field of geotopography is to manage and update the Digital Basic Landscape Model (Basis-DLM) as the basis for the establishment of various specialized information systems in administration and business.

The regular updating of the Basis-DLM database takes place in different time frames. These cover the period from the emergence of change in the landscape up to the release of the updated database. A distinction is made between a key update of three, six or twelve months for feature types or attributes of greatest importance for the customers and the basic update of the entire database within a maximum of a five-year period during which the Basis-DLM is checked and, in the case of changes, updated. Figure 11 shows a visualised DLM section of the Erfurt motorway junction (A4/A71) together with the new stretch of the ICE-high speed link between Erfurt and Munich, which opened in December 2017.

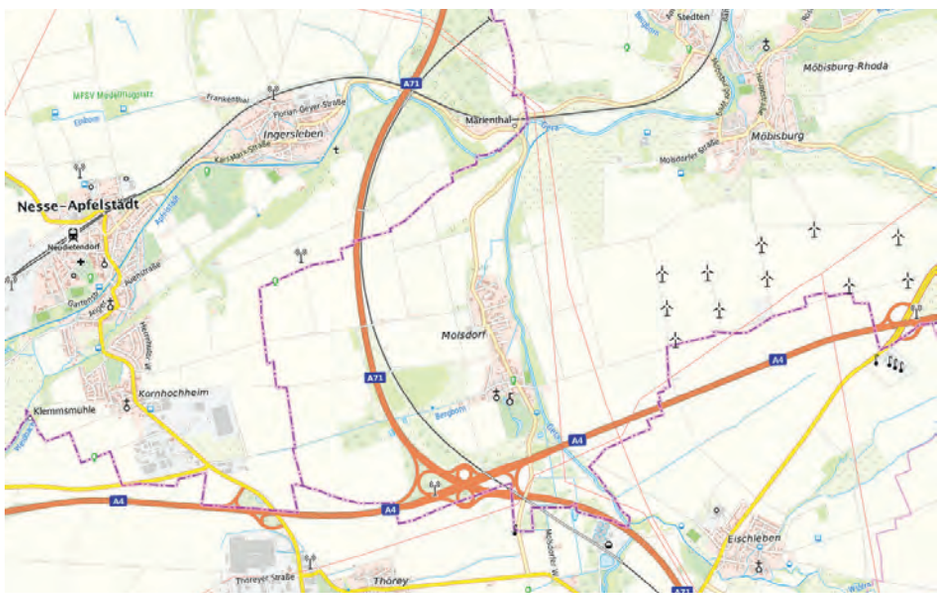


Fig. 11: Visualised Basis-DLM with motorway junction Erfurt (A4/A71) and new ICE high-speed link Erfurt – Munich (centre of picture from north to south)

In the course of the review of its product portfolio the Working Group Geotopography discovered that for many users a reduction of the upper limit for the key update cycle is desired. For the autumn of 2018 a decision of the AdV plenum is being pursued to reduce this cycle to a maximum of three years, in the future.

The digital Base Landscape Model has, for a long time, been an important and reliable source of data for environmental monitoring in regard to Land Use/Land Consumption and the most important database for the monitoring of settlement and open space development (IÖR-Monitoring).

Dr.-Ing. Gotthard Meinel

Division Director Monitoring, Leibnitz Institute for Ecological Urban and Regional Development (IÖR) e. V, Dresden

With the joint project “ATKIS® Generalisation” the conditions were created to derive the DLM50 from the Basis-DLM using model generalisation fully automatically. The DLM50 exhibits a simpler form of structuring and a lower data volume than the Basis-DLM. For the production of the Digital Topographic Maps 1:50,000 (DTK50) and 1:100,000 (DTK100), the corresponding automated, interactive processes (cartographic generalisation) were developed and put into practice. This marked an important milestone in the effective and efficient provision of ATKIS® products given the increasingly demanding user requirements for up-to-date information and shrinking human resources at all surveying and mapping authorities.

The DLM250 and DLM1000 processed at BKG are available nationwide and are updated on an annual basis. The contents are being continuously expanded for the production of the small-scale DTK250 and DTK1000 as well as for the EuroGeographics products EuroRegionalMap (1:250,000) and EuroGlobalMap (1:1,000,000) and additionally, for the linking of technical data and for the reporting at a European level (main user: European Commission). The requirements of the users in this area are also continuing to increase.

Land Cover/Land Use from the perspective of Geotopography

Analyses and time series observations for topics of high social significance, such as climate, energy, mobility, sustainability and demography, are usually based on standardised geospatial reference data. The documenting, management and provision of this application-neutral landscape and real estate-descriptive geospatial data is the task of the Official Surveying and Mapping Authorities. Practice has shown that, alongside statistics, as well as the land registry and fiscal administration, a major user group can be found within the context of land use and environment. With this in mind, and because of increasingly complex user requirements, it is vital to institute the differentiation of the current feature type Actual Use (TN) into the semantically clean categories of Land Cover (LB) and Land Use (LN). AdV is working on an appropriate strategy for transferring the existing object database (of TN) into the components of LB and LN, in order to meet the extended requirements of the German and European users.

For this purpose, an application-neutral nomenclature of LB and LN has been created which offers the scope of content as well as the semantic neutrality which is needed in order to fulfil the diverse user requirements. Furthermore, a data migration concept has been developed which is based on the extension of the existing feature types of the TN. The purpose of this operation is the elimination of semantic ambiguity within the feature type catalogue by means of extension. Following this extension, the automatic filling of the technical schema of LN is possible.

The Land Cover should also be, on the basis of data retrieved from remote sensing, generated mostly automatically. A higher topicality as well as the establishment of a history is intended. This could then facilitate future time series observations in order to answer ad hoc questions of political nature without the necessity of creating time series manually.

The progress of this task is already at an advanced stage and AdV will discuss the necessary fundamental resolution in the autumn of the year 2018.

Digital Elevation Models

In addition to the Digital Landscape Models that describe position, the surveying and mapping authorities manage Digital Terrain Models (DGM) with varying levels of precision to represent height as a third dimension. These models are available to authorities and businesses as part of the geotopographic core data for setting up Geographic Information Systems (GIS). Digital Terrain Models are digital, numerical models of the terrain heights and shapes of the earth's surface reduced to a regular grid. They do not contain any information about structures (e. g. bridges) and vegetation.

The products of the product group Digital Terrain Models (ATKIS®-DGM) are structured according to their grid size. DGMs with a larger grid size are then usually automatically derived from DGMs with the lowest available grid size. For the ATKIS® technical concept, the DGM feature type catalogue is available in the GeoInfoDok. The data quality is documented in the ATKIS® product standard for Digital Terrain Models. For the DGM5, for example, this stipulates a terrain-type-related height accuracy of the grid points of +/– 0.35 m to +/– 1.10 m with a confidence level of 95 % (2σ). The foundation for this high precision is usually the high precision Airborne Laser Scanning, which generates data for the DGM mostly automatically by now. In order to provide a quality overview to both the surveying and mapping authorities as data producers and to the product users, the Working Group Geotopography decided on a quality standard for DGMs, during the reporting period.

Currently, DGM data sets with a grid size of 5 m (DGM5), 10m (DGM10), 25 m (DGM25), 50 m (DGM50), 200 m (DGM200) and 1,000 m (DGM1000) are available nationwide for the whole of Germany. Since 2004, BKG in cooperation with AdV has been offering standardised Digital Terrain Models for the entire territory of the Federal Republic of Germany. Here BKG is taking on the task of harmonising the height data collected by the Laender in the overlap areas between the Laender, processing it appropriately (e. g. data formats, sections) and offering it to customers primarily from the fields of energy, the environment and conservation via the portal of the Service Centre (DLZ) at **www.geodatenzentrum.de**.

The current Digital Terrain Model of Germany, available with a grid size of 5 m, and all the other above-mentioned lower resolutions are constantly updated and continuously improved by BKG on the basis of the data updates of the Laender. Figure 12 shows a section of the DGM5 in a shaded view.

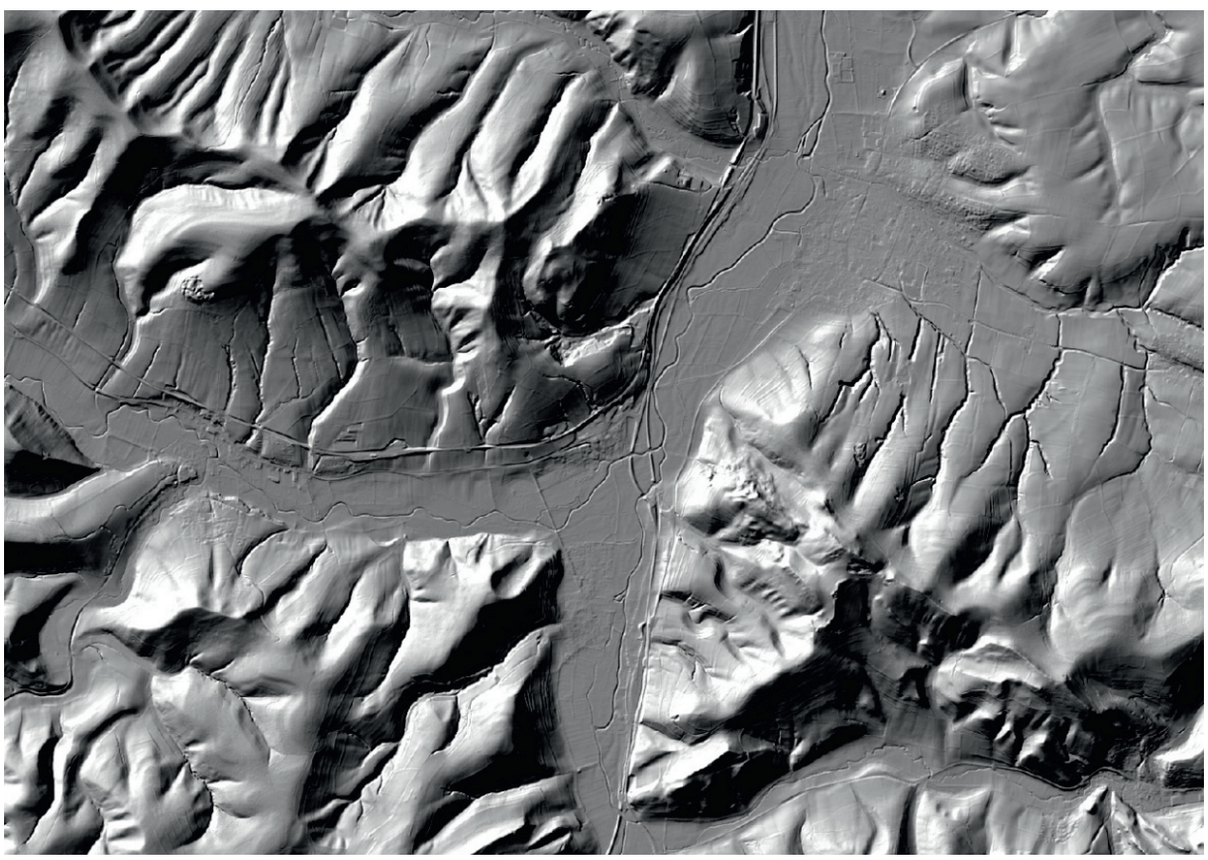


Fig. 12: Extract from the DGM5 in a shaded view.

For risk analyses in calculating tariffs, terrain models are used by insurance companies in particular. For this purpose, the German Insurance Association (GDV e. V.) uses the “Zoning System for Flooding, Backwater and Heavy Rain” (ZÜRS for short) in connection with the geospatial reference data of the DGM5 as a basis.

Furthermore, in the reporting period, work has proceeded in almost all the German Laender on the set-up, completion or updating of high-precision DGMs with grid sizes of 1 m (DGM1). Nationwide coverage with DGM1 will presumably be achieved at the end of the year 2019.

In the surveying and mapping agencies, Digital Surface Models (DOMs) are created in addition to DGMs. DOMs are digital, numerical models of the heights and shapes of the earth's surface, including structures and vegetation, reduced to a regular grid. As with the DGMs, DOMs are structured according to their grid size and DOMs with a larger grid size are automatically derived from the DOM with the lowest available grid size using new interpolation. DOMs do not constitute an AdV standard product, however.

DOMs are based on the method of Airborne Laser Scanning or the digital image correlation (image matching). An increasing demand for these products can be observed amongst the users. The DOM and their data quality are defined by the ATKIS® standards for Digital Surface Models.

3D Building Models

The surveying and mapping authorities within AdV have been offering the product 3D Building Models since 2013. The data is collected on the basis of the AdV product standard for 3D Building Models and the data format description in the AdV CityGML profile. The AFIS®-ALKIS®-ATKIS® model has been expanded to include 3D buildings and 3D structures as part of the GeoInfoDok 7.0. 3D Building Models are available ubiquitously with the Level of Detail 1 (LoD1). Here all buildings and structures are given a flat roof ("block model"). A total of more than 51 million building objects in LoD1 are now available for users. The Central Office for House Coordinates and Building Polygons (ZSHH) provides this data to customers who need the data for more than one particular land. In the next level of detail, Level of Detail 2 (LoD2), all buildings and structures are currently being modelled by the surveying and mapping authorities using standard roof shapes. In figure 13 an oblique view of Gotha in Thuringia in LoD2 is displayed. In some Laender the production of the data sets is already well advanced or even complete. In autumn 2016 the AdV Plenum set the beginning of 2019 as the deadline for nationwide coverage to be available. Owing to user requirements, AdV further decided to incorporate significant structures into the database in addition to the buildings. Modelling examples for the identified feature types such as towers, bridges and masts are available. These supplementary objects are supposed to be available nationwide at the beginning of the year 2021.

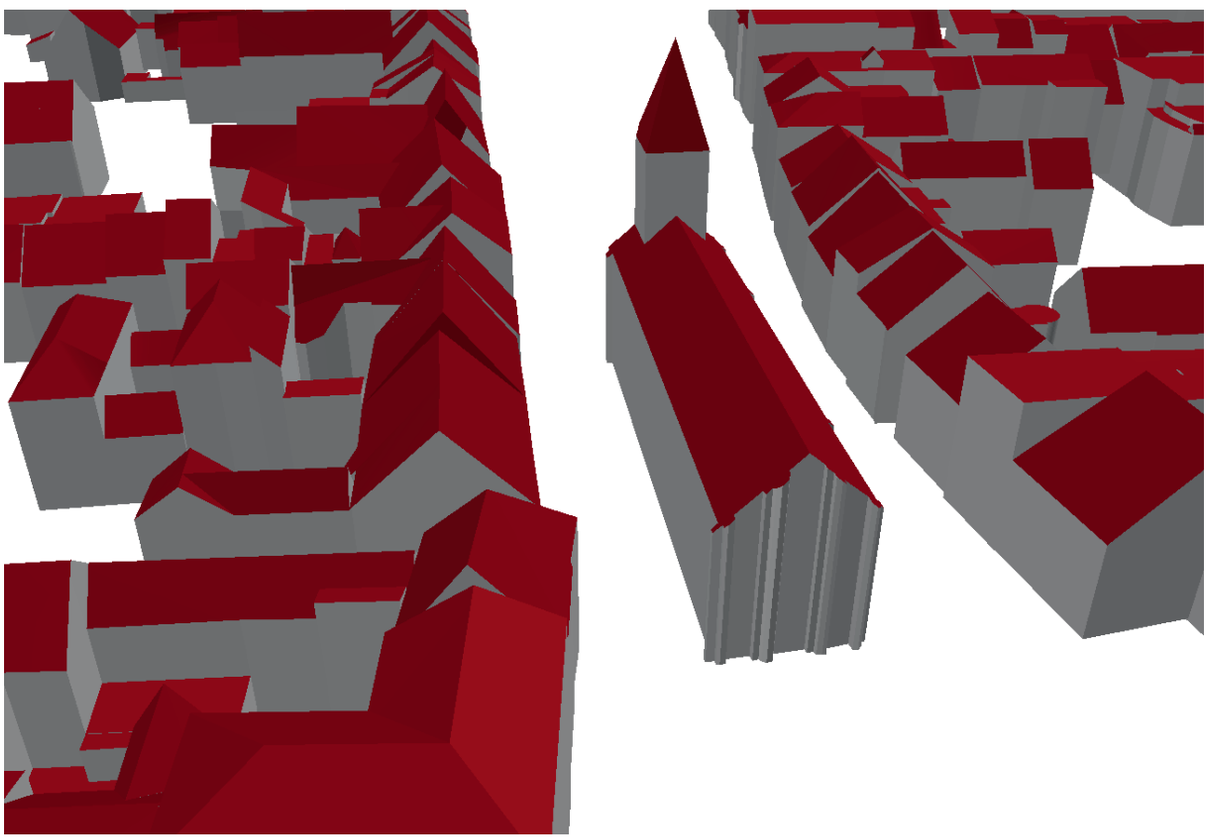


Fig. 13: 3D Building Model with the Level of Detail 2 (LoD2), Neumarkt with Margarethen church in Gotha, Thuringia

Digital Topographic Maps

Based on the Digital Landscape and Terrain Models, the surveying and mapping authorities create the Topographic Maps in modern map graphics. This is documented in the ATKIS® portrayal catalogues as part of the GeoInfoDok of the AFIS®-ALKIS®-ATKIS® project. Since the end of 2016 the current portrayal catalogues have been available in a formalised form aligned with all the above-mentioned information systems. The latter are based on an object model that was integrated into the AFIS®-ALKIS®-ATKIS® model world.

In almost all Laender, full coverage through Digital Topographic Maps (ATKIS®-DTK) has been achieved.

For DTK50 and DTK100, the surveying and mapping authorities have made an agreement with the German Federal Ministry of Defence that they should be maintained and published as joint civilian and military maps. DTK100 has been available with nationwide coverage and in standardised form for Germany since the end of 2012. Focused on the needs of the Bundeswehr and other users, future versions of DTK50 will again show a representation of individual buildings, created by means of automated generalisation processes.

The raster data set of the Digital Topographic Maps on a scale of 1:250,000 (DTK) and 1:1,000,000 (DTK1000) have been updated in the course of the reporting period. Both map series are derived from the scale-related Digital Landscape Models DLM250 or DLM1000 and are processed cartographically. Federal agencies use these small-scale DTK primarily. Additionally, BKG service centre makes the maps open to the public. There they are, together with the foreign share, seamlessly available as a Web Map Service (WMS). A download of the maps as Open Data structured in either individual data layers or collected into collective data layer. is possible as well. The print on demand process has been successfully implemented by BKG for both map series. Since 2017 a printed 30-page DTK250 map series (TK250) is available. Every reverse page shows a correspondent satellite imagery which is provided by the European earth observation programme Copernicus (see Figure 14).

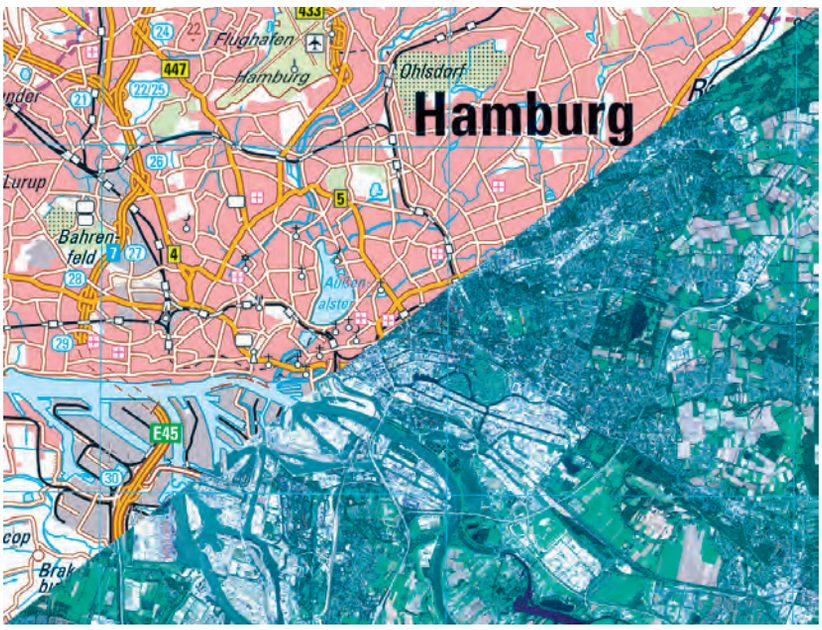


Fig. 14: Topographic Map 1:250,000 (TK250) with corresponding satellite imagery

The DTK1000 is also available in different print versions. This overview and landscape map is available as folded map in a scale of 1:1,000,000 (Figure 15). The wall maps “Overview Map Germany”, “Administrative Map Germany”, “Landscape Map Germany”, “Satellite Map Germany” and “Land Cover Map Germany” derive from the DTK1000. They all are available at a scale of 1:750,000 with a hanger or as wall map.

Fig. 15: Topographic Map 1,000,000 (DTK1000)

Also, techniques for a mostly automated cartographic generalisation of the various map series are available and in operation in the Laender. This makes highly efficient derivation from the Digital Landscape and Terrain Models possible.

As long as DTKs are not yet being created on the basis of the ATKIS® portrayal catalogues, the Laender will continue the conventional topographic map series to the extent required in each case and keep them available in printed form and as a raster data set, it is however, not continuing any further. To meet customer requirements, the possibilities of web-based presentations continue to be increasingly used.

AdV has realised, however, that despite all the progress in creating the DTKs, the changing user requirements cannot be fully and adequately met by the current products. As a selected change approach, the project group Vector-DTK of the AdV Working Group Geotopography has created a prototype of a vector-based DTK. The automatic derivation of these vector-DTKs uses the same source data as for the derivation of the current raster data set. An exemplary implementation with cartographically edited data was carried out in order to create the DTK50. The content is subdivided thematically and can be edited or further processed. The presentation is similar to the printed version and can be adjusted by the users according to their needs.

Throughout the reporting period, in concert with this technical development the AdV working group engaged further in working out requirements and implementation possibilities for a “Map of the Future” (this also includes the map services). As a result, in the autumn of 2017, the AdV plenum initiated a project which commenced under the title “Smart Mapping”. As a first step, a new working group has been established, which is supposed to develop a functional, a technical and a data provision concept, by autumn of 2018.

Official Map Services

The demand for official map services has increased tremendously from users of various types over the past years. In addition to high performance, the availability of, preferably, infinitely variable zooming, high uptime, availability in a viewer and as a service, font and signature adjustments for every scale, a simple standardised characteristic map style as well as nationwide availability at a minimum and inter-Laender provision are particularly expected.

DLM and DTK could not entirely fulfil these demands. Based upon the activities of several member authorities, a joint web-based map service of the name “WebAtlasDE” was implemented jointly by the federal government and the Laender in 2012 which was embedded in the geographic portals of the federal government and the Laender. In this process, Digital Landscape Model raster map tiles of different scales are created and then made available via the Web Map Tile Service (WMTS) on a performant and highly reliable level.

In particular, the complete presentation of all buildings registered in the real estate cadastre, including their house numbers, and the regular comprehensive update of the geotopographic data analogously to the DLM continuation are stand-out features of WebAtlasDE. The service was for example then embedded into the homepage of **www.adv-online.de** and can be retrieved there. Along with the official reference system ETRS89/UTM, the coordinate reference system used by many non-governmental users, “Pseudo Mercator”, is also offered.

With the product TopPlus-Open, BKG breaks new grounds and creates a consistent, free content worldwide web map based on free and official data sources. For this purpose, many different data sources were merged, processed and combined, to obtain the best possible map presentation. Official geospatial data of the Laender Berlin, Brandenburg, Hamburg, Mecklenburg-Western Pomerania, North Rhine-Westphalia, Rhineland-Palatinate and Thuringia are presented in the product (Figure 16).

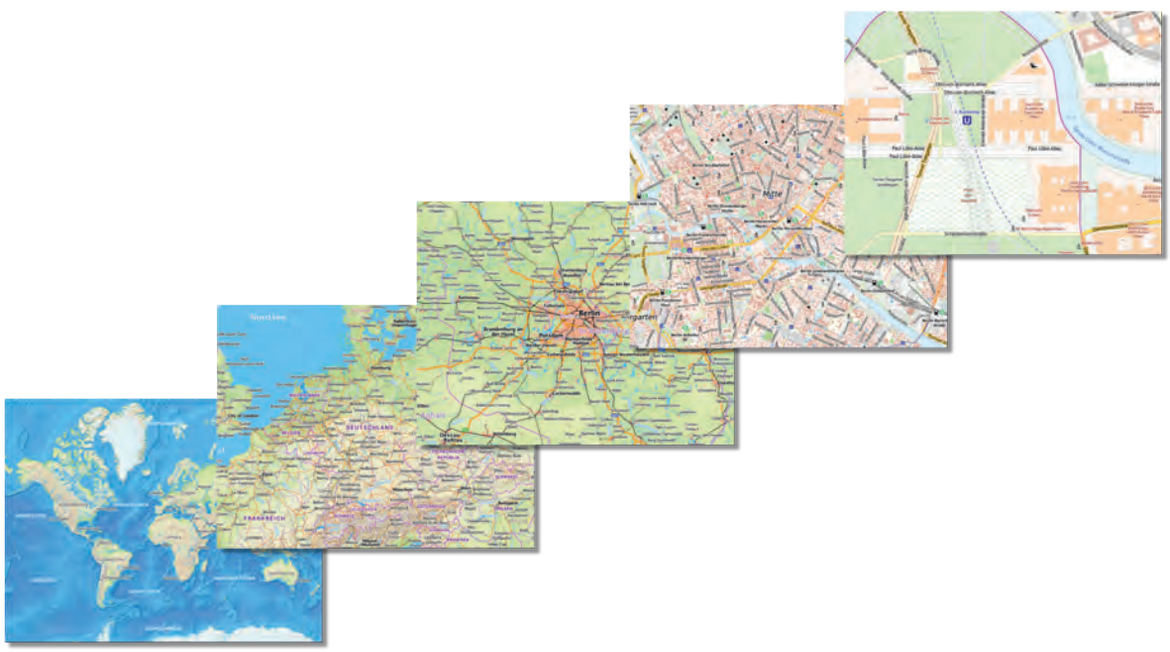


Fig. 16: Different levels of detail of TopPlus-Open ranging from world maps to more detailed local depictions

TopPlus-Open was activated in September 2017 in Berlin, during the INTERGEO®, a worldwide leading convention for geodesy, geoinformation and land management. Since then the product can be used freely, utilized and redistributed by everyone. For this the geospatial data according to the Open Data Datenlizenz Deutschland – Namensnennung – Version 2.0 is available free of charge for online use.

This web map is available as an internet service via the standardised Open Geospatial Consortium (OGC)-conform interfaces Web Map Service (WMS) and Web Map Tile Service (WMTS), can be easily integrated into common GIS systems and web map applications like ArcGIS, QGIS, OpenLayers or Leaflet and can be used on diverse devices ranging from smartphone to the desktop PC.

The official map services are also involved in the project “Smart Mapping” of AdV (see section Digital Topographic Maps). As soon as the general requirements of the users for such services (see previous paragraph) are met here as well, it is the objective, that through a convergence of all product processes, the high timeliness of the landscape-descriptive geospatial reference data is transferred to all products of AdV as quickly as possible.

ATKIS® Geospatial Data Service, INSPIRE

In the provision of geospatial reference data via web technologies, harmonisation throughout Germany is also necessary. AdV has therefore created non-sector-specific web profiles for viewing and download services. Built upon this, for the area of geotopography, the web product specifications required here (WebAtlasDE-WMS, WebAtlasDE-WMTS and ATKIS®-DLM-WFS) have been agreed to by the AdV Plenum and will be updated as needed by the working group. Further product specifications are supposed to follow in the future.

Besides the NAS format as AdV's standard output format, a standardised structure of the widely used Shape format has been defined in order to be able to deliver data in the AAA® model to customers in this format as well. Based on the AdV Shape Profile version 1.0.0, the corresponding AdV product specification for DLM data has been available for several years now.

The above-mentioned production specifications, as with the other AdV geotopographic standards, can be looked up in their latest version on the website **adv-online.de**.

Furthermore, the main emphasis of the work carried out during the reporting period was on compiling the documents necessary for the implementation of the INSPIRE Directive. These were available in their finalised form in the course of 2017 and were approved by the AdV plenum in order to guarantee the implementation of INSPIRE's Annex-I topics by 23 November 2017 – the deadline all member states were required to deliver their geospatial data in a compliant and interoperable manner by.

BKG has also fulfilled this legal obligation for its spatial data products in time. INSPIRE -compliant spatial data is now available throughout Germany for the medium scale range, i. e. approx. in the scale of 1:250,000, for the INSPIRE relating topics mentioned in Figure 17.

INSPIRE Thema	Datengrundlagen des BKG			
	DLM250	CLC10	GN	VG
Annex I				
Administrative units / Verwaltungseinheiten				X
Geographical names / Geographische Bezeichnungen			X*	
Hydrography / Gewässernetz	X			
Protected sites / Schutzgebiete	X			
Transport networks / Verkehrsnetze	X			
Annex II				
Land cover / Bodenbedeckung		X		

Fig. 17: INSPIRE - provided by BKG
Source: BKG

** This geospatial data has been INSPIRE-compliant since 2015 already and has now been updated.*
(CLC = data set CORINE Land Cover; GN = data set geographic names; VG = dataset administrative boundaries)

The BKG Service Centre provides the geospatial data as open data via INSPIRE conform download (WFS) and mapping services and it has its own section at **www.geodatenzentrum.de/geodaten/gdz?l=down_inspire**. On top of that, the INSPIRE services of BKG can be researched at the geoportal Germany (**www.geoportal.de**).

During the implementation of INSPIRE in BKG rather than only fulfilling the statutory obligations the main focus was much more put on actively shaping the INSPIRE directive by means of Europe-wide interoperable spatial data. The federal office therefore did not only implement the minimum requirements of INSPIRE, but also made use of all previously gained experience for the harmonisation and edge matching of European geo-spatial reference data. Especially, the results of the European Location Framework Project (ELF) carried out by EuroGeographics were applied (**www.elfproject.eu**).

The establishment of a cross-level geographic infrastructure is fundamental for Germany. Through that, the locating of geospatial data sets and services as well as their subsequent usage for tasks in areas like security, mobility and environment is made easy. This is what the Federal Agency for Cartography and Geodesy is responsible for on the federal governmental level.

Prof. Dr.-Ing. Hansjörg Kutterer
President and Professor of the Federal Agency for Cartography and Geodesy (BKG)

For the years 2018 to 2020 the creation of documents necessary for a nationwide standardised provision of INSPIRE-Annex I and III topics and the implementation of other spatial data at a federal governmental and Laender level as well as the update of current data and services is up next on the agenda of AdV.

Digital Orthophotos

The surveying authorities of the German Laender commission aerial imagery flights at regular intervals in order to provide up-to-date aerial photographs to external customers and for internal use in updating the Digital Landscape Models and Digital Topographic Maps. These aerial photos are oriented and orthophotos are calculated from them. In this way the Digital Orthophotos product group (ATKIS®-DOP) rounds off the ATKIS® concept.

Due to the image-based documentation of the landscape, Digital Orthophotos (DOPs) are suitable for all view-based applications. DOPs with a ground resolution of 20 cm (DOP20) are available in colour for all of Germany. Individual Laender have been producing DOP10 for some years now.

Because the results of aerial photography are crucial to the prompt continuation of the geotopographical reference data of ATKIS®, the high-resolution DOP20 is subject to an update cycle of no more than three years. The stipulations in the product and quality standard for the Digital Orthophotos provide the necessary conditions e. g. for the pooling of the Laender data at the Central Office for Geotopography (ZSGT) located at BKG. Along with the Laender, the ZSGT provides the DOPs and visualises them, as a nationwide data pool, in a DOP viewer available online. The DOP20 is firmly established as a standard product for virtually all technical applications with a spatial reference within and outside of the surveying authorities. Modern technologies, such as the computer-controlled dense image matching in which a pixel-based surface model combined with radiometric image data is created from oriented stereo aerial image pairs, make it possible to produce so-called TrueOrthophotos, which has been picked up by individual Laender, already. These kinds of orthophotos no longer contain any tilting effects, meaning all the objects displayed are shown in the correct position and no occluded areas remain. The member authorities of AdV decided in 2017 that a nationwide extensive data pool of the same quality level will be available by the beginning of the year 2023, at the latest.

The switch to digital aerial survey camera systems has been completed for some time now. The high efficiency of multi-channel photography permits the simultaneous use of black-and-white (PAN), colour (RGB) and infrared (CIR) aerial image data. Since the near infrared wavelength channel has been made available, urgent requirements of surveying, forestry, agriculture and environmental authorities could be met.

Besides questions regarding the quality requirements for digital photography flights and questions of data transmission and analysis, the surveying authorities are focusing on the challenges of long-term data security and history management, as time series of aerial photographs are an indispensable tool for the work of the ever-growing number of users. The protection of aerial image data files should therefore also meet uniform minimum standards in the future. Through this long-term preservation of historical aerial images in digital databases, the AdV member authorities offer a data pool that often dates back decades and meets customers' requirements in this segment, for time series to a special degree. Historical aerial photographs by itself do usually not offer a georeferencing and are therefore limited in terms of analysability. By means of historical orthophotos derived from older aerial images the georeference is produced and faults originating from projective and perspective distortions are eliminated in the process, for the most part.

Users are given the possibility of comparing the current situation with other timestamps, e. g. so as to take landscape development into consideration in current decision processes.

The digital aerial photographs as the basis for deriving ATKIS®-DOP are increasingly made available to professional users additionally as Oriented Aerial Images by the surveying authorities. Oriented Aerial Images are aerial images that contain all the parameters required for stereoscopic analysis of the internal and external orientation. Rapid IT developments and the cost-efficient provision of user software are making stereoscopic aerial image analysis and presentation an economically viable option for users.

The high data quality combined with the multifaceted information comprised in the digital aerial imagery additionally offers the possibility of image-based classification. Looking to the future, the aim is to identify change information of various kinds in an automated process and utilise it in the topographical information systems; initial procedures are being used prototypically.

Toponomy

In collaboration with the Permanent Committee on Geographical Names (StAGN), BKG offers a standardised (gazetteer) service that provides the toponymy (GN-DE) from the vector data pool of the products DLM250, VG250 and GN250. GN250 (Geographical Names 1:250,000) is generally available in a classification of names corresponding to the ATKIS® feature types of ATKIS® in the AAA® data model. The raw data pool comprises around 183,700 entries of geographical names, including names of municipalities, parts of municipalities, landscapes, mountain ranges, mountains, islands, rivers, canals, lakes and seas. In accordance with the specifications of the Open Geospatial Consortium (OGC), the GN-DE database is available as a standardised Web Feature Service (WFS) at the BKG Service Centre. This data set has been provided in INSPIRE-compliant form as a service for the European Open Data Portal.

In accordance with the relevant resolutions of the United Nations Group of Experts on Geographical Names (UNGEGN), the StAGN has now compiled the 6th edition of the “Toponymic Guidelines for Map and Other Editors for International Use: Federal Republic of Germany”. This document is intended to provide information in cases of uncertainty about the use of geographical names and to serve as a set of rules to achieve the necessary standardisation. One of its chapters is dedicated to the consideration and treatment of geographical names in the official minority languages in Germany.
Download: **www.stagn.de/empfehlung-schreibweise-gn**.

The 11th conference on the standardisation of geographical names took place in New York, in August 2017. StAGN was represented by several participants; conference papers were handed in and presented. This conference was mainly influenced by the negotiations concerning the “Draft Resolution for Adoption by the United Nations Economic and Social Council (ECOSOC) – Future organization and methods of work of the United Nations Group of Experts on Geographical Names (E/CONF.105/L.3)”. The Draft Resolution (XI/1) was approved on 17. August 2017 during the conference. Through this the dual structure consisting of “Group of Experts” (UNGEGN) and “Conference” (UNCSGN) with respective different timescales, irregular rota and high costs has been merged and optimised. The final resolution (E/CONF.105/165) was accepted by the ECOSOC in the autumn.[1] This resolution is in accordance with the resolution “Strengthening institutional arrangements on geospatial information management” (E/RES/2016/27)[2] which had been introduced via UN-GGIM[3] (see also Chapter 7) at the ECOSOC

The spring meeting 2017 of the StaGN took place at BKG in Frankfurt/Main at the beginning of March. It took place in combination with the German and Dutch-speaking division of the UNGEGN, which held a meeting directly following the StAGN meeting. The autumn meeting of 2017 took place at the Julius-Maximilians-University in Würzburg. In their contributions to the meeting, the Linguistic Institute pointed out the significance of the standardisation of geographical names in linguistics.

[1] **https://undocs.org/E/CONF.105/165**

[2] **http://ggim.un.org/**

[3] **http://ggim.un.org/docs/E_RES_2016_27_en.pdf**

5. Working Group Information and Communication Technology

AAA®-Model

With the work on the AAA® model, AdV has designed an integrated and harmonised modelling of all the geospatial reference data of the mapping and cadastre authorities – split into a basic schema and a common AFIS®, ALKIS® and ATKIS® technical schema – drafted and realised by the AdV member authorities. The AAA® basic schema (Figure 18) forms the basis for the technical application schema for modelling the AFIS®, ALKIS® and ATKIS® objects as well as for data exchange via the Norm-based Exchange Interface (NAS). The procedure is described in detail in the "Documentation on the Modelling of Geoinformation of Official Surveying and Mapping (GeoInfoDok)", the latest version of which is published at **www.adv-online.de**.

It should be emphasised that international norms and standards are consistently observed and implemented in the AAA® project. Through the fully non-sector-specific modelling of the AAA® basic schema, other technical information systems can also use the classes defined in the AAA® basic schema for their own modelling, which has been done, for example, through the establishment of the Information System for Rural Development (LEFIS) as an object-oriented technical data model by the authorities for agricultural structure. LEFIS is a planning system for the continuous processing of land management measures under the Farmland Consolidation and Agricultural Adjustment Act. To support the extensive use of the AAA® model in sector-specific information systems, the software scripts behind the modelling are available to third parties free of charge. Since 2015, the nationwide switch of the geospatial reference data from ALKIS® and ATKIS® to the management according to the modelling of GeoInfoDok version 6.0 is completed. The AFIS® changeover is well advanced and will be complete in 2018. In addition to this, however, further developments to the AAA® model are being continued in an ongoing process in order to continue meeting the demands of users and GIS producers. To this end, the GeoInfoDok is being updated on the basis of revision notifications that can be entered through a web-based ticket system at www.adv-online.de, under AAA®-Modell > Dokumente der GeoInfoDok. The already received revision notifications have been evaluated by the AAA® revision committee. At the beginning

of 2018 the version 7.0.3 of GeoInfoDok has been released, which amongst other things ensures an ongoing backward compatibility to the current reference version 6.0.1. In 2018 further application schemas based on the AAA® model will be drafted (see Land Cover and Land Use, Page 30), following the national and international requirements of different user circles, in order to derive current information regarding Land Cover and Land Use from geospatial reference data. The accompanying adjustments of GeoInfoDok and the resulting version 7.1 of the GeoInfoDok as future reference version will be conferred by AdV in the autumn of the year 2018.

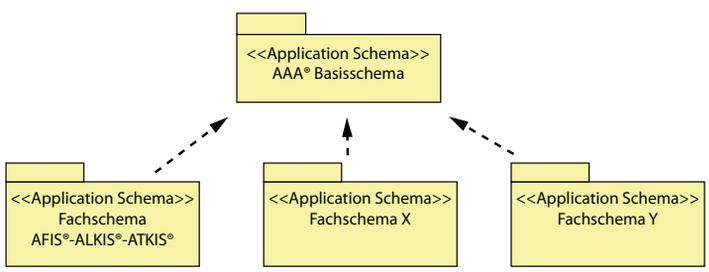


Fig. 18: The non-sector-specific AAA® basic scheme as a for modelling application-specific thematic schemata (e. g. AFIS®, ALKIS® und ATKIS®)

Over the past years some basic and technical approaches to the previous portrayal catalogues of AFIS®, ALKIS® and ATKIS® have been revised and implemented as formalised AAA® portrayal catalogues (fSKs). In the future, the AAA® portrayal catalogue object model will be recorded with additional interdisciplinary information in a main document on the AAA® portrayal catalogue in the GeoInfoDok. The advantages of formalisation stem from, among other things, the homogeneity and integration of the output from AFIS®, ALKIS® and ATKIS®, the automatic processing of the signature system in areas such as quality assurance, deriving documentation and revision lists, up to the updating process. A new version of the fSKs as agreed on AdV working level was published in 2018 at www.adv-online.de, under “AAA®-Modell > Dokumente der GeoInfoDok”, and represents the basis for action for the AdV project groups in their further work on maintaining and assuring the quality of the portrayal catalogues. Furthermore, tests can be conducted by companies on their own implementation and any necessary adjustments to the AAA® portrayal catalogue object model can be reported.

The formalised portrayal catalogues (fSKs) can be integrated easier and faster into the geospatial reference systems. In the past, enormous manual efforts for the implementation of the SKs were necessary. Through the use of established technologies, a bridge to the relevant OGC standards has been built, which consequently simplified the web-based provision of SK compliant maps.

Clemens Portele

interactive instruments GmbH

Geopatial Data Infrastructure

Fulfilling the requirements ensuing from the INSPIRE Directive and its implementation in the geospatial data access laws and geospatial data infrastructure laws of the federal government and the Laender is of central importance for the AdV member authorities. The interoperability of geospatial data required by INSPIRE can be achieved with a data schema transformation (AAA® as source data set, INSPIRE as target data set). The release of the target data sets will take place in the following two steps

- target data sets according to Annex I by 23 November 2017 and
- target data sets according to Annex II and III by 21 Oktober 2020.

To guarantee a homogeneous procedure among the AdV member authorities, definitions for INSPIRE product specifications were developed that describe the contents of the INSPIRE compliant data sets and services. A significant result of this work is the establishment of coordinated and tested mapping tables (alignments) with the aid of which an unequivocal, complete and largely formalised version of the AAA® mapping rules in accordance with GeoInfoDok 6.0.1 can be created and maintained compliant with INSPIRE – unique in this form throughout Germany and Europe (Figure 19).

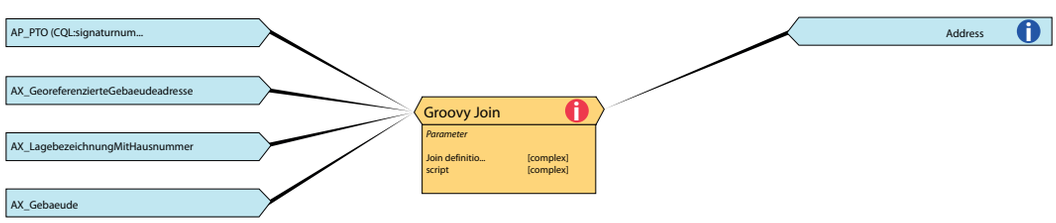


Fig. 19: Derivation rule – AX_Georeferenzierte Gebaeudeadresse, AX_LagebezeichnungMitHausnummer and AX_Gebaeude to Address

The advantages of this formalised description of the derivation rules are the uncovering of technical inadequacies in the mapping, the automated transfer of the mapping results to a transformation tool and, additionally, automatic documentation. Moreover, these alignments can be imported and further processed by software products for data schema transformation so that the conditions at the AdV member authorities are met for creating INSPIRE data sets and services that are uniform throughout Germany. The alignment for Annex I topics is completed and work for the creation of alignments and product specifications of the Annex II and III topics has been picked up.

The purpose of this project was the complete and correct mutual-mapping of two complex standard data models. The transition of a formal data transformation into an easily understood documentation was crucial for the collaboration between the technical experts. The transformation projects as well as the documentation deriving from it can now be used by authorities in all Laender to make nationwide standardised services according to the provisions of INSPIRE available.

Thorsten Reitz
wetransform GmbH

Furthermore, AdV is addressing the enhancement of the INSPIRE guidelines by the EU and the consequences that result for AdV's work. This includes analysing reports and stipulations that are being developed by the EU Commission's Maintenance and Implementation Group (MIG) in regard to their relevance and implementability in the AdV member authorities. If needed, concrete fundamental or superordinate aspects of the INSPIRE implementation will be coordinated with other committees of AdV.

Harmonised provision of geospatial reference data

The coordination of user-oriented provision of geospatial reference data in Germany was identified by AdV early on as one of its key tasks and was established as a focus in its strategic statements of principles. With the use of modern information technology and online distribution channels, web-based applications and geospatial data services make it possible now to supply geospatial reference data quickly, efficiently and thus, at the same time, in a user-oriented way. To this end the "AdV Geographic Reference Data Provision Strategy" forms AdV's common framework for action regarding the provision of geospatial reference data and contains, furthermore, basic stipulations for the implementation of this framework in the form of a plan of action. The AdV thus defines an overall strategy for the comprehensive provision of geospatial reference data that actively contributes to promoting a modern information, knowledge and civil society in Germany, with the surveying and geoinformation authorities assuming their national responsibility. Fundamental strategic, functional, technical, organisational and sales-related specifications are made, and tasks that can also be used as examples in the provision of geospatial data in other fields are defined. Components of the AdV Provision Strategy are described as, amongst other things, an interoperability framework, geospatial data services and geoapplications, such as the AdV Metadata Information System, the AdV Registry and the AdV Test Suite. With the AdV Provision Strategy, the geospatial reference data and applications of the AdV member authorities as well

as the framework for meeting the requirements of the National Geoinformation Strategy (NGIS) are already defined. The NGIS, as part of the National eGovernment Strategy, was decided upon by the GDI-DE steering committee and defines for Germany, among other things, the requirements for the interoperable and useful data exchange of available geoinformation.

The steadily growing demand for current, nationwide standardised quality-assured and permanently available geospatial reference data and geospatial data services of the AdV member authorities are being met by the AdV Test Suite.

Prof. Christian Killiches

Chairman Geobasis Steering Committee

To monitor compliance with the specifications of geospatial reference data and geospatial data services, the AdV Provision Strategy describes the development and operation of an AdV Test Suite (see Figure 29). The AdV Test Suite is of particular importance for guaranteeing the interoperability of the geospatial reference data and geospatial data services of the AdV member authorities and is a prerequisite for establishing a cross-Land quality management system.

The work so far includes

- the development of a concept for data, services and metadata
- the performing of data tests as part of a pilot implementation with regard to acceptable performance behaviour
- the development of more than 800 test criteria, so far, for AAA® data and metadata as well as
- the development of test criteria for service tests together with prototyping.

The LA Geobasis elaborated the tender documents necessary for the implementation of data tests in a test suite and the tendering procedures have started.

In accordance with the AdV Provision Strategy, AdV has created a series of technical web profiles for viewing and download services (Web Map Service – WMS, Web Map Tile Service – WMTS and Web Feature Service – WFS). Regulations valid for both profiles alike have been consolidated into a comprehensive OGC web service base profile which simplifies the maintenance of these profiles in general. These technical profiles form the basis for each of the sector-specific versions regarding the technical data to be provided (product specification). With the approach of defining general technical profiles and differentiated subject-specific product specifications, services and data formats produced by the member authorities are being harmonised, standardised in terms of contents and further expanded for the purpose of a nationwide provision of geospatial reference data as the basis for geospatial data infrastructures in Germany and in Europe. These profiles are supplemented

by the AdV Metadata Profile, which describes the structure and semantics of the metadata for the geospatial reference data and geospatial data services of the AdV member authorities. The latest versions of the profiles are uploaded to **www.adv-online.de**, under AdV-Produkte > Standards und Produktblätter > AdV-Profil.

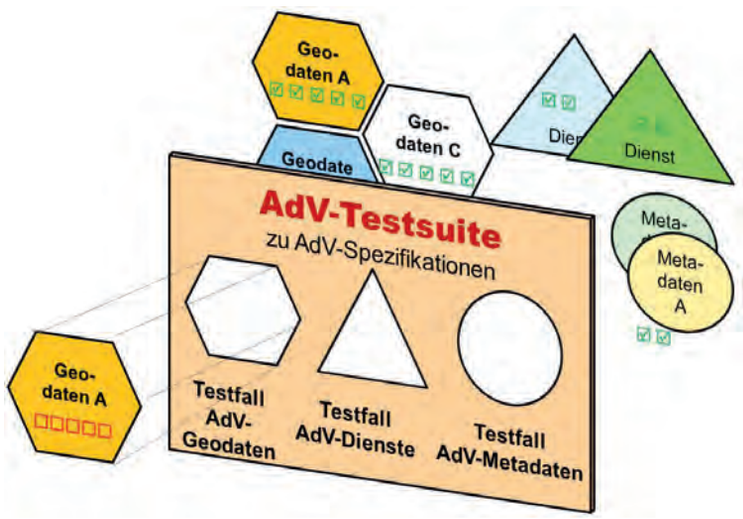


Fig. 20: Test cases of an AdV Test Suite

6. Working Group Public Relations and Marketing

Geospatial reference data describes and documents the space we live in. It is the non-interest-specific and non-application-specific description of the topography of the earth's surface (surveying and mapping) and real estate (real estate cadastre). Almost all planning and decision-making processes are related to a specific place and have an impact on our environment. They have a spatial reference! Geospatial reference data forms the link between the relevant sector-specific information and the corresponding location – and its surroundings – on the earth's surface. This makes it easier to recognise spatial connections and allows activities and phenomena to be precisely located. A comprehensible map is just as useful for knowledge transfer as it is for visualising complex situations. In Germany the surveying authorities of all the Laender are responsible for collecting, managing and providing geospatial reference data. They are working with a clear legal mandate. As modern, technical authorities, they thus guarantee that the state, the business sphere, scientists, researchers and the public are provided with highly up-to-date geospatial reference data. Efficient data services and modern online shops ensure needs-based access anytime and from anywhere. One of AdV's core tasks lies in continuing this development, recognising the current and future demand for geospatial data products and facilitating and promoting the use of official geospatial reference data throughout Germany.

Requirements

The responsibility for official surveying lies with the German Laender according to constitutional law. Because the need for a multitude of spatial applications goes beyond the provision of geospatial reference data within one Land and because users are increasingly making greater demands in terms of geospatial reference data being technically standardised across Laender and the contents being of high quality, it is necessary for nationally standardised, up-to-date and high-quality products and services to be provided and made accessible to expert users and the public. In addition to digital output on data storage devices, web-based data offerings are now standard. The surveying and mapping authorities provide digital databases for searching, viewing and downloading via geoportals, geospatial data services and geoviewers.

AdV has realised that a strategically important goal is for geospatial reference data to be also provided via geospatial data services by the appropriate agencies. With these standardised Internet services, the Official Surveying and Mapping in Germany wants to actively contribute to the development of the geospatial data infrastructure and eGovernment and thus promote a modern information, knowledge and civil society in Germany.

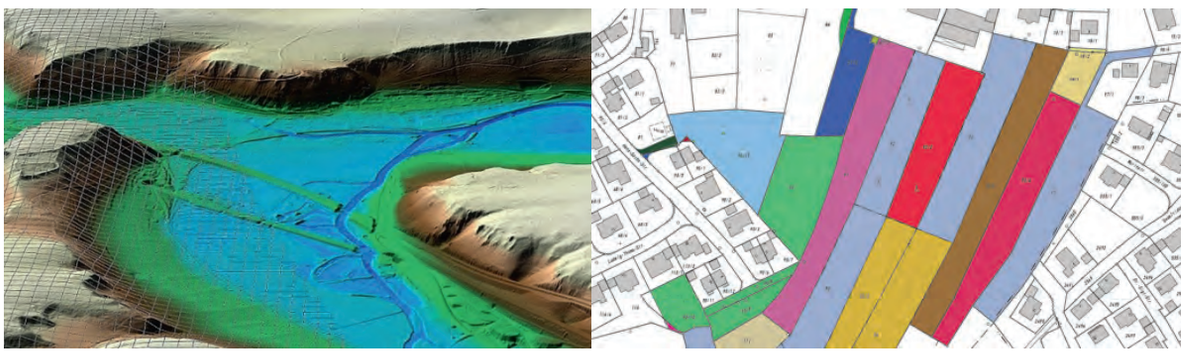


Fig. 21/22: Official geospatial data can be found in many areas (conservation, infrastructure, planning, public security)
Photo: LDBV

To allow for a nationwide standardised product range, the distribution points are being networked and the provision of the products harmonised. Currently, certain product groups are being provided across national borders and in harmonised form by three central distribution points: the Central Office for House Coordinates and Building Polygons (ZSHH) at the Bavarian Central Office for Digitisation, High-Speed Internet and Surveying, the SA*POS*® Central Office (ZSS) at the Lower Saxony Mapping and Cadastre Agency and the Central Office for Geotopography (ZSGT) at the Federal Agency for Cartography and Geodesy (BKG), which also provides the federal institutions with geospatial reference data.

To achieve the goals of optimally satisfying the cross-Land demand in the long term and standardising the provision of products in the Official Surveying and Mapping in Germany, the Public Relations and Marketing Working Group (AK PRM) of AdV performs both operational and strategic PRM tasks for the nationally available geospatial reference data products and services, with the involvement of the member authorities and the other working groups of AdV. In this process, the following subject areas are to be covered:

- ascertaining and documenting the requirements of the state and the public regarding this collaboration and aligning them with the geospatial reference data products and services (product policy)
- networking of the central and regional distribution points and their involvement in implementing new strategies for providing geospatial reference data (distribution policy)

- maintaining the licence and fee models, licence agreements and model-based licensing for the use of the geospatial reference data and geospatial data services (conditions policy)
- implementation of measures to provide information on the availability and usability of the geospatial reference data and geospatial data services (product information)
- implementation of measures to promote a positive perception of the Official Surveying and Mapping in Germany and its cross-regional geospatial reference data products and services (public relations).

Product policy

Fig. 23: Modern geospatial data displayed in a 3-D print *Photo: LDBV*

To achieve optimum distribution of the geospatial reference data, geospatial reference data products are to be produced and made available in a user and purpose-oriented way as part of the official activities of the surveying and mapping authorities. For this purpose, information is required about users' demand and requirements regarding the geospatial reference data (product, intended use, customer satisfaction) as well as the conditions of provision and product information (information channels and contact channels to the surveying and mapping authorities). Together with the central distribution points, the AK PRM coordinates and conducts user surveys and analyses of the current range of official geospatial reference data. It is also the goal to be able to consistently meet the current needs of innovative users with the product portfolio of official geospatial reference data.

Distribution policy

Fig. 24: In 2017 Eisenach was the venue for the sales manager conference Photo: LDBV

AK PRM defines itself as a communication platform for the distribution points of all the surveying authorities and for the central distribution points and it supports their exchange of experience. To this end, AK PRM annually conducts a sales manager conference. Besides providing basic information about the activities of the various AdV committees and the central distribution points, the event serves as a platform to discuss new approaches to data usage and product development. AK PRM is actively involved in developing and implementing new strategies for the provision of geospatial reference data. AK PRM is for instance involved in the revision of the contract regarding the continuous transmission of official digital geospatial reference data of the Laender for their use within the federal sector (V GeoBund). Furthermore, AK PRM works as part of a working group of the plenum on the positioning of AdV towards a European and international collaboration.

Conditions policy

To regulate usage rights in connection with the provision of the geospatial reference data and geospatial data services a nationally standardised licence and fee model is necessary. This must satisfy current requirements, be as clear and simple as possible and also regulate the use of all the currently offered geospatial reference products. For this reason, the Official Surveying and Mapping in Germany has approved the Directive on Fees for the Provision and Use of Geospatial reference data of the Surveying and Mapping Authorities of the Laender of the Federal Republic of Germany (AdV Fee Directive) and published it at www.adv-online.de. It is used by the central distribution points, and the individual German Laender are encouraged to implement it. AK PRM updates the license and fee model according to the requirements of AdV. Currently AK PRM is working out the details of a pricing structure for future geospatial data products like a central presentation service for cadastral parcel information as well as for INSPIRE download services. The adjustments of AdV's cross-national licence and fee model to the switch to Open Data in individual Laender was one of the main areas of work in 2017 and 2018.

Standardised sample agreements are indispensable for transparency and the use of geospatial reference data across national borders. AK PRM maintains the standardised model licence agreements for complex application scenarios, the contract template for geoproduct licencing and the General Terms and Conditions of Use (AGNB).

In addition to this, internet-enabled, brief and easily understandable sample text modules for the licensing of geospatial data services have been developed. These sample agreements are used at the central distribution points and are also recommended for Laender-internal licensing. They are available at **www.adv-online.de** and are free for further use.

Product information

To ensure that the Official Surveying and Mapping in Germany appears and presents itself in text and image in a uniform way, AdV has adopted a common corporate design and made it available to all member authorities. AdV's corporate design is regularly adapted to keep it in line with technical advancements and the requirements of the distribution points.

AdV's information publications are uniformly produced according to the design rules defined by the corporate design. The purpose of the materials is to provide the interested public with information on the applicability and availability of the geospatial reference products in the language of the geomarket.

The logos of the AdV products also form part of the corporate design. Many of these AdV "brands" are protected as word or figurative marks, having been entered in the trademark register of the German Patent and Trademark Office. These lists are constantly being updated. To strengthen the umbrella brand of AdV, the official AdV logo is also protected as a registered trademark, since 2016.

Web portals and works of reference

Particular significance is attached to the central portal of AdV, in order to pool the nationwide information concerning geospatial reference data in a user-oriented manner. The AdV website (**www.adv-online.de**) provides information regarding tasks, product range and developments. Visitors should be able to access AdV's Internet information in a user-friendly way and within just a few clicks. This includes:

- information about current topics and innovations in official surveying,
- current product information,

Fig. 25: Via the AdV website the visitor gains access to the distribution points of the Laender, as well as the central distribution points of AdV for cross-national-related data (access function)

- terms of purchase and licence regulations,
- access to the distribution points of the Laender,
- information about and access to the central distribution points.

The web contents are maintained by editors of the individual working groups. The AK PRM undertakes the coordination of the structural work.

Public relations and trade fair appearances

In the course of establishing geospatial data infrastructures in the Federal Republic of Germany, AdV is endeavouring to raise awareness of the geospatial reference data and geospatial data services of the surveying authorities of the Laender and to maintain direct contact with national and international customers. As in previous years, the Official Surveying and Mapping was represented by AdV with an exhibition stand at INTERGEO® 2017 in Berlin, the world's leading fair for surveying and mapping (Figure 26). In addition to the presentation of the products and capabilities of the Official Surveying and Mapping in Germany, accompanying lectures took place. The three central offices of AdV were present at AdV's stand and provided information about „geospatial reference data from one source". The team present at the ZSHH booth consisted of representatives of the former ZSHH (situated at the Bezirksregierung Köln) and the new ZSHH (situated at the Agency for Digitisation, High-Speed Internet and Surveying in Munich). Thus, the present ZSHH customers were able to already get to know the new points of contact at the ZSHH.

Fig. 26: AdV joint stand at the INTERGEO® 2017 in Berlin *Photo: AdV*

7. Involvement in National and International Organisations

EuroGeographics

EuroGeographics (**www.eurogeographics.org**) is the non-profit association of the national institutions in Europe that are responsible for performing geodesy, cartography and real estate cadastre-related tasks. The collaboration in terms of EuroGeographics includes the development of cross-national, harmonised products, as well as joint working groups and projects. The members of EuroGeographics particularly aim to support the European Commission in establishing the European geospatial data infrastructure in connection with the INSPIRE framework directive and the Copernicus earth observation programme.

AdV is an associated member and the Federal Agency for Cartography and Geodesy (BKG) a regular member of EuroGeographics. Both are actively involved in the work on products, in projects and in expert groups. Furthermore, the president of BKG is a permanent member of the Management Board and currently also Vice President of EuroGeographics.

EBM, ERM, EGM and EuroDEM

EuroGeographics offers the following official European data sets in standardised form, harmonised across national borders and with data timeliness in line with demand:

- EuroBoundaryMap (EBM) – the administrative units of all national administrative levels in Europe, with names, unique code numbers and a reference to the statistical classifications NUTS/LAU of Eurostat, the Statistical Office of the European Union. The data set in the scale 1:100,000 is currently being compiled by 39 data producers.

- EuroRegionalMap (ERM) – the topographic reference data set in the scale 1:250,000 is currently being compiled by 35 data producers.
- EuroGlobalMap (EGM) – the topographic reference data set in the scale 1:1,000,000 is automatically being derived and has been available on the Internet as Open Data on EuroGeographics' website since 2013.
- European Digital Elevation Model (EuroDEM60) – a digital terrain model computed by BKG in 2008 from the national data sets with a position resolution of approx.60 m and a height accuracy of 8 – 10 m.

The scope of tasks covers the organisation of the entire production process as well as its strategic planning and technical implementation. An additional key task for the product managers is communicating with the data producers and regional coordinators. In cooperation with them, the production process is constantly monitored and optimised if necessary. The Federal Service Centre for Geoinformation and Geodesy at BKG serves as a distribution centre for EuroGeographics and delivers the European data sets to both German and international customers.

On the basis of the specifications for EBM and ERM, BKG and its partner authorities in Europe produce official national data corresponding to the annual production plan. This data is checked for EBM by BKG and for ERM be the regional coordinators and BKG. They then are respectively merged to one data set. EBM and ERM are published once a year.

Fig. 27: Members EBM (EuroBoundaryMap

Fig. 28: Members ERM (EuroRegionalMap

Knowledge Exchange Networks

The Knowledge Exchange Networks (KENs) provide platforms for an exchange of experiences on various topics between experts from the EuroGeographics members. One example is the INSPIRE KEN, in which members can present their experiences with INSPIRE implementation and discuss solutions for its execution.

BKG is represented in most of the KENs and actively contributes to the work.

European Location Services

The European Location Framework (ELF) project serves to further implement the target of EuroGeographics to harmonise the geospatial reference data of its members across borders and make this available for global, European (e. g. Copernicus and tasks of the European Commission) and regional applications, tailored to suit the demand. ELF supported the implementation of the INSPIRE Directive at a national level, above all in the national cross-border harmonisation of the geospatial reference data through the development of geospatial data services and tools.

The ELF project was launched in March 2013 and completed, as planned, after a duration of 44 months on 31 October 2016. It continues since then under the slightly modified name European Location Services (ELS). During a biennial transitional phase, under the responsibility of EuroGeographics, a suitable management structure will be established which will enable the maintenance of project results and the steering of the ELS. The goal is to achieve the operationalisation of the platform and the web-based services, both of which were developed in ELF. BKG will continue to be involved in ELS and has taken over the role of the data specification coordinator.

A part of the activities is the successor-project Open ELS which is supported by the European Commission. The project started on 1 Mai 2017 and covers the period of two years. Open ELS is managed by EuroGeographics. Alongside BKG nine additional surveying authorities are involved. The Open ELS project puts an emphasis on the open data aspect. This includes the free of charge provision of the official geospatial data via services as well as the further development of required platforms and central tools.

Further information regarding ELS and the Open ELS can be found under:
http://www.eurogeographics.org/news/towards-future-european-location-services
http://openels.eu/about/

UN-GGIM: Europe – establishing efficient geospatial data management

Integrating national geospatial data into the European and international environment is increasingly coming into focus. Significant in this context is the "United Nations Global Geoinformation Management (UN-GGIM)", an initiative of the United Nations (UN) that has taken on the task of coordinating the global geoinformation management. An important part of UN-GGIM is the integration of statistical and geospatial information, particularly regarding their significance for the 17 UN Sustainable Development Goals (SDGs).

Sustainable development is based on valid geoinformation. Together with other UN member states, Germany is involved in the Committee of Experts of UN GGIM to ensure the best usage of geoinformation for the monitoring of the sustainability goals according to the Agenda 2030. For this BKG is the lead institution.

Prof. Dr.-Ing. Hansjörg Kutterer

President and Professor of the Federal Agency for Cartography and Geodesy (BKG)

A regional body at the European political level that dealt with questions of geodesy and geoinformation at a comprehensive level, had previously been lacking. To close this gap UN-GGIM: Europe was formally put in place in September 2014 by UN-GGIM (global) to act as such a political body for Europe. A great opportunity for UN-GGIM: Europe lies in the stronger networking of the national surveying and cadastre authorities with the national statistical offices.

BKG has taken over the leadership of the working group on the topic of data integration (Working Group "Data Integration"). Very pleasing is the agreed close cooperation between BKG and the German Federal Statistical Office (Destatis). Through this, synergies between UN-GGIM: Europe and expert groups from statistics can be created and, at the overall level, procedures and methods from the spheres of geodesy and geoinformation on the one side and statistics one the other can be merged.

Alongside the report on "User needs for combinations of data" at the beginning of 2017 the working group suggested methods for an improved networking of geospatial data and the collaboration of the statistical offices and the surveying and cadastre authorities and made recommendations regarding the handling of diverse issues in Europe, such as installing a quality management for the open data linking from non-governmental sources. Working Group B's new task for 2017 to 2020 focuses on analysing and evaluating the "geospatial dimension" of both the SDGs and the defined indicators for monitoring the attainment of the goals, which can

only be determined with the help of geospatial data or for analyses that require geospatial data as baseline information.

For further information regarding the UN-GGIM: Europe Working Group “Data Integration” as well as the already published reports please go to:
http://un-ggim-europe.org/content/wg-b-data-integration

Copernicus – the European earth observation programme

The European earth observation programme Copernicus is a joint initiative of the European Union and the European Space Agency (ESA) with the goal to create an independent European earth observation system. Politics, business and science constantly require reliable and up-to-date information. Copernicus contributes towards the exploitation of the huge potential of remote sensing for social and political interests. To reach this goal, Copernicus links satellite-based earth observation with terrestrial, aircraft and maritime in situ data as well as modern data processing and modelling techniques.

The basis of the programme is the space component. This consists of six satellite families, the so-called Sentinels, specially developed for Copernicus by ESA. The Sentinel missions include radar, spectral and altimeter systems for land observation and for monitoring the oceans and the atmosphere. In three of these satellite families, two identically constructed satellites fly in a paired constellation in order to increase the data availability. The data from the Sentinels is supplemented by images from additional national and commercial missions. The core of Copernicus form six Copernicus services which are dealing with topics of land monitoring, marine environment monitoring, disaster and crisis management, security, monitoring of atmosphere and climate change.

As part of Copernicus, information products and satellite data are made available to everyone free of charge (Commission Delegated Regulation (EU) No. 1159/2013). These can be further processed for diverse applications. More information can be found at **www.d-copernicus.de**.

With the expansion of the Copernicus programme, the availability of satellite data and services is improving immensely. However, in many cases, public institutions are not sufficiently prepared for integrating satellite information into their work processes. In order to support the authorities during the implementation of Copernicus data, in 2012 the German Federal Ministry of Transport and Digital Infrastructure (BMVI) decided to supplement the establishment of Copernicus with its own national activities. These national projects are being conducted in three areas: support of the technical coordination; technical implementa-

tion and validation projects; and the set-up and pilot operation of a national Copernicus IT infrastructure (CODE-DE – **https://code-de.org/**).

The Federal Cabinet adopted the national Copernicus strategy on 13 September 2017. This strategy defines the German objectives for Copernicus and validates measures on a national and European level, by which the federal government will pursue these objectives. Alongside these objectives the strategy formulates these four areas of actions:

1. Being in dialogue with the user groups,
2. Ensuring access to data and services,
3. Developing new services and technologies,
4. Shaping Copernicus in Europe.

Concrete measures regarding the implementation of the strategy are supposed to be regularly defined in the course of national Copernicus work programmes. The BMVI is responsible for drawing up the work programmes. In close collaboration with other resorts which are specifically mentioned in the strategy, these work programmes are being drafted and implemented accordingly to the responsibilities. Strategy and work programmes collectively replace the existing measurement programme. The first work programme is currently in preparation.

That satellite data enters the Copernicus information services together with the technical and reference data of the federal government and geospatial reference data of the Laender makes sense and is worth striving for. The thematic land monitoring service, for example, also includes the creation and distribution of the Corine Land Cover data (CLC), which, in Germany, is being derived from the Basis-DLM (Digital Landscape Model) and updated for the appropriate target year by the Federal Agency for Cartography and Geodesy (BKG) by means of Copernicus and other satellite imagery. In cases of urgent damage mapping by the Copernicus service “Catastrophe and Crisis Management” the topographic data of the official German surveying is available to the European Commission due to an appropriate agreement with AdV.

Copernicus – application in land surveying

The data of the individual Copernicus satellites is published by several surveying authorities. The Agency for Surveying and Geoinformation Schleswig Holstein provides image data of the Copernicus satellites Sentinel-2 visually and expanded with additional information on vegetation, water ways, development etc. as a viewing service to the public. Here, by means of an on-file orthophoto and with the help of a slide bar, a comparison of satellite imagery and orthophoto is possible.

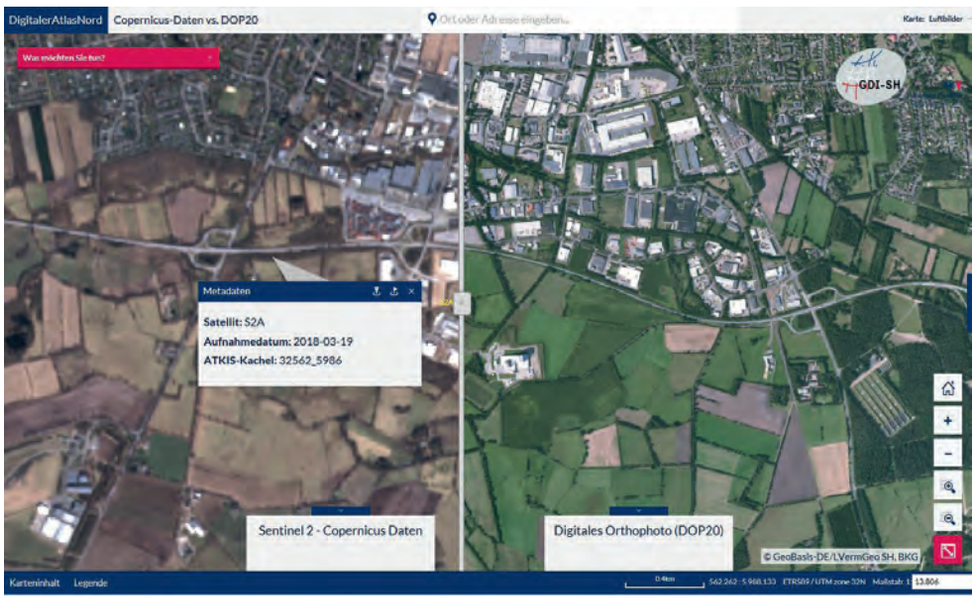


Fig. 29: Current sentinel data compared to the orthophoto (© LVermGeo SH)

The data used are pictures from the Sentinel-2, whose pixels have a ground resolution of 10 x 10 metres. The two Sentinel-2 satellites are especially suitable for the documentation of vegetation. With cloudless skies, these satellites deliver new updated pictures of the surface of the earth every six days. Changes in the topography can therefore be identified and documented quickly. Other advantages are that areas outside the orthophoto flight area such as offshore wind farms situated in the North Sea are also covered and that an on the fly switch from the usual true-colour images in an RGB presentation to colour-infrared presentation is possible.

Fig. 30: Colour-Infrared Sentinel-2 imagery (© State Office for Surveying and Geoinformation Schleswig Holstein)

For all of Germany, Schleswig-Holstein is a forerunner in the area of processing and publishing Copernicus Sentinel-2 data. This best practice approach could set a precedent – not only with other land surveying authorities.

Cornelia Weber
Director of Schleswig-Holstein Agency for Surveying and Geoinformation

Geospatial reference data in mFund – an example of application

Since 2016, the BMVI has been supporting research and development projects related to digital data-based applications for Mobilty 4.0. with a research initiative called mFund. Alongside the financial support mFund supports by means of divers event formats the networking of players from politics, economy and research as well as the access to the mCloud data portal.

Digital geospatial data is indispensable in order to find a solution for mobility related issues. Official geospatial data of different administrative levels is of great importance for the setup of mobility platforms. The Official Surveying and Mapping authorities must also face these new challenges.

Hartmut Gündra
Cluster management Network Geoinformation of the metropolitan Rhine-Neckar region

The network geoinformation of the metropolitan Rhine-Neckar region (GeoNet.MRN) finds in this context the digital street space to be an heterogenous data space which is subject to different recording methods and technical perspectives. In the focus of the project “Experimentierfeld Digitaler Straßenraum” (Testbed Digital Street Space – xDataToGo) is the development and testing of a cooperative data infrastructure as basis for inter-municipal mobility applications such as, for example, the large-capacity and heavy-duty transport (GST). Official geospatial data in connection with commercial navigation data bases are supposed to help to speed up the GST approval process.

A concept of public point of interest infrastructure for multimodal mobility applications such as, for example, of the digital experience area Rhine-Neckar is under development in the XPress project. The target is to interlink

official geospatial data with digital cultural, leisure and touristic data in order to customise mobility offerings according to user needs. This should thus contribute towards raising the attractivity level of public transportation.

For both intentions official geospatial data is an important constituent of intelligently linked regional infrastructures. Available data are intended to be used in new scopes of application and hitherto inaccessible data to be made available in data marketplaces like e. g. the Mobility Data Marketplace (MDM).

The new requirements for geo information like e. g. availability, data quality, data standards, licensing conditions, resulting from the digital change are debated in technical discussions and workshops. Here, mostly questions regarding data governance and new business models are playing a significant role and are also subject of the investigations.

Open Geospatial Consortium

The AdV service profiles and with them almost the entire range of GIS standards are based on OGC specifications which are generally common but also to some extend quite old. The WMS specification is, after all, more than 15 years old. This is why it is being considered at the Open Geospatial Consortium as to how these specifications can be developed further. A possible and potential innovation in terms of a geospatial data infrastructure is expected especially in regard to the better utilisation of geospatial data on the internet, by which the current common internet technology is consistently thought of. That way the web developers can, e. g. via APIs, access GDI date easier without having to use relatively complex web services like WFS. This approach takes the principles of “Linked Data” into account.

This approach is new and innovative since hereby two worlds are being combined; the geospatial data and the world of the internet. The internet is not part of the GDI; but rather vice versa. Of course, geospatial data is being provided presently on the internet as a file download as well as via OGC web services. The use of this data and these interfaces usually require GSI software and a good knowledge of the specifications, which are rather rudimentarily available outside the “GSI world”. This is why the obstacles for non-experts in order to use the data are relatively high. Furthermore, the web has progressed in recent years and is offering a number of modern technologies that were unforeseeable during the development of the OGC web services. The question is therefore whether and, if so, how AdV is planning on providing geospatial data by means of simple and sustainable technology in order to reach as many users as possible. A paradigm shift is not the goal but rather the exploitation of additional user groups on the basis of the existing infrastructure.

These developments have a direct impact on the AdV's profiles and with that on the current and future provision of data. This is why AdV, represented by the Information and Communication Technology Working Group, is actively working with the OGC, on these developments in particular, as a technical member and is a long-term voting member.

ISO/TC 211

The Geoinformation/Geoinformatics Technical Committee develops and maintains formal geoinformation standards. Fundamental standards important for AdV and GeoInfoDok are the most part stable and only further developed with caution.

A new and important aspect of the digital world is the long-term preservation of geospatial data. For this purpose, under a German lead, a standard has been developed, which, based on considerations within AdV, is now ready and lined up for publication.

Currently activities on an ISO level are taking place in order to improve the coaction of standards and geoinformation and the digital planning method called Building Information Modelling (BIM). The purpose of this is in particular the definition of an interface in order to transfer GIS data into the BIM world and vice versa. Especially the transfer of CityGML building data to a BIM project is conceivable.

Establishing and maintaining the compliance of the AdV standards, especially the GeoInfoDok, with the ISO standards has become an important ongoing task in AdV's project groups. Here again, the Information and Communication Technology Working Group has proved itself as an expert body. With the available resources it represents the interests of AdV and introduces the relevant standards to AdV, particularly as technical profiles.

Permanent Committee on Cadastre in the European Union

On 1 July 2017 Estonia assumed the EU Council Presidency and thus also the Presidency of the Permanent Committee on Cadastre in the European Union (PCC) for the second half of 2017. At the conclusion of the presidency, the PCC General Assembly was held in the city of Tallin on 14 and 15 November 2017. The focus of the conference included lectures on the topics of digitisation and new technologies, real estate cadastre and land registry in Estonia and the European cooperation in these areas. Several presentations were dedicated to the topic of blockchain technology and possible forms of application in the field of real estate cadastre and land registry.

On 1 January 2018 Bulgaria assumed the presidency for the first half of the year 2018. The Bulgarian authority for surveying, cartography and cadastre organised the spring General Assembly in Sofia. The situation in Bulgaria, where currently only approx. half of the land area is covered by cadastral maps, was the extensive topic of presentations and discussions. During the international experience exchange, topics such as the multifunctional cadastre as well as the socio-economic value of the open data status of geospatial data were discussed.

On 1 July 2018 the presidency of the EU, and thus of the PCC, for the second half of 2018 was transferred to Austria; the autumn PCC General Assembly is planned to take place in the city of Vienna.

Explanation of frequently used abbreviations

AdV	Working Committee of the Surveying Authorities of the Laender of the Federal Republic of Germany
AAA®	AFIS® – ALKIS® – ATKIS®
AFIS®	Authoritative Control Point Information System
ALKIS®	Authoritative Real Estate Cadastre Information System
ATKIS®	Authoritative Topographic-Cartographic Information System
BKG	Federal Agency for Cartography and Geodesy
BMI	Federal Ministry of the Interior, Building and Community
BMVg	Federal Ministry of Defence
BMVI	Federal Ministry of Transport and Digital Infrastructure
DGK	German Geodetic Commission
DGM	Digital Terrain Model
DLM	Digital Landscape Model
DLZ	BKG Service Centre
DOP	Digital Orthophoto
ELF	European Location Framework
GDI-DE	Spatial Data Infrastructure Germany
GeoInfoDok	Documentation on the Modelling of Geoinformation of Official Surveying and Mapping
INSPIRE	Infrastructure for Spatial Information in Europe
NAS	Norm-based Exchange Interface
ÖbVI	Publicly Appointed Surveyors
OGC	Open Geospatial Consortium
SA*POS*®	Satellite Positioning Service of the Official German Surveying and Mapping
TN	Actual Use
WFS	Web Feature Service
WMS	Web Map Service
WMTS	Web Map Tile Service
ZSGT	Central Office for Geotopography
ZSHH	Central Office for House Coordinates and Building Polygons
ZSS	Central Office SA*POS*®

AdV Chairpersons

from-to	Name	Title	Ministry	Land
1948–1958	Kurandt, Friedrich	Dr.-Ing. E. h., Ministerialrat	Hessischer Minister der Finanzen	HE
1959–1960	Pinkwart, Ernst	Prof. Dr. phil., Ministerialrat	Innenministerium des Landes NRW	NW
1960–1971	Nittinger, Johannes	Prof. Dr.-Ing. habil., Dr. Ing. E.h., Ltd. Ministerialrat	Nieders. Minister des Innern	NI
1972–1973	v. d. Weiden, Adam	Dr.-Ing. Ministerialdirigent	Ministerium des Innern, Rheinland-Pfalz	RP
1974–1975	Graf, Franz Xaver	Prof. Dr.-Ing. Ministerialdirigent	Bayerisches Staatsministerium der Finanzen	BY
1976–1977	Grundt, Werner	Leitender Ministerialrat	Innenministerium Baden-Württemberg	BW
1978–1979	Hübner, Günter	Prof., Senatsdirigent	Senator für Bau- und Wohnungswesen, Berlin	BE
1980–1981	Watermann, Helmut	Leitender Ministerialrat	Innenministerium des Landes NRW	NW
1982	Lämmerhirt, Erich	Erster Baudirektor	Freie und Hansestadt Hamburg - Baubehörde -	HH
1983–1984	Lucht, Harald	Dr.-Ing., Direktor der Kataster- und Vermessungsverwaltung	Freie Hansestadt Bremen, Senator für das Bauwesen	HB
1985–1988	Schröder, Wulf	Ministerialrat	Hessisches Ministerium für Wirtschaft und Technik	HE
1989–1990	Schlehuber, Jürgen	Ministerialrat	Niedersächsisches Innenministerium	NI
1991–1992	Herzfeld, Günter	Ministerialdirigent	Ministerium des Innern und für Sport, Mainz	RP
1993–1994	Engelsberger, Max	Dr., Ministerialdirigent	Bayerisches Staatsministerium der Finanzen	BY
1995–1996	Vetter, Hans	Leitender Ministerialrat	Wirtschaftsministerium Baden-Württemberg	BW
1997–1998	Graeff, Hagen	Erster Baudirektor	Freie- und Hansestadt Hamburg - Baubehörde -	HH
1999	Rokahr, Friedrich	Leitender Senatsrat	Senatsverwaltung für Stadtentwicklung	BE
2000–2001	Tilly, Heinrich	Ministerialrat	Ministerium des Innern Brandenburg	BB
2002–2003	Vogel, Friedrich Wilhelm	Leitender Ministerialrat	Innenministerium des Landes NRW	NW
2004–2005	Klöppel, Reinhard	Ministerialrat	Hessisches Ministerium für Wirtschaft, Verkehr und Landentwicklung	HE
2006–2007	Kummer, Klaus	Prof. Dr.-Ing., Präsident	Landesamt für Vermessung u. Geoinformation, Sachsen-Anhalt	ST
2008–2009	Stoffel, Hans Gerd	Leitender Ministerialrat	Ministerium des Innern und für Sport, Rheinland-Pfalz	RP
2010–2011	Draken, Wolfgang	BVermGeo	Niedersächsisches Ministerium für Inneres	NI
2012–2013	Püß, Ulrich	Ministerialrat	Thüringer Ministerium für Bau, Landesentwicklung und Verkehr	TH
2014–2015	Schleyer, Andreas	Ministerialrat	Ministerium für Ländlichen Raum und Verbraucherschutz Baden-Württemberg	BW
2016–2017	Luckhardt, Thomas	Leitender Senatsrat	Senatsverwaltung für Stadtentwicklung und Umwelt, Abtl. III Geoinformation	BE
2018–2019	Liebig, Siegmar	Ministerialrat	Niedersächsisches Ministerium für Inneres und Sport	NI
2020–2021	Kunst, Tobias	Ministerialrat	Bayerisches Staatsministerium der Finanzen, für Landesentwicklung und Heimat	BY

www.adv-online.de

Arbeitsgemeinschaft der Vermessungsverwaltungen
der Länder der Bundesrepublik Deutschland