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

National Report

2014 / 2015

AMTLICHES DEUTSCHES VERMESSUNGSWESEN

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2014 / 2015

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Dear Reader,

This national report impressively shows the wide range of the AdV's activities, from providing the national geodetic spatial reference to collecting, managing and making available geographic reference data and the products derived from it, in the context of national and international obligations. The report gives insight into the daily tasks of the surveying, mapping and geoinformation sector in Germany and is an expression of the well-functioning cooperation of the Laender and the federal government in the AdV.

The completion of the work to set up the Authoritative Real Estate Cadastre Information System ALKIS® this year means that alongside the Authoritative Control Point Information System AFIS® and the Authoritative Topographic-Cartographic Information System ATKIS®, the third "A" in the reorientation of the Official Surveying and Mapping is being employed in all the Laender. Now, under the motto "collect once, use multiple times", it is necessary to create synergies between the systems to further enhance the quality of the data and the extent to which it is up to date and to improve the products and services offered to the user. An AdV working group has taken on these challenges with the goal of developing a strategy to harmonise ALKIS® and ATKIS®.

A further milestone in providing geographic reference data nationwide in a standardised way and from a single source was the signing of the agreement to establish the Central Office for Geo-Topography (Zentrale Stelle Geotopographie – ZSGT) at the Federal Agency for Cartography and Geodesy. Now – alongside the SA*POS*® Central Office and the Central Office for House Coordinates and Building Polygons – all three central offices are united under the umbrella of the Geobasis Steering Committee.

There is virtually no end to the list of the AdV's multi-faceted tasks, such as the introduction of a new AdV quasigeoid and vertical reference frame (DHHN2016), the nationwide provision of over 51 million 3D buildings by the end of 2015 and the establishment of a geocoding service at the beginning of 2015.

Enjoy reading this interesting and informative material.

Andreas Schleyer
Chair of AdV

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 appropriate authorities of the Laender and the Federal Ministries of the Interior, of Defence and of Transport, Building and Urban Development have been cooperating in the Working Committee of the Surveying Authorities of the Laender of the Federal Republic of Germany (AdV) in order 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 Bund and Laender Working Committee for Sustainable Regional Development for the field of rural restructuring have guest status in the AdV.

Surveying, mapping and real estate cadastral authorities of the Laender

In recent years, conventional surveying, mapping and real estate cadastral systems have advanced in terms of both subject matter and methodology, with a focus on geoinformation management. Over the last decade, this process has been accompanied by comprehensive legislative reforms. The key to modernising the administrative procedures of the surveying, mapping and geoinformation authorities in the Laender is to open up the administrative bodies to adjacent areas in order for foundations for infrastructural and spatial planning policy to be provided in the network.

The surveying, mapping and geoinformation 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 / farmland 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, geotopography and first order control / 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*®
- the provision of 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 land parcels in the official real estate cadastre for ownership rights in the land register, which will, in future, be managed throughout the Federal Republic using the Authoritative Real Estate Cadastre Information System (ALKIS®) and
- the harmonisation of the data from the real estate cadastre and from surveying and mapping

Federal Agency for Cartography and Geodesy

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

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

Various federal institutions, public administration, the economy, the academic sphere – and almost every citizen in Germany – benefit from the BKG's work. For example, the work of the 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 our geospatial data, maps, texts, reference systems and information services for their plans and research.

In cooperation with the Laender, the BKG performs 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 procedures and methods required for this purpose
- the provision and updating of geodetic reference networks in the Federal Republic of Germany, including the requisite
    - surveying and mapping services and theoretical services for the acquisition and preparation of measurement data, and involvement in bilateral and multilateral activities for determining and updating global reference systems
    - advancement of the measurement and observation technology employed
- representing the interests of the Federal Republic of Germany in the field of geodesy and geoinformation at an international level

In the field of geodesy, the BKG provides a standardised spatial reference framework (coordinate system) for all of Germany. To this end it operates three geodetic observatories in Wettzell, Concepción (Chile) and O´Higgins (Antarctica) in cooperation with partner institutions. With various technologies, the BKG here monitors, 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.

The spatial reference for geospatial data is secured with various state-of-the-art geodetic technologies. For example, the calculated correction data of the Global Navigation Satellite Systems (GNSS) contributes to the greater precision and reliability of geo-referencing and of the satellite navigation systems in everyday use and also of Galileo in the future.

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

Through the DLZ, the 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, geographic names and additional topographic data. All the geospatial data is also made available as online services. In addition, the DLZ supports its customers by advising them and by means of needs-based applications.

The Spatial Data Infrastructure Germany (GDI-DE) represents the comprehensive networking of geospatial data at federal, Laender and municipal authorities. The BKG coordinates the development, expansion and

maintenance of the federal part of the GDI-DE and operates its central components, such as Geoportal.de (**www.geoportal.de**).

Beyond Germany's borders, in close cooperation with its European and international partners in geodesy, the BKG is contributing to the provision and implementation of a standardised spatial reference frame and with its partners in geoinformation to the development of a European and global geospatial data infrastructure.

Federal Ministry of Defence
Bundeswehr Geoinformation Service

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 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).

On behalf of the Bundeswehr and at inter-departmental level, the BGIC provides geoinformation covering crisis regions and areas of operations abroad. It is the central agency of the BGIS which – taking an interdisciplinary approach – develops, shapes and implements the processes of GeoInfo data collection, GeoInfo data management and GeoInfo production that are relevant for GeoInfo support.

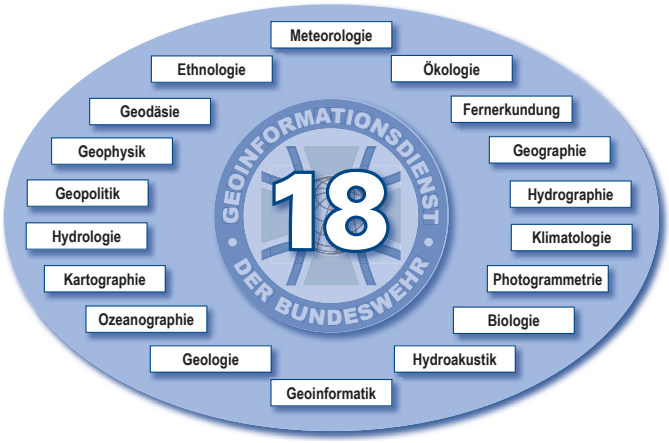

Fig.1: Interdisciplinary approach – disciplines represented in the BGIS (credits: BGIC)

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 (BKG) 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, in a standardised structure and requiring a single step, current geodata models and data over the German territory into the Bundeswehr GeoInfo Database so that they can be used for military purposes.

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 the AdV since 1950, represented by the Geo-Coordination Agency. The latter coordinates the diverse use of the geographic reference information of the Laender in its area of responsibility with more than 15 high-level authorities and coordinates the transfer of expertise from the surveying and mapping units of the “wet section” to the AdV.

For the operation and maintenance of the approx. 7,300 km of Germany’s inland waterways and approx. 17,000 km² of sea waterways, the Federal Waterways and Shipping Administration (WSV) is subordinate to the BMVI as an authority with its own surveyors. The surveying, mapping and real estate division has approx. 450 employees. Official surveying and mapping tasks are carried out throughout Germany that necessitate close consultation within the AdV. Along the waterways, the WSV has its own base network (position and elevation marks) and manages a digital map series (1:2,000), the content of which is used for the updating of the ATKIS® Basis-DLM. In the area of responsibility of Surveying and Geoinformation, the WSV works closely with other BMVI high-level authorities: Federal Maritime and Hydrographic Agency (BSH), Federal Institute of Hydrology (BfG) and Federal Institute for IT Services in the Sector – Service Centre for Information Technology (BA DLZ-IT). For the offshore area, the Federal Maritime and Hydrographic Agency (BSH) conducts marine surveys in Germany’s North and Baltic Seas as the most travelled waters of the world. Marine surveys and cartography provide essential foundations for environmental protection, the erection of offshore installations, coastal protection and hydraulic engineering. The survey region of the BSH covers an area of some 57,000 km², equivalent to one sixth of Germany’s land area.

This is shown in a nautical chart series containing approx. 150 data records for electronic nautical chart systems, as well as 60 nautical charts in hard copy format. In addition, large volumes of data on the current and

historical chemical, physical and biological condition of the water column in the German territorial sea as well as operational information and forecasting services for the water level, tides, waves and drift are available over an Internet-based geospatial data portal as a maritime component of the GDI-DE. The “Geodesy” department of the Federal Institute of Hydrology (BfG) supports the WSV in the fields of activity of Geodetic Reference Systems, Geokinematics, Hydrographic Surveying, Geo-Topography and Feature Surveying. For expert advice, the staff have the specialised knowledge required in the context of applied research and project execution. Intensive cooperation with universities and other research institutions is essential in this context.

All the agencies and higher-level authorities work closely with the surveying and mapping authorities of the German Laender and within the AdV working groups. The main emphases are on the exchange of information about topography, information technology and spatial reference, as well as the use of SA*POS*® services, especially in the reception range over the sea.

In addition, on behalf of the federal government, the BMVI is responsible for coordinating the earth observation programme “Copernicus” of the European Union (formerly Global Monitoring for Environment and Security – GMES). Through the implementation of a national “Copernicus programme of measures”, citizens and companies in Germany are to noticeably benefit from the European earth observation programme “Copernicus”. This is to be achieved by realising the potential resulting from Copernicus for a more effective and efficient public service.

Further details about geoinformation in the sector can be found on our website **www.bmvi.de/EN**.

Organisation of the AdV

Figure 2 shows the organisation of the AdV. It is led by the Chair and the Plenum. The AdV is supported by the working groups and the management.

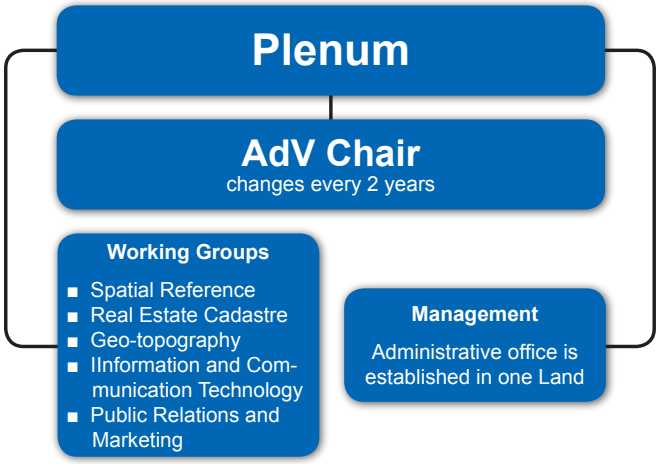

Fig 2: Organisation of the AdV

Objectives and tasks of the AdV

The member authorities collaborate in the 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 geographic reference data that is essentially standardised and geared towards meeting the requirements of the information society and
- provide the infrastructure for geographic reference data as an important component for modern e-government architectures

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

- creation and coordination of future-oriented joint concepts for the nationwide standardisation of the real estate cadastre, surveying and mapping and the geographic reference information system, to meet the needs of politicians, industry and administrative units
- promoting the joint execution of projects of cross-regional importance
- facilitating and coordinating, firstly, standardisation procedures for recording and managing geographic reference data and, secondly, methods of access and distribution
- support in establishing and developing the national and European geospatial data infrastructure and the corresponding electronic services
- representation and presentation of official surveying and mapping to the public
- involvement in international specialist organisations for promoting the transfer of expertise
- 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

The Geobasis Steering Committee, in which all Laender are represented, was established on 8 December 2010 under the administrative agreement for cooperation in the Official Surveying and Mapping in Germany. The administrative agreement aims to further improve the operational implementation of the strategies agreed on in the AdV and to further optimise cooperation across Germany. Furthermore, the Geobasis Steering Committee is to ensure that the geographic reference data is provided in standardised form to all users in the quality required.

The Geobasis Steering Committee has the following tasks and powers for the implementation of strategic resolutions adopted by the AdV:

- monitoring and analysis of work and development situations, including compliance with the defined quality standards and norms
- analysis of potential for cooperation and devising proposals as to how this can be realised
- facilitating collaboration between individual Laender or several Laender
- quality control based on AdV standards regarding content and format consistency

Official surveying and mapping statistics

Land	Inhabitants	Land area in km²	Land parcels in thousands	Number of authorities		
				Laender authorities (and Laender enterprises)	regional offices	Publicly Appointed Surveyors (ÖbVI)
Baden-Württemberg	10,631,278	35,751	8,879	1	60	172
Bavaria	12,604,244	70,550	10,713	1	51	—
Berlin	3,421,829	892	399	1	12	51
Brandenburg	2,449,193	29,654	3,113	1	17	149
Bremen	657,391	419	207	1	1	5
Hamburg	1,746,342	755	252	1	—	8
Hesse	6,045,425	21,115	4,985	1	7	82
Mecklenburg-Western Pomerania	1,596,505	23,212	1,904	1	7	67
Lower Saxony	7,790,559	47,614	6,164	1	—	102
North Rhine-Westphalia	17,571,856	34,110	9,283	1	53	448
Rhineland-Palatinate	3,994,366	19,854	6,338	1	6	80
Saarland	990,718	2,569	1,289	1	—	11
Saxony	4,046,385	18,420	2,706	1	13	106
Saxony-Anhalt	2,244,577	20,452	2,662	1	—	52
Schleswig-Holstein	2,815,955	15,800	1,889	1	—	42
Thuringia	2,160,840	16,173	3,125	1	—	68
Total for Germany	80,767,463	357,340	63,908	16	227	1,443

Tab. 1: Statistics:

Population figures – source: Federal Statistical Office, date: 2013-12-31. Results based on the 2011 census.

Land area – source: Federal Statistical Office, date: 2013-12-31.

Area in Rhineland-Palatinate: including the area "Joint German-Luxembourgian territory" of 6.2 km². Differences in area are possible due to rounding of figures.

Land parcels, number of authorities, Publicly Appointed Surveyors (ÖbVI), date: 2014-12-31.

2. Spatial Reference

The global reference systems and the national geodetic spatial reference have a strict, mathematically defined correlation and therefore cannot be considered independently. This is especially evident in modern measuring systems – in particular global navigation systems. Here changes to the system parameters directly affect the measurement results and must therefore be considered. Updating the implementation of the international reference system (currently, the ITRF2008 is used) for a new era results in systematic changes to the satellite orbit data and the coordinates of the global reference stations, which has an impact right through to the SA*POS*® area of application. It is therefore crucial for both the global reference systems and the regional (Europe) and national sections to be monitored and adapted on a regular basis. Here BKG and the various institutions of the Laender make significant contributions to their respective areas of activity.

Connection to the global reference systems

The geodetic infrastructure, consisting of geodetic reference stations and data and analysis centres, calls for an internationally coordinated, committed collaboration between institutions and states that guarantees the long-term safeguarding of the services.

In order to record global changes to the planet and create appropriate measures to improve the living conditions of humanity, standardised geodetic reference networks with long-term stability are required. For example, the rise in sea level of a few millimetres per year can only be recorded if a stable spatial reference is implemented globally over a long period of time with a high level of precision. To this end, geodetic reference systems with millimetre precision are required globally for position, height and gravity. At the same time, the global reference frame is also the basis for running the satellite navigation systems and for regional and national reference systems and networks, such as the European Terrestrial Reference System (ETRS89), which is

the basis for INSPIRE data (INfrastructure for SPatial InfoRmation in Europe) right through to the German real estate cadastre.

The essential basic elements for positioning, geo-referencing (linking features with coordinates) and navigation are satellite navigation systems (GPS, GLONASS, Galileo, Beidou), global geodetic reference systems and networks, and geodetic services that provide users with data and information on an ongoing basis according to internationally agreed regulations and standards. The operation of the satellite navigation systems is secured for the long term through state programmes. The International Association of Geodesy (IAG), as part of the International Union of Geodesy and Geophysics (IUGG) has assumed the task of defining and implementing geodetic reference systems since the beginning of its founding. As an international scientific organisation, the IAG can, however, only to a limited extent guarantee that the required components will be secured for the long term; the IAG depends on the voluntary contributions of the participating institutions.

With the federal German law on geodetic reference systems, networks and geotopographic reference data (Bundesgeoreferenzdatengesetz – Federal Geographic Reference Data Act – BGeoRG), the BKG has been assigned the official task of cooperating in bilateral and multilateral work to establish and maintain global geodetic reference systems and networks and to further develop the measurement and observation technology employed. This is comparable to the task assigned to the Physikalisch-Technische Bundesanstalt (National Metrology Institute of Germany) by the Time Act (Zeitgesetz).

In the International Metre Convention, for example, the usage of the SI units is regulated, as well as the necessary organisational structures and the rights and duties of the signatory states. Binding regulations of this kind under international law do not exist for spatial reference. The original treaties that Prussia had with German and non-German states were abolished following the First World War. Since then the IAG has been operating as a scientific organisation in the field of geodesy.

So as to be better prepared for natural disasters, geospatial data – including that about changes in sea level or movements of the earth's crust – needs to be available on the basis of a standardised, global geodetic reference frame.

Resolution for the maintenance and improvement of a global geodetic reference frame

The General Assembly of the United Nations (UN-GA) acknowledged this necessity and passed a resolution for the maintenance and improvement of a global geodetic reference frame – "Global Geodetic Reference Frame for Sustainable Development (GGRF)" – on 26 February 2015. This is the first time that a resolution with a "geo-connection" has been introduced and passed in the UN-GA. The resolution had already been adopted by the United Nations' Economic and Social Council (ECOSOC) on 17 November 2014.

The resolution for the maintenance and improvement of a global geodetic reference frame ("A Global Geodetic Reference Frame for Sustainable Development – GGRF") was developed in the scope of the UN Committee of Experts on Global Geospatial Information Management (UN-GGIM Committee) and finally submitted by the UN member state the Republic of Fiji.

The BKG was actively involved in the drawing up of the resolution. Its aim is to safeguard the current cooperation of scientific organisations for the long term through the multilateral cooperation of the member states by means of a UN mandate.

The UN resolution GGRF is intended to emphasise to the international community the significance of geodetic infrastructures and to help safeguard long-term developments through appropriate forms of cooperation. For the BKG this resolution is important for better supporting both the geodetic tasks and the provision of sound geoinformation. In this way, a higher level of political awareness is also achieved. The GGRF resolution creates better conditions overall for evaluating the activities in the IAG context and for involving further member states in the activities at a political level. The BKG will continue to actively support this process and provide its contributions in the context of the IAG.

As a contribution of the Federal Republic of Germany to the international geodetic reference systems, the BKG together with the Satellite Geodesy Research Institution of the Technical University of Munich operates the Geodetic Observatory (GO) Wettzell. This observatory is equipped with all the important measuring systems of geodetic spatial techniques and makes observations in the field of SLR (Satellite Laser Ranging), VLBI (Very Long Baseline Interferometry), GNSS (Global Navigation Satellite System) and necessary additions from local sensors in accordance with the internationally coordinated services. A precision gravity laboratory implements the absolute gravity reference for Germany and provides the necessary conditions for integration into the international metrological standards.

Support of international experiments through the TWIN radio telescope 1 (TTW1)

With the TWIN telescopes having been officially inaugurated in 2013, the first of the two telescopes was able to commence regular operation in 2014. Since June 2014 TTW1 has been running simultaneously to the older 20-metre radio telescope RTW, which has been regularly incorporated in international measurement programmes since 1983. Figure 1 shows the two telescopes in action.

In 2015 the second TWIN telescope should then also go into operation, in which a newly developed broadband receiver is currently still being installed and tested.

The radio telescopes are on the premises of the Geodetic Observatory (GO) Wettzell in the Bavarian Forest and form part of a global network of geodetic VLBI stations. VLBI (Very Long Baseline Interferometry) means radio interferometry on very long baselines. With this technique, coordinates on the earth's surface and the orientation of the earth in space are ascertained around the clock in order to create and maintain a globally standardised, stable coordinate system.

The results achieved with the TTW1 so far give reason to be optimistic: the foundation for introducing the TWIN radio telescope as a successful component of the new VLBI Global Observing System (VGOS) has thus been laid.

The Radio Telescope Wettzell (RTW) has been providing its service for the International VLBI Service for Geodesy and Astrometry (IVS) continually since 1983. This reliable system has contributed significantly to the internationally highly recognised status of the observatory and continues to do so. With currently almost 4000 hours of operation annually, RTW is still the most frequently used radio telescope within the IVS. Following re-engineering, it is ready for new tasks in which not the speed but the resolution counts.

Fig 3: Synchronous operation – the 13.2m TWIN radio telescope TTW1 (foreground, left) and the 20-metre RTW (background) simultaneously measure radio sources (quasars).

For example, in March 2014 the telescope received signals from the moon sent by the little Chinese lunar rover Yutu ("Jade Rabbit") so as to precisely ascertain the lunar rover's position.

TIGO becomes AGGO

In the scope of scientific-technical cooperation between Germany and Chile, the BKG's Transportable Integrated Geodetic Observatory (TIGO) was very successfully operated together with the project partners Universidad de Concepción and Instituto Geográfico Militar in Chile from 2002 to 2014. Following the severe earthquake in Concepción in February 2010, no long-term funding for the TIGO project was found in Chile anymore, so a new project partner was sought by Germany.

With the National Scientific and Technical Research Council (Consejo Nacional de Investigaciones Científicas y Técnicas, CONICET for short) of the Ministry of Science, the BKG's future project partner was found in Argentina in 2012. Following the conclusion of a cooperation agreement between BKG and CONICET in 2013, construction work began for erecting the observatory near the provincial capital of La Plata. Part of this work involved the infrastructure for setting up the containers and instruments, similar to the set-up in Chile. Simultaneously, preparations were made in Concepción for transportation to Argentina. The instruments and infrastructure installations were dismantled, some of them completely overhauled, and carefully packaged.

At the destination, the name TIGO will cease to exist. There, with the TIGO components, the Argentinian-German Geodetic Observatory (AGGO) is now being set up – and thus TIGO will become AGGO. TIGO, or AGGO, is an important joint contribution of Argentina and Germany to the global geodetic observation infrastructure. Alongside GO Wettzell, this observatory is one of two fundamental stations for geodesy operated by the BKG for the establishment of a Global Geodetic Observing System (GGOS).

Fig 4: The radio telescope is "folded up" and ready for stowing.

Fig 5: The containers at the location in Concepción are packed (6 January 2015).

Data analysis

Besides the operation and ongoing development of this geodetic observation technology, the BKG also runs analysis, combination and data centres, thereby supporting the use and provision of geodetic data and products:

- one of three global data centres of the International VLBI Service for Geodesy and Astrometry (IVS)
- one of currently six analysis centres of the IVS
- the combination centre of the IVS
- one of currently eight analysis centres of the International Laser Ranging Service (ILRS)
- the central office of the International Earth Rotation and Reference Systems Service (IERS)

The central office of IERS has been located at the BKG since 2001. The tasks include creating the IERS annual reports, compiling the minutes of the meetings of the IERS Directing Board (twice a year) and updating the IERS web pages. The corresponding data management system and the address data management system have been maintained and modernised on an ongoing basis.

The observation stations and analysis centres of the BKG are part of the global activities for the application of the spatial techniques for geodesy, geophysics, navigation, space flight and chronometry. In carrying out these

activities, the BKG contributes to the global reference systems, which provide the basis for both the European and national position, height and gravity reference systems.

Gravity field measurement

In 2014, together with the Landesbetrieb für Küstenschutz, Nationalpark und Meeresschutz Schleswig-Holstein (Schleswig-Holstein Agency for Coastal Defence, National Park and Marine Conservation – LKNM) and the Schleswig-Holstein Agency for Surveying and Geoinformation (LVerm-Geo SH), the BKG conducted extensive gravity measurements in the area of the North Frisian Wadden Sea to improve the data base for determining the German quasigeoid model.

Near the coast, elevation data related to the sea level is of particular importance. It forms the basis for monitoring long-term changes to the sea level, the beach and the seabed. The example of Schleswig-Holstein, a Land in which one third of the inhabitants live in potentially flood-prone areas, makes the necessity of precise and reliable geospatial data immediately obvious. Only on the basis of such survey data is it possible to calculate the safe height of dykes and to warn of storm surges and floods reliably and in good time. For satellite-supported height determination through GPS and GALILEO, which is used for a multitude of applications today, a model of the height reference surface is thus necessary. Calculating and making available the official height reference surface for Germany is one of the BKG's core tasks. This so-called German Combined Quasigeoid (GCG) is based on measurements of the gravitational force (gravity).

The aim of the project is to close data gaps in the mudflat areas between the island of Sylt and the Elbe estuary near Cuxhaven. With the data gained in this way, an improvement and quality enhancement to the height reference surface in the area of Schleswig-Holstein's North Sea coast will be possible within the scope of the new definition of the German quasigeoid model planned for 2016. Because of the diverse kinds of survey work in the context of coastal protection and within the official tasks of surveying and mapping, such a highly precise and up-to-date height reference surface is also of great significance for the participating project partners.

At the beginning of the project came the selection of a good 200 measuring points that were distributed evenly across the measuring area in the Wadden Sea. Three measuring squads were in action, each consisting of one LKNM employee who was familiar with the place and had experience with the mudflats (and was simultaneously responsible for the GNSS measurements for coordinate and height determination) and two BKG employees. Besides the measuring equipment to be transported, it was, above all, safety considerations that led to the choice of this measuring squad configuration, which ultimately proved successful.

The evaluation and analysis of the measurements from the approximately 300 measuring points is still in progress, but one thing is already certain: the results will hugely enhance the forthcoming version of the GCG in the area of Schleswig-Holstein's North Sea coast. Furthermore, the successfully completed project is to serve the BKG as a basis for comparable future work and activities.

Fig 6: Transportation with the Hägglunds.

Fig 7: The relative gravimeter is transported to the next measuring point in watertight packaging.

3. Real Estate Cadastre, Land Valuation

The introduction of the Authoritative Real Estate Cadastre Information System ALKIS® in the 16 German Laender is nearing completion. By the end of 2015 all German Laender are expected to have converted to ALKIS®.

Authorities that either set up a new electronic register with data about domestic pieces of land or revise an existing one are obliged by the federal E-Government Act to also incorporate nationwide uniformly defined, direct geo-referencing in that register. The basis for a geo-referencing system is geographic reference data and a geocoding service that is able to assign a coordinate to individual or large numbers of features. Here there is also a focus on data protection issues.

An additional challenge lies in further developing the harmonisation of ALKIS® and ATKIS® based on the geographic reference information of the Actual Use (Tatsächliche Nutzung – TN) of land.

The aim of creating a "digital real estate cadastre" necessitates converting the existing predominantly analogue real estate cadastre files into digital form. This is also required because many files are now in a bad condition due to their age and some of them represent cultural assets. Principles and recommendations for the procedure of converting the files are currently being developed and this is also being coordinated with the interests of the archive departments of the Laender.

To guarantee the cross-Land use of the real estate cadastre's geographic reference data, a consistent, seamless representation of spatially referenced objects is necessary along the borders of the Laender. The coordination of the Laender borders is evaluated annually by the Real Estate Cadastre Working Group.

Support has again been given to some legislative projects. Following the amendment to Article 198, paragraph 2 of the German Federal Building Code (BauGB), the way has now been opened for an administrative agreement between the federal government and the Laender regarding cooperation in the area of official land valuation. The purpose of the agreement is to improve the cross-Land transparency of the land market, in particular

by publishing a property market report for Germany (IMB-DE). In the guidelines on the Real Estate Valuation Ordinance the final vote is being taken on the capitalised value directive.

The exemption of measuring instruments used in official surveying and mapping from obligatory calibration was recorded in the Measurement and Calibration Regulation that came into effect on 1 January.

The introduction of ALKIS® and the Networked Standard Land Value Information System (VBORIS) is closely connected with the forthcoming property tax reform. The standard values as the current basis for property tax are to be replaced by a new, up-to-date basis of assessment. Irrespective of the models and variants, it is apparent that the geographic reference data and the valuation information will play a crucial role for the future property tax.

ALKIS® introduction

The AdV member authorities Bremen, Mecklenburg-Western Pomerania and Saxony-Anhalt completed their ALKIS® migration in 2014, meaning ALKIS® has now been introduced in twelve German Laender.

Bavaria, Saxony and Saarland have begun the migration and will complete it in 2015. Berlin will follow with the migration and plan the introduction of ALKIS® likewise for 2015.

Nationwide completion could thus be achieved by the end of 2015, meaning that ALKIS® data would then be available all over Germany for the first time. Particularly those users requiring the cross-Land data of the real estate cadastre will value the nationally uniform cadastre standard.

Fig 8: Status of ALKIS® introduction

A graphic overview of the status of the introduction of ALKIS® can be found at **www.adv-online.de** – AdV-Produkte – Liegenschaftskataster – ALKIS. The current status of the AAA® migration in the Laender, which covers AFIS® and ATKIS® as well as ALKIS®, can be accessed at **www.adv-online.de** – AAA Model – Status of Migration. The information on the ALKIS® basic data stock and on the Land-specific contents has been updated. The information from all the Laender on this is available as a synopsis at **www.adv-online.de** – AdV-Produkte – Liegenschaftskataster – Download.

Geocoding service for land parcels

The goal of the law to promote electronic administration (E-Government Act – EGovG) from 2013 is to facilitate electronic communication with the authorities at the federal level by dismantling obstacles. It contains diverse obligations for public agencies such as setting up access for the transfer of electronic documents. From the point of view of official surveying and mapping, Article 14, paragraph 1 of EGovG is of particular significance. This states that authorities that either set up a new electronic register with data about domestic pieces of land or revise an existing one have to incorporate in that register a nationwide uniformly defined, direct geo-reference (i.e. coordinate) for each land parcel, each piece of land and for any area defined in a statutory provision.

The basis of a geo-referencing system is the geographic reference data of the surveying, mapping and real estate cadastral authorities of the Laender. Economically, only a geocoding service can meet the statutory requirement. This service can assign a coordinate to individual or large numbers of features with geographic identifiers (e.g. land parcel designations, building addresses, geographic names) in order for them to be permanently recorded. Geocoding services with reverse functionality are additionally able to identify, starting from a coordinate (point) or a defined area (rectangle or polygon), all the geographic identifiers with a particular spatial reference entirely or partly contained in the search area. By means of a geocoding service, indirectly geo-referenced data sets can thus be analysed and visualised in geo applications together with other directly geo-referenced data sets through the standardised spatial reference.

The implementation of a joint geocoding service of the federal government and the Laender is based on the “Technical Concept of a Geocoding Service of the AdV” in version 0.61 (as at 15 August 2014). In this, so far the geocoding service for addresses, geographic names and points of interest (POI) has been designed. At the AdV Plenum meeting in 2014 the assignment was then also given to compile the technical and functional description of a geocoding service for land parcels and to update the above-mentioned technical concept. Here it is also necessary to take statutory conditions in the Laender into consideration.

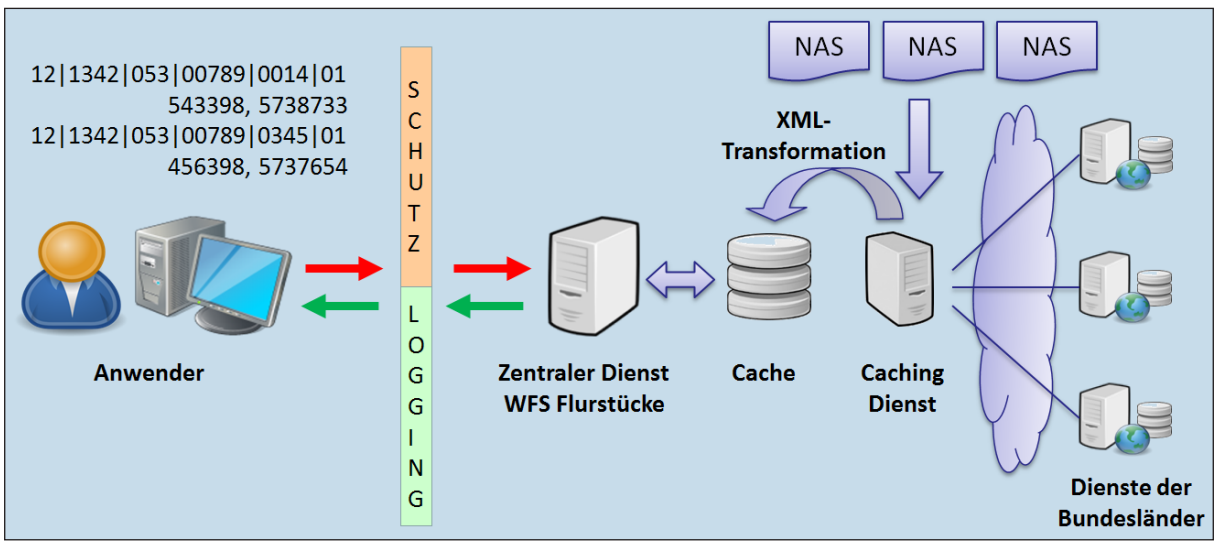

Fig 9: Principle of the geocoding service

ALKIS®-ATKIS® harmonisation

Within the context of updating the AAA® technical schemas, a joint working group of the AdV's Real Estate Cadastre and Geo-Topography Working Groups called "ALKIS®-ATKIS® Harmonisation" (AG HarmAA) was commissioned by the AdV Plenum to,

- outline the current situation regarding the problem areas in the harmonisation of ALKIS® and ATKIS®
- analyse the facts in detail particularly in the area of Actual Use and
- prepare proposals for decisions on the harmonisation from a content-related point of view and present these in a master plan

The work is in progress. So far it has emerged that the general rule that applies to geographic reference data: "collect once, use multiple times" can be implemented optimally if standardised data entry criteria for ALKIS® and ATKIS® are implemented in the Laender at the same time as version 7 of the "Documentation on the Modelling of Geoinformation of Official Surveying and Mapping" (GeoInfoDok 7.0) is introduced. Moving away from the currently applicable lower limits for entries in ALKIS® and ATKIS® towards common lower limits releases synergetic potential that can be used to ensure quality according to a product standard whose definition is yet to be finalised. In this process, currency and factuality are key concepts that have a high priority in the management of geographic reference data.

Due to the currently very heterogeneous quality of the Actual Use in ALKIS® across different Laender, a product standard ALKIS®-TN is to be defined that contains, among other things, target values for the quality of the ALKIS®-TN and describes the data entry criteria recommended by the AdV. On an ALKIS®-TN product sheet, the quality and Land-specific peculiarities are to be documented to achieve greater transparency for cross-Land applications regarding the TN verification in the Laender (e.g. for official area statistics). In order to avoid the confusion that has been noticed between land cover and land use in the definitions of the "Actual Uses" modelled in the GeoInfoDok and to avoid resulting redundant data acquisition and uncertainties in the use of the data, there is a debate as to whether to divide the feature type field Actual Use (TN) into Land Cover (LB) and Land Use (LN) in future modelling. Independently of one another, LB and LN could be arranged in levels, modified and adapted to user requirements. With automated evaluation processes on the basis of remote sensing and aerial image data, changes in the landscape could be ascertained efficiently and promptly. In international developments such as INSPIRE and LUCAS (Land Use/Land Cover Area Frame Survey) a distinction of this kind between LB and LN is also made. For complete harmonisation, the analysis would need to be extended to all feature type fields besides TN.

Coordination of data at the Land borders

To guarantee the cross-Land use of the real estate cadastre's geographic reference data, a consistent, seamless representation of spatially referenced objects in the real estate cadastre is necessary along the borders of the Laender. For this reason, in 2010 the AdV recommended that the Laender complete the coordination of the real estate cadastre data at the Land borders by 2015 if possible. At the same time, the Real Estate Cadastre Working Group was commissioned to evaluate the status of the coordination process annually.

29 border lines nationwide with a length totalling approximately 7,170 km are affected. From the point of view of the experts, a border line between two Laender is not coordinated merely when the two Laender have agreed on identical coordinates but rather only when these coordinates are also being used in the same coordinate system in the real estate cadastre in both Laender. Only then is a cross-Land presentation without gaps or overlaps possible in the user systems.

The current evaluation shows that it will not be possible to complete coordination of the data at the Land borders in 2015, despite the AdV's recommendation. For the remaining coordination of the border lines, a time frame of six years on average is stated by the Laender concerned due to existing circumstances (e.g. resources).

Fig 10: Digitisation of the border atlas of 1921 ("Atlas of the maps and layout plans of the new German-Danish national border produced by the National Border Agency of the Department for Foreign Affairs") at the Schleswig-Holstein Agency for Surveying and Geoinformation, Dept. 6 in Husum (Photo: D. Zitzmann)

Digitisation of real estate cadastre files

The aim is to transfer the real estate cadastre in its entirety, with the components ALKIS® and the real estate cadastre files, to the digital realm. Although the introduction of ALKIS® means that a very significant step into the digital future has been made, the real estate cadastre files are still currently in analogue form in many Laender. Some of those files (particularly those from the early days of cadastral surveys) are in a bad condition. Many analogue real estate cadastre files are deeds. These must be protected from loss or destruction. The originals need to be safeguarded and archived as cultural assets. The digitisation and provision of the relevant real estate cadastre files via an information portal on the Internet would remove the necessity of a local inspection by Publicly Appointed Surveyors.

Based on a workshop of the Real Estate Cadastre Working Group (AK LK) in 2013 and a decision by the AK LK in 2014, a working group “Archiving of Real Estate Cadastre Files” was formed and, with a view to digitising the real estate cadastre files and establishing a document management system, was commissioned to

- describe the starting situation (the needs)
- ascertain and present the status (conception, implementation) in the individual Laender and
- develop guidelines and recommendations for the procedure

Here the technical correlation with the tasks of the archive departments of the Laender is kept in mind, which are currently grappling, above all, with the long-term archiving of geospatial data.

4. Geo-Topography

Using the Authoritative Topographic-Cartographic Information System (ATKIS®), the surveying and mapping authorities of the Laender manage geographic 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. Once the migration of ATKIS® to the AFIS®-ALKIS®-ATKIS® data model had been completed nationwide, the main tasks in the reporting period involved the introduction of AAA® processing in cartography and the construction of databases in the field of 3D building models.

Digital landscape models

One of the key tasks of the surveying and mapping agencies in the field of geo-topography is to manage and update the Digital Basic Landscape Model (Basis-DLM) as the basis for establishing various thematic information systems in administration and businesses. The database of the ATKIS® Basis-DLM additionally serves as the basis for the derivation of the small-scale Digital Landscape Models ATKIS®-DLM50, DLM250 and DLM1000, for the production of official Digital Topographic Maps and the joint web-based map service of the federal government and the Laender (WebAtlasDE).

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 updated in the case of changes.

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

The DLM250 and the DLM1000 processed in the BKG are available nationwide and updated on an annual basis. The contents are being continuously expanded to create the EuroGeographics products EuroRegionalMap (1:250,000) and EuroGlobalMap (1:1,000,000) and also to link thematic data and for reporting at the European level (main user: European Commission). The requirements of the users also continue to increase in this area.

The Digital Landscape Models of the ATKIS® technical schema must be continuously adapted to the changing requirements for geotopographical core data. The aim of the conception commissioned by the AdV Plenum for updating the joint AFIS®-ALKIS®-ATKIS® data model is thus to improve the harmonisation of the data in the real estate cadastre and in geo-topography, so that data is captured only once and can then be made available for as many products as possible. The practical implementation of Version 7.0 of the “Documentation on the Modelling of Geoinformation of Official Surveying and Mapping (GeoInfoDok)” will make it possible to meet requirements made of Germany’s geotopographic reference data arising in part from the European projects Copernicus and CORINE Land Cover (CLC) and from INSPIRE. At its 126th meeting in September 2014, the AdV Plenum agreed to the contents stipulated by the GeoInfoDok 7.0 including for the ATKIS® area.

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 the authorities and businesses as part of the geo-topographical 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. DGMs can also include additional information (e.g. terrain edges, skeleton lines or distinctive terrain points). 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 generally derived automatically from the DGM with the smallest available grid size. For the ATKIS® technical concept, the DGM feature catalogue is available in the GeoInfoDok.

Currently, DGM data sets with a grid size of 10 m (DGM10), 25 m (DGM25), 50 m (DGM50), 200 m (DGM200) and 1,000 m (DGM1000) are available nationwide for the whole of Germany. The data quality is documented in the ATKIS® product standard for Digital Terrain Models. For the DGM10, for example, this stipulates a terrain-type-related height accuracy of the grid points of ± 0.60 m to 2.10 m with a confidence level of 95 % (2 σ).

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 5 m (DGM5), 2 m (DGM2) and even 1 m (DGM1). Figure 11 shows, as an example, the different resolutions of terrain structure in DGMs of different grid sizes. In the course of 2014, nationwide coverage was achieved with DGMs with a grid size of 5 m or better. The Central Office for Geo-Topography (ZSGT) at the BKG offers the DGMs to customers in collaboration with the Laender.

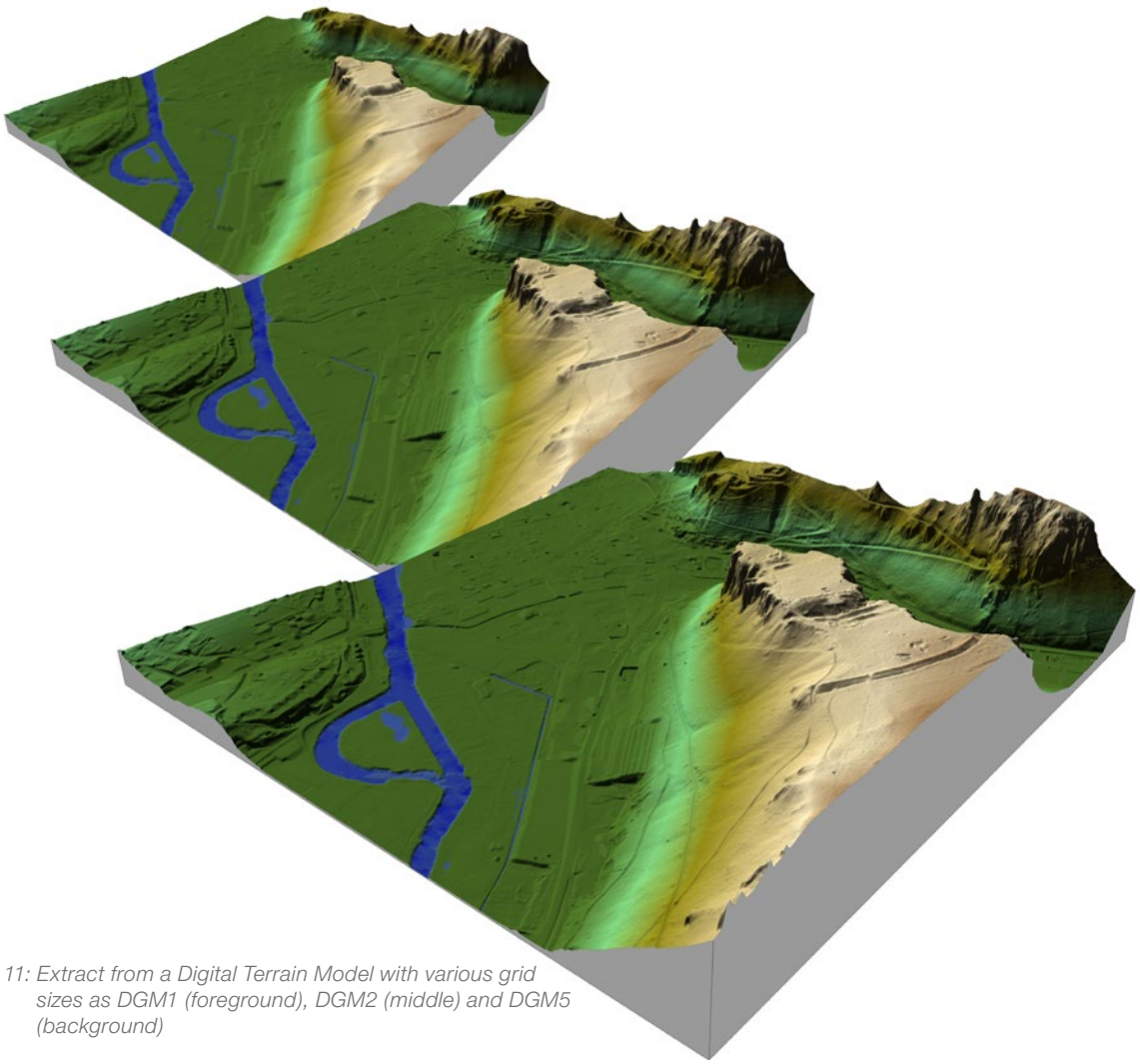

Fig 11: Extract from a Digital Terrain Model with various grid sizes as DGM1 (foreground), DGM2 (middle) and DGM5 (background)

In the surveying and mapping agencies, Digital Surface Models (DOM) 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, the DOMs are structured according to their grid sizes and DOMs with a larger grid size are automatically derived from the DOM with the lowest available grid size using new interpolation.

DOMs are based on the technique of airborne laser scanning or digital image correlation (matching). An increasing demand for these DOMs among users can be observed. The data quality is to be documented using the ATKIS® standard for Digital Surface Models.

3D building models

The surveying and mapping authorities have been offering the product of 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 AdV-CityGML version 1.0. The AAA® model has been expanded to include 3D buildings and 3D structures as part of the GeoInfoDok 7.0.

Nationwide, 3D building models are being created with the Level of Detail 1 (LoD1). Here all buildings and structures are given a flat roof ("block model"). The comprehensive availability of the more than 51 million building objects nationwide is expected in the course of 2015. The Central Office for House Coordinates and Building Polygons (ZSHH) is making this data available for cross-Land use. As at March 2015, 12 of 16 Laender have made their entire database in LoD1 available to the ZSHH for release.

In the future, all buildings and structures will be modelled by the surveying and mapping authorities in the next level of detail, Level of Detail 2 (LoD2), using standard roof shapes. The creation of the data sets in LoD2 is already well advanced in some Laender or has even been completed. It is not yet possible to name a date for nationwide coverage, however, which will not be before the end of 2016.

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. Digital Topographic Maps (ATKIS®-DTK) are already available in many Laender for the entire Land. For DTK50 and DTK100, the surveying and mapping authorities have agreed with the German Federal Ministry of Defence that they should be maintained and published as joint

civilian and military maps. DTK100 has been available for the whole country and in standardised form for the Federal Republic since back at the end of 2012.

In the course of 2014, following three years of development work, the map series DTK250 was derived from DLM250 in an automated process by the BKG and is likewise available for the whole country at the BKG's Service Centre – initially as a sheet-line-free web map service, later also per map sheet. As a result, it was possible to discontinue the previous map series DTK200-V.

Two tools are used in the process of creating DTK250 from Digital Landscape Model 250 (DLM250). With the FME software, the fast and effective derivation and attributive processing of the DLM GIS data is carried out and with the MapServer Suite the cartographic products are created.

The MapServer Suite is software developed specifically for map production. It has proved of value for geographical publishers and in several Land surveying and mapping authorities. Firstly, the software is designed for prompt and effective development work and, secondly, it facilitates rapid updating in a way that is adapted to the cartographic requirements. The application works with a relational database in which all the data is stored with geo-referencing. The labelling is annually synchronised in a fully automated process with the geographical name book (GN) of the BKG and transferred to the MapServer Suite.

To meet the high quality standards required of an official topographic map, the automatic derivation is checked and corrected by cartographers. In this way the deficiencies of both the automated map derivation and the automated synchronisation of the labelling with the GN are redressed. This leads to a better legibility of the map and makes it possible to recognise unambiguously what the map features refer to.

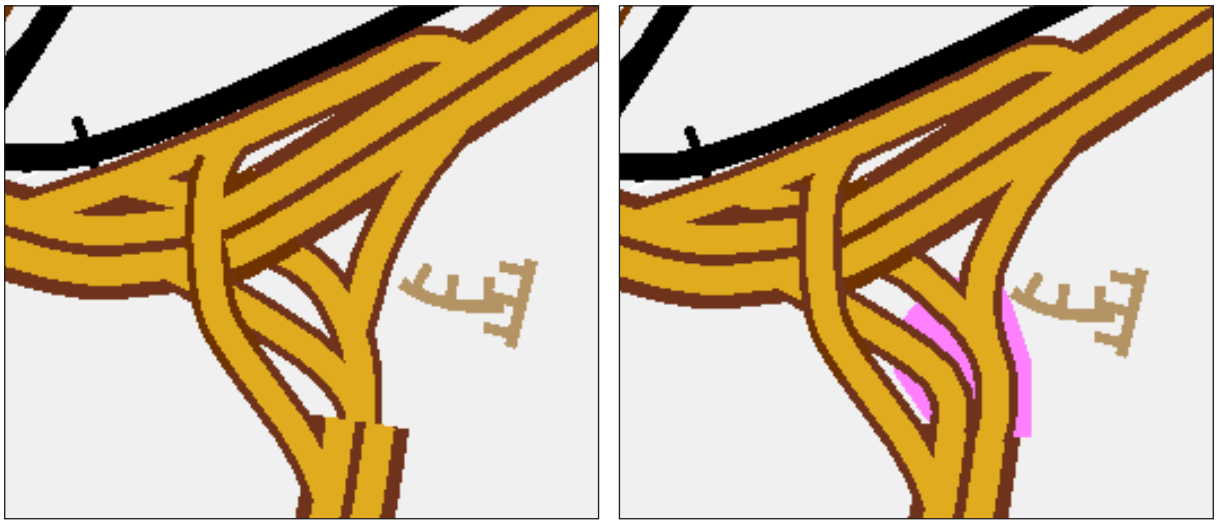

Fig 12: DTK250 correction example: before and after correction

Despite this rather traditional portion of work, in future it will be possible to make the 35 map sheets and the web map service available three months after the release of the current DLM250. Thus it has been possible to significantly shorten the updating cycle by comparison with previous methods. This process is also successfully used to produce the 1:1,000,000 Digital Topographic Map (DTK1000) and in the print-on-demand procedure for raster maps.

Fig 13: Excerpt from DTK250

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

So far 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. The proportion of these provisional DTKs has decreased further during the reporting period. To meet customer requirements, the possibilities of web-based presentations are increasingly being used.

ATKIS® geospatial data services

Based on the awareness of necessary harmonisation also in the provision of geographic reference data via web technologies and building on the web profiles for viewing and download services created in a non-sector-specific way by the AdV, in the area of geo-topography the following web product specifications have been compiled and agreed to by the AdV Plenum:

- AdV product specification WebAtlasDE-WMS, version 1.0, as at 24 February 2014
- AdV product specification WebAtlasDE-WMTS, version 1.0, as at 24 February 2014
- AdV product specification for ATKIS®-DLM-WFS, version 1.0, as at 24 February 2014

Besides the NAS format as the 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, a corresponding AdV product specification for DLM data is being compiled; a resolution by the AdV Plenum is targeted for autumn 2015.

The above-mentioned production specifications can be viewed at all times in their current form, like all the other AdV standards in the field of geo-topography, on the website adv-online.de.

WebAtlasDE

The need for official map services among all kinds of different users has risen dramatically in recent years. In addition to good performance, aspects that are expected are, in particular, preferably "continuous" zooming, high availability, provision both in the viewer and as a service, font and signature adjustment at every scale level, a simple, standardised map style and provision throughout Germany and across the Laender.

DLM and DTK were unable to fully meet these requirements. Based on the activities of some member authorities, in 2012 a common web-based map service was therefore implemented by the federal government and the Laender under the name "WebAtlasDE" which has already been linked on the federal and Laender geoportals

in multiple cases. To this end raster map tiles of various scales are created from the Digital Landscape Models and made available via a Web Map Tile Service (WMTS) with good performance and high reliability.

In particular, the complete presentation of all buildings available in the real estate cadastre, including their house numbers, and the periodic comprehensive update of the geotopographic data, similar to the DLM updating, are unique features of the WebAtlasDE. The service has been linked, for example, on the home page of adv-online.de and can be accessed there. In the context of making the resolution on the AdV product specification WebAtlasDE-WMTS mentioned in the above section, the AdV Plenum decided that WebAtlasDE would be offered in future alongside the official reference system ETRS89/UTM in the coordinate reference system “Pseudo Mercator”, too.

Fig 14: Excerpt from WebAtlasDE – Erfurt

Digital orthophotos

The surveying and mapping 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. The Digital Orthophotos product group (ATKIS®-DOP) thus rounds off the ATKIS® concept. Thanks to the image-based documentation of the landscape, 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 are already producing DOP10.

Because the results of aerial photography are crucial to the prompt updating of the geotopographical core data of ATKIS®, the high-resolution DOP20 is subject to an updating cycle of no more than three years. Setting a product standard for the Digital Orthophotos provides the necessary conditions for the data of the Laender to be pooled at the Central Office for Geo-Topography (ZSGT) located at the BKG. The ZSGT provides the DOPs along with the Laender and visualises them together in a DOP viewer available online. The DOP20 is now established as a standard product for virtually all technical applications with a spatial reference within and outside of the surveying and mapping authorities.

The introduction of digital aerial survey camera systems presents new challenges for the surveying and mapping authorities, while simultaneously providing new opportunities. The high efficiency of multi-channel photography permits the simultaneous use of black-and-white (PAN), colour (RGB) and infrared (CIR) aerial image data. The addition of the infrared channel meets the criterion for merging the requirements ensuing from the surveying and mapping, forestry, agriculture and environmental authorities in the aerial photography flight projects of the Laender. The series of Figures 15, 16 and 17 on the opposite page exemplifies the differences.

Besides questions regarding the quality requirements for digital photography flights and regarding data transmission and analysis, the surveying and mapping authorities are focusing on the issues of long-term data security and history management, as time series of aerial photographs are an indispensable tool for the work of more and more 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 member authorities of the AdV offer a set of data that meets the customer requirements for time series to a special degree.

The digital aerial photographs as the basis for deriving ATKIS®-DOP are increasingly being provided to specialist users as Oriented Aerial Images by the surveying and mapping authorities. Oriented Aerial Images are aerial images that contain all the parameters required for stereoscopic analysis. Rapid IT developments and the cost-efficient provision of user software is making stereoscopic aerial image analysis and presentation

Fig 15: Town centre of Ludwigslust (Mecklenburg-Western Pomerania) as a PAN aerial image

Fig 16: Town centre of Ludwigslust (Mecklenburg-Western Pomerania) as an RGB aerial image

Fig 17: Town centre of Ludwigslust (Mecklenburg-Western Pomerania) as a CIR aerial image

an economically viable option for users. Figures 18 and 19 show two different kinds of analysis systems as examples.

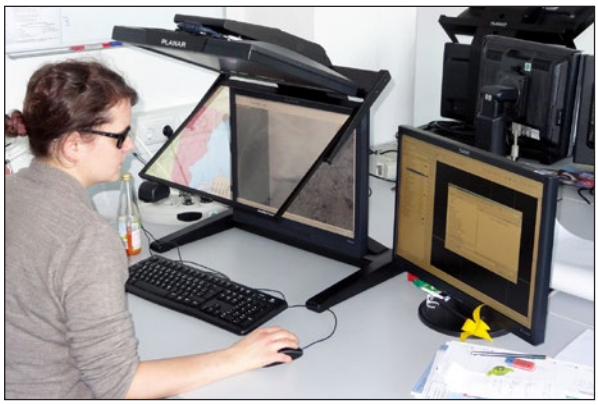

Fig 18, 19: Stereoscopic analysis systems (left: passive system; right: active system)

The high data quality combined with the diverse information 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 techniques for this are currently being tested. An example of this is presented in Figures 20 and 21.

Fig 20, 21: Automated detection of forest areas (right) on the basis of ATKIS®-DOP (left)

Toponymy

In collaboration with the Permanent Committee on Geographic Names (StAGN), the BKG offers a standardised (gazetteer) service that provides the toponymy (GN-DE) from the vector data of the products DLM250, VG250 and GN250. GN250 (Geographic Names 1:250,000) is available in a classification of names corresponding to the ATKIS® feature types in the AFIS®-ALKIS®-ATKIS® data model. The database comprises around 154 500 entries of geographic names, including municipalities, parts of municipalities, landscapes, mountain ranges, mountains, islands, rivers, canals, lakes and seas. The GN-DE database is available as a standardised Web Feature Service (WFS) according to the specification of the Open Geospatial Consortium (OGC) at the Service Centre (DLZ) of the BKG.

5. Information and Communication Technology

Information and Communication Technology forms the technical interface between activities in the fields of spatial reference, the real estate cadastre and geo-topography. It helps to establish the Spatial Data Infrastructure (GDI) based on official geographic reference data using networks and geoservices. The activities focus on the maintenance and advancement of the AFIS®-ALKIS®-ATKIS® (AAA®) concept for modelling the geoinformation of the official surveying and mapping and for the information technology coordination of the GDI activities for the AdV at a national level.

AAA® model

With the work on the AAA® model, the AdV designed an integrated and harmonised modelling of all geographic reference data of the surveying, mapping and geoinformation authorities – split into a basic schema and a common technical schema AFIS®, ALKIS® and ATKIS®. This is implemented by the AdV member authorities. The AAA® basic schema (Figure 22) 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 data 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 was done, for example, through the establishment of the Information System for Rural Development (LEFIS) as an object-oriented thematic data model by the authorities for agricultural structure. LEFIS is a planning system for the continuous processing of land consolidation measures under the Farmland Consolidation and Agricul-

tural Adjustment Act. To support an 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.

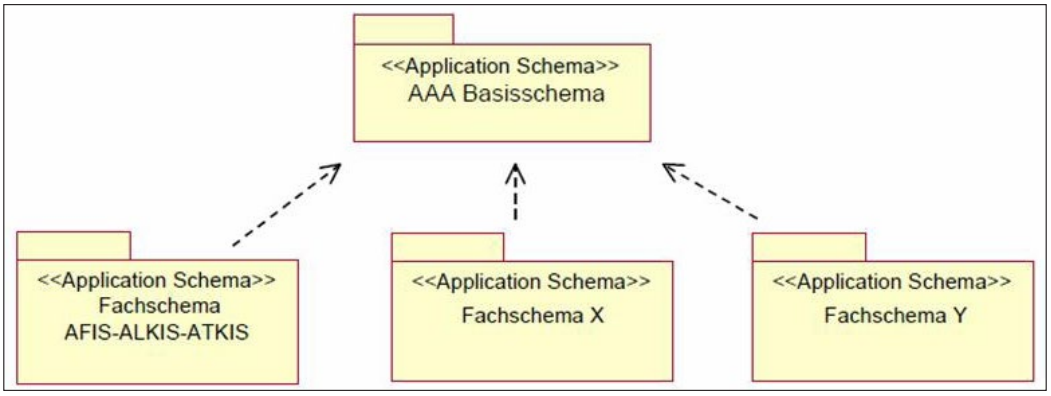

Fig 22: The non-sector-specific AAA® basic schema as a basis for modelling application-specific thematic schemas (e.g. AFIS®, ALKIS® and ATKIS®)

The Germany-wide migration of all geographic reference data to the modelling of GeoInfoDok version 6.0 will be complete in the near future. In addition to this, however, further developments to the AAA® model are being continued in an ongoing process in order to keep meeting the demands of users and GIS producers. To create planning security for users and companies, the work on the new version 7.0 of the GeoInfoDok has already now been completed and published at **www.adv-online.de**.

GeoInfoDok 7.0 differs from the current version 6.0 in the following fundamental new modelling and technical aspects:

- 3D building models
- digital elevation models
- amendments to the Land Appraisal Act (Bodenschätzungsgesetz)
- collaboration with agricultural structure authorities and land register authorities
- improving the processing solutions (e.g. changes in the reasons for amendments)
- requirements of the CORINE Land Cover project
- harmonising the data of the real estate cadastre and the area of geo-topography

It is intended for the GeoInfoDok 7.0 to also be provided in English as previously.

The AdV revision notifications for the GeoInfoDok are being managed henceforth through a web-based ticket system that can be accessed at **www.adv-online.de** in the section AAA® model (Figure 23). The advantages of the "AFIS®-ALKIS®-ATKIS®-Revision" ticket system include the following:

- Through the free read access, any changes to the AAA® model will be transparent to everyone at an early stage,
- The web application facilitates convenient and comprehensive search and filter options,
- The role and rights management allows active participation for registered parties,
- Through a migration of all previous revision points from GeoInfoDok 6.0.1 to GeoInfoDok 7.0, it is also possible to follow the current development.

Geospatial data infrastructure

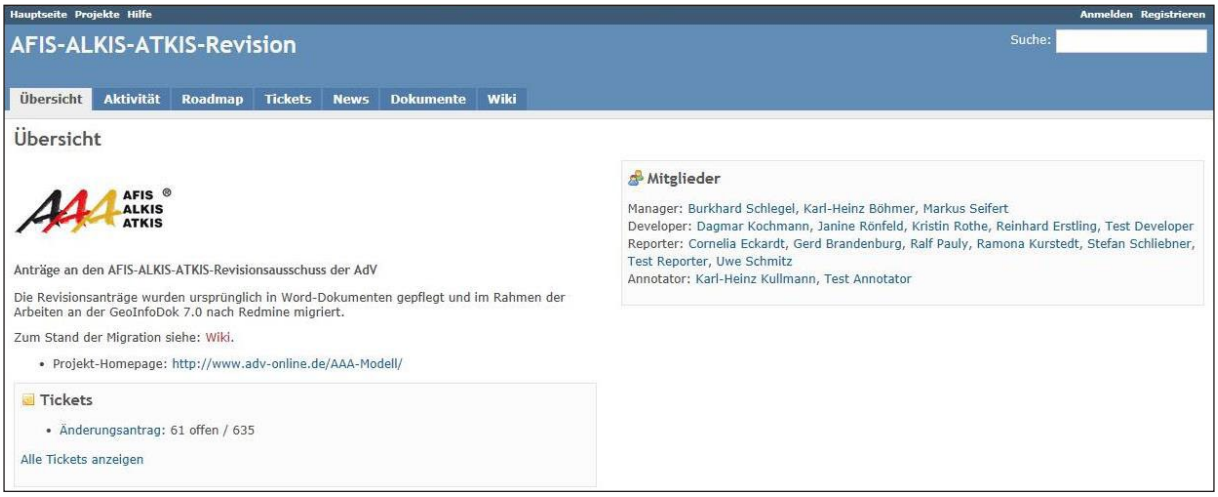

Fig 23: Start window of the AFIS®-ALKIS®-ATKIS®-Revision ticket system

The AAA® data model's compliance with 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. Accordingly, the INSPIRE expert network of the AdV looks in detail at the INSPIRE data specifications and their effects on the AAA® model and creates mapping tables for this as a model for the transfer of the AAA® data to the INSPIRE data model. In addition to the INSPIRE expert network of the AdV, the representation of the AdV's interests in the European geospatial data infrastructure process of INSPIRE is provided for by the involvement of experts from AdV in European committees ("Pool of Experts" and "Maintenance Implementation Group").

For the uniform implementation of the INSPIRE Directive by the AdV member authorities, e.g. in the areas of monitoring and the (minimum) contents of interoperable services, proposals for uniform framework conditions and benchmark figures have been determined, which are currently being discussed in the AdV committees.

Harmonised provision of geographic reference data

In light of the developments in the provision of geospatial data via web technologies and the requirements ensuing from the INSPIRE process, the AdV has created a series of technical web profiles for viewing and download services (Web Map Service – WMS, Web Map Tile Service – WMTS, Web Feature Service – WFS). These technical profiles form the basis for each sector-specific structure regarding the thematic data to be provided (product specification). With the approach of defining general technical profiles and differentiated subject-specific product specifications, the goal being pursued is to harmonise, standardise in terms of contents and further expand the services and data formats produced by the AdV member authorities for the purpose of a nationwide provision of geographic reference data as the basis for geospatial data infrastructures in Germany and in Europe. These profiles are supplemented by the now completed AdV metadata profile, which describes the structure and semantics of the metadata for the geographic reference data and geospatial data services of the member authorities.

AdV-Profile	Version (Stand / Größe)
AdV-WMS-Profil	3.0.0 (02.05.2012 / 148 KB) 2.0.0 (15.05.2008 / 41 KB)
AdV-WMTS-Profil	1.0.0 (21.05.2014 / 157 KB)
AdV-WFS-Profil	1.0.0 (29.04.2013 / 213 KB)
DOG-Profil HKFK	2.0.0 (17.11.2010 / 539 KB)
AdV-Shape-Profil	1.0.0 (31.01.2014 / 128 KB)
AdV-Metadatenprofil	1.0.0 (21.05.2014 / 836 KB)

Fig 24: Page area of Standards and Product Sheets – AdV Profiles at www.adv-online.de

Due to the advancements and updates occurring with standardisation and in the INSPIRE process, the AdV profiles are regularly updated in order to guarantee the interoperability of the web services of the AdV member authorities. These activities are seamlessly embedded in the overall strategic concept for the AdV strategy for providing geospatial data services as mentioned in the preface. The most recent versions of each of the profiles have been uploaded to the newly structured page area for AdV standards at **www.adv-online.de** – AdV-Produkte – Standards und Produktblätter, see Figure 24.

In accordance with the strategy for providing geospatial data services, the AdV has additionally begun developing a test environment. In the completed version it will be possible to test both AAA® data and web services for compliance with the appropriate specifications (GeoInfoDok, profiles and product specifications).

6. Public Relations and Marketing

All spatial planning and decision-making processes require geographic reference data to link the relevant sector-specific information with the corresponding location on the earth's surface. This geographic reference data is any non-interest-specific, non-application-specific description of the topography of the earth's surface (surveying and mapping) and of real estate (real estate cadastre). In order to ensure the availability of geographic reference data and geospatial data services for the government, for business, for scientific purposes and for the public, the surveying and mapping authorities of all the German Laender are under a legal obligation to collect, manage and provide geographic reference data. For modern, technical authorities, the provision of highly up-to-date geographic reference data around the clock in the form of services and online shops has long since become part of everyday business.

Requirements

The responsibility for official surveying and mapping lies with the German Laender according to constitutional law. Because the need for a multitude of spatial applications goes beyond the provision of geographic reference data within one Land and because users are increasingly making greater demands in terms of geographic 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 interested 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 with different characteristics for searching, viewing and downloading via geoportals, geospatial data services and geoviewers. The meta-information system provides information on availability, characteristics and points of contact for the products. The AdV has realised that a strategically important goal is for all the geographic reference data products to also be provided via geospatial data services in the future 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 of e-government and thus promote a modern information, knowledge and civil society in Germany.

To allow for a nationally standardised product range, the distribution points are being networked and what they provide is being standardised. Currently, certain product groups are being provided across Laender and harmonised at three central distribution points: the Central Office for House Coordinates and Building Polygons, the SA*POS*® Central Office and the Central Office for Geo-Topography at the Federal Agency for Cartography and Geodesy (BKG). The BKG also supplies the national government institutions with geographic reference data.

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

- collection and documentation of the requirements of the state and the public regarding the collaboration and comparing these with the geographic reference data products and services (needs survey and needs analysis)
- maintenance of the licence and fee models and model licence agreements, as well as execution of model-based licensing for the use of the geographic reference data and geospatial data services (conditions and distribution policy)
- implementation of measures to provide information on the availability and usability of the geographic reference data and geospatial data services (product information) and
- implementation of measures for the positive perception of the Official Surveying and Mapping in Germany and its cross-Land geographic reference data products and services (image promotion)

Services

Needs survey and needs analysis

To achieve optimum distribution of the geographic reference data, user and purpose-oriented geographic reference data products are to be produced and made available as part of the official activities of the surveying and mapping authorities. If, for this purpose, information is required about the demand and requirements of users regarding geographic reference data (product, intended use, product satisfaction) and regarding conditions of provision and product information (information channels and contact channels to the surveying and mapping authorities), the central distribution agencies conduct user surveys and analyse the results jointly with the AK PRM.

Licence and fee model

To regulate rights of use in connection with the provision of the geographic reference data and geospatial data services, there is a need for a nationally standardised licence and fee model that satisfies current requirements, is as clear and simple as possible and regulates the use of all the currently offered geographic reference products. For this reason, the Official Surveying and Mapping in Germany has approved the directive on fees for the provision and use of geographic 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 recommended to implement it. The AK PRM updates the licence and fee model according to the AdV's requirements and in consultation with the other working groups if the AdV Fee Directive has to be adapted to keep abreast of the technical advancement of the products and in line with user requirements. The AK PRM is currently investigating how the fee stipulations can be simplified by applying transparent and flat-rate regulations, and also how area and time-based flat-rate models for download services can be developed. To meet the increasingly wide-ranging demand for geospatial data also in completely new areas, the AK PRM is developing licence models that will enable our customers and partners to use geographic reference data as the basis for their own specialist and technical products and to offer these new solutions.

Model licence agreements

Given that the nationwide provision of geographic reference data and services continues to be standardised and that the community of surveying and mapping authorities, with its nationwide provision of geographic reference data, is being increasingly perceived as a supplier community, the AK PRM has updated the standardised model licence agreements for complex applications, the small contract template for geoproduct licensing and the General Terms and Conditions of Business and Use (AGNB). To supplement this, web-enabled, brief and easily understandable sample text blocks for the licensing of geospatial data services have been developed. These sample agreements are used at the central distribution points and are recommended for licensing within the individual Laender. The interested public can view and download them at **www.adv-online.de** and use them for their own purposes.

Exchange of information

Furthermore, the AK PRM sees itself as a communication platform for the distribution points of all the surveying and mapping authorities and for the joint distribution points and it supports the exchange of experience regarding the application of the AdV Fee Directive. To this end, the AK PRM annually conducts a two-day sales manager conference. Besides purely providing 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.

Information documents and corporate design

To ensure that the Official Surveying and Mapping in Germany has a uniform appearance and a uniform presentation in text and image, the AdV has adopted a common corporate design and made it available to all member authorities. The AdV's corporate design is regularly adapted to suit the technical advancements and the requirements of the distribution points. At the beginning of 2015 the current version was approved by the Chair of the AdV.

Fig 25: Logos for AFIS®, ALKIS® and ATKIS®, as featured in the corporate design

Fig 26: Product brochure for SAPOS®

The AdV's information materials are created uniformly 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 geographic reference products in the language of the geomarket.

The AK PRM publishes the AdV product portfolio with the title "Basis for your decisions", which focuses on the geographic reference product range of the surveying and mapping authorities and its potential uses.

Based on this, further product brochures and leaflets containing detailed information on the nationally available products are published in consultation with the AdV's working groups.

Web portals and works of reference

The AdV website (**www.adv-online.de**) provides information about the tasks, product range and developments with a user-friendly interface. In a further step, the various product-related websites are to be merged and adapted accordingly. The AdV's presence in the works of reference available online is important because its role, tasks and product range can be widely communicated via this medium. Interested visitors should be able to access the AdV's Internet information in a user-friendly way and with just a few clicks. Contact can be made directly with the AdV via a contact form if particular questions need to be clarified. Within the scope of the AdV provision strategy, the AdV's Internet presence is gradually being added to and expanded.

Image promotion

For the surveying and mapping authorities to be perceived in a positive light, public relations activities must be actively pursued, making use of appropriate media and an effective presence at events. The AK PRM has produced a geo-film describing the organisation, role and product range of the Official Surveying and Mapping in Germany in an easy-to-understand form. For it to be used widely and effectively, the film can be found on the AdV website (**www.adv-online.de**) and has subtitles in German, English as well as sign language. Furthermore, the surveying and mapping authorities provide regular information events for the interested public.

Public relations and trade fair appearances

In the process of establishing geospatial data infrastructures in the Federal Republic of Germany, the AdV is endeavouring to raise awareness of the geographic reference data and geodata services of the surveying and mapping authorities in the Laender. As in previous years, the official surveying and mapping was represented by the AdV with an exhibition stand at INTERGEO® 2014, the world's leading fair for surveying and mapping, in Berlin (Figures 27 and 28). Besides the presentation of the products and capabilities of the Official Surveying and Mapping in Germany, accompanying lecture and discussion forums took place.

Fig 27: Joint stand of the AdV at INTERGEO® 2014 in Berlin; a key topic: official geoinformation

Fig 28: Surveyors of the future visit the AdV stand at INTERGEO® 2014 in Berlin

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 tasks. Collaboration within the context of EuroGeographics includes the development of transnational, 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 earth observation programme Copernicus.

The 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. Moreover, the president of the BKG is also a permanent member of the Management Board and was elected Vice President of EuroGeographics for two years in December 2014.

EBM, ERM, EGM and EuroDEM

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

- EuroBoundaryMap (EBM) – the administrative units at all national administrative levels in Europe, with names, unique code numbers and a reference to the spatial classifications NUTS (Nomenclature des Unités Territoriales Statistiques) and LAU (Local Administrative Units) of Eurostat, the Statistical Office of the European Union. The data record in the scale 1:100,000 currently covers 41 European countries (Figures 29 and 30)

- EuroRegionalMap (ERM) – the topographic reference data set in the scale 1:250,000. ERM covers a region of 36 European countries (Figure 31)
- EuroGlobalMap (EGM) – the topographic reference data set in the scale 1:1,000,000. EGM covers a region of 37 European countries and has been available free of charge on the Internet since 2013. EGM is derived automatically from ERM (Figure 32)
- European Digital Elevation Model (EuroDEM60) – a digital elevation model computed by the BKG from the national data records with a position resolution of 2'' (approx. 60 m) and a height accuracy of 8-10 m

The BKG is responsible, among other things, for merging the national contributions, for the creation, updating and development of EBM and for the European digital elevation model (EuroDEM). Furthermore, the experts at the BKG provide the German contributions to the products and are very actively involved in EBM and ERM in the respective technical teams, which are working intensively on the sustainable maintenance and development of the products. The Service Centre at the BKG is the distribution centre for EuroGeographics and delivers the European data records to both German and international customers.

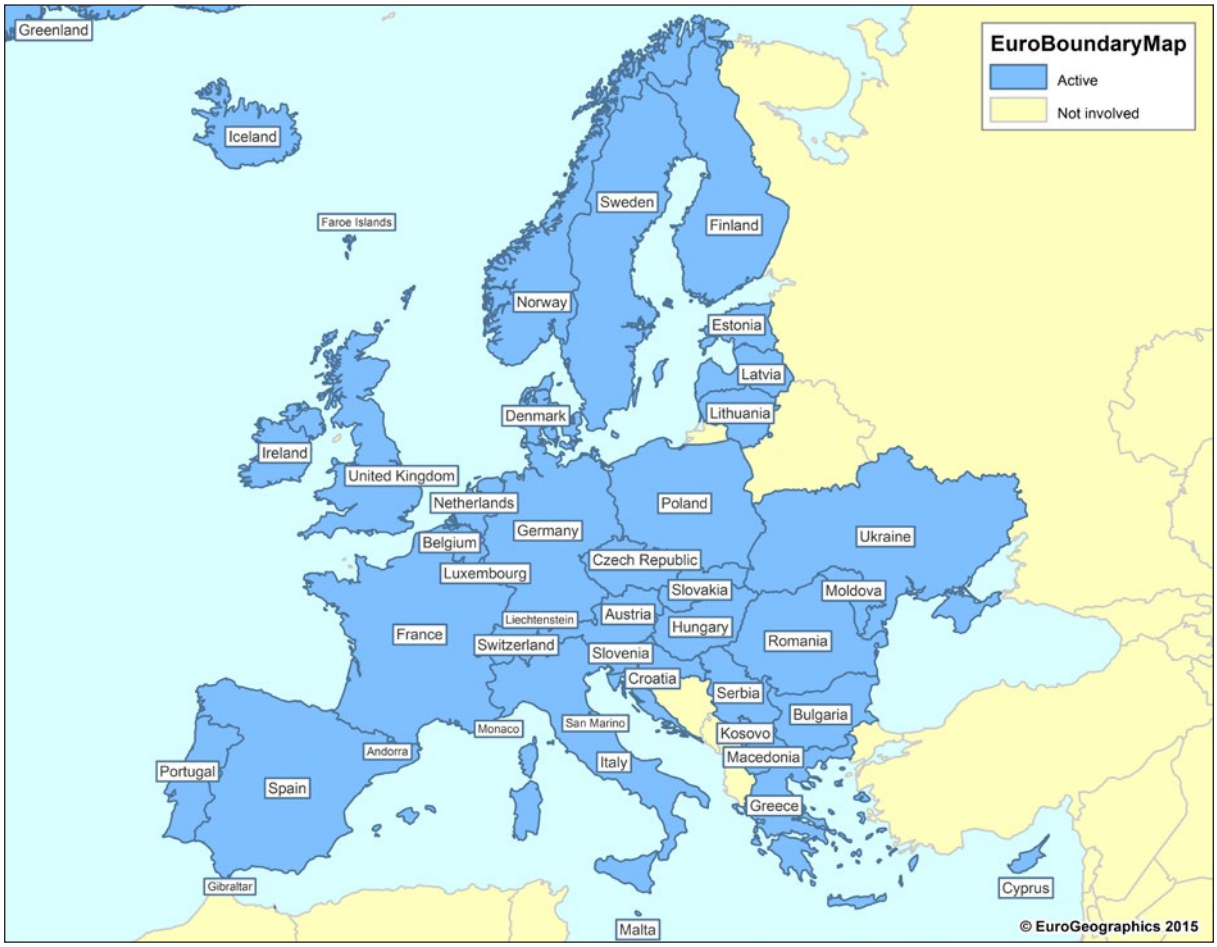

Fig 29: Members of EBM (EuroBoundaryMap)

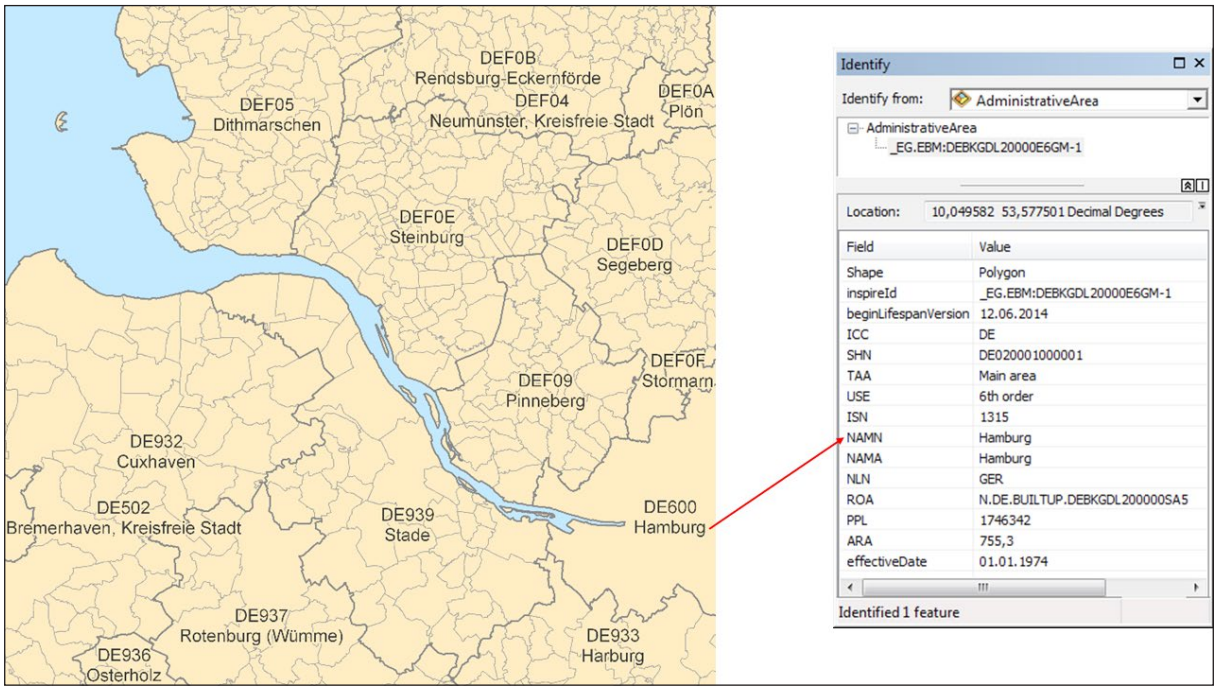

Fig 30: Example of EBM (EuroBoundaryMap)

Fig 31: Members of ERM (EuroRegionalMap)

Fig 32: Members of EGM (EuroGlobalMap)

European Location Framework

The BKG is involved in the project European Location Framework (ELF), which was initiated by EuroGeographics. The project serves to further the target of EuroGeographics to create products that are harmonised across borders on the basis of the official data of its members and provide these for global, European (e.g. Copernicus and tasks of the European Commission) and regional applications. ELF supports the implementation of the INSPIRE Directive at a national level through the development of geospatial data services and tools for data harmonisation.

The project started in March 2013 and has a duration of three years. 30 Partners from the administrative, academic and business spheres – including European surveying and cadastral authorities from 13 European countries – are working on establishing this infrastructure (Figure 33). The cooperation is being funded within the scope of the "Competitive and Innovation Framework" programme of the European Commission with 50 % of the project budget.

In Phase II, geographic reference data of higher resolution is being added in selected test areas (Sweden, Finland, Norway, Poland and the Czech Republic), along with the first geospatial data services and applications. In the further course of the project the data availability is being expanded – gradually – in geographical and thematic terms.

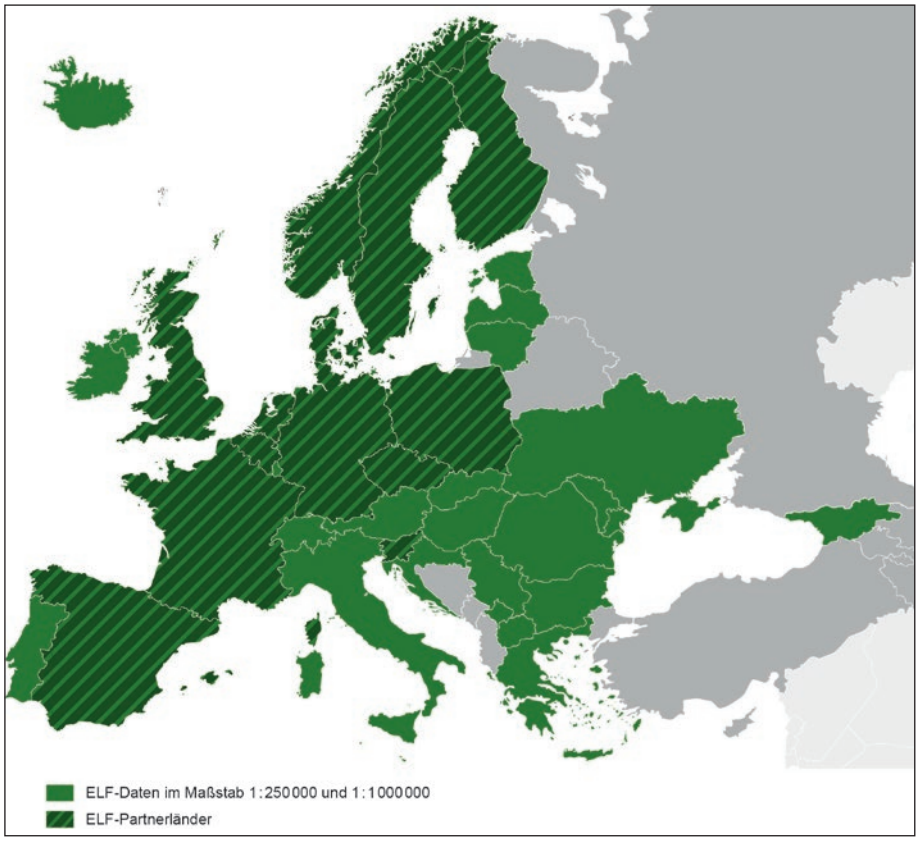

Fig 33: Members of ELF (European Location Framework)

The main objectives of the project are:

- furthering the implementation of the INSPIRE Directive especially in terms of the cross-border harmonisation of the geospatial data
- establishing an efficient web platform to enable distributed national geospatial data and geospatial data services to be merged and made available for a wide range of services
- highlighting the usability of the web platform in key areas of European politics and for other users, such as SMEs
- developing example applications in the fields of health statistics, emergency mapping, insurance and property management
- integrating additional thematic data sets, particularly of those topics that go beyond the scope of the INSPIRE topics of the national surveying and cadastral authorities, in order to meet specific user requirements
- providing a user-friendly interface to search for European geospatial data and to use and incorporate this data in one's own applications

Copernicus

The European earth observation programme Copernicus is a joint initiative of the European Union and the European Space Agency (ESA) for the creation of an independent European earth observation system. The member states of both institutions contribute as partners towards the development of Copernicus. Copernicus uses satellite data from existing missions, while also establishing its own observation capabilities with the Sentinel missions. The aim is for the satellite data along with thematic and reference data from the federal government and geographic reference data of the Laender to be incorporated in Copernicus information services that deal with the six themes: land monitoring, marine environment monitoring, disaster and crisis management, atmosphere monitoring, climate change monitoring and security. Further information about the data, services, activities, events and more can be found at **www.d-copernicus.de**.

The land monitoring service also includes the creation and distribution of the Corine Land Cover data, which in Germany is derived from the Basis-DLM (Digital Landscape Model) and is updated by the BKG for each of the reference years using Copernicus and other satellite images.

If the need arises for urgent damage mapping by the Copernicus “Emergency Management” service, topographic data of the Official Surveying and Mapping in Germany is available to the European Commission under an agreement with the AdV.

Under the auspices of the Land of Schleswig-Holstein, the possibility of integrating earth observation technologies for updating the ATKIS® Basis-DLM into the EDP structures of the Schleswig-Holstein Agency for Surveying and Geoinformation is being explored in the pilot project “DLM-update”. The aim is to answer the question as to whether the previous manual tracking of the ATKIS® Basis-DLM can be optimised and accelerated by means of a semi-automated process with the aid of satellite remote sensing data and aerial images.

This project is being conducted jointly by the Schleswig-Holstein Agency for Surveying and Geoinformation and a company for remote sensing. It is funded by the Federal Ministry for Economic Affairs and Energy and managed by the German Aerospace Center. From satellite image data (Figure 34) and digital orthophotos (Figure 35) a layer with seven land cover classes is created (Figure 36). This is compared feature by feature with the actual use of the ATKIS® Basis-DLM. As a result, suggestions for updating ATKIS® are generated, which can be read into a geoinformation system (3A Editor) very simply by means of an additional toolbar and displayed and evaluated there.

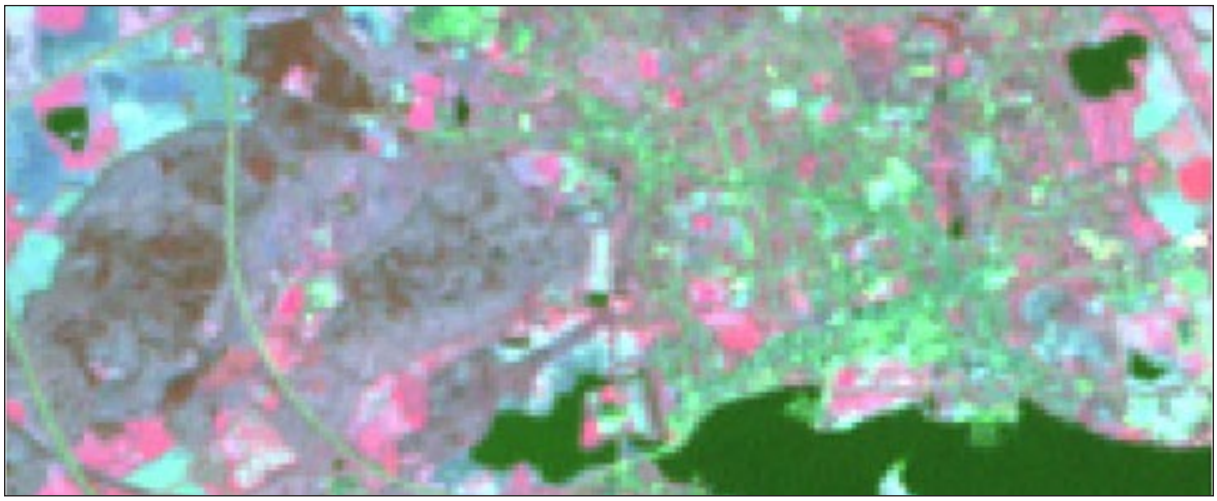

Fig 34: Landsat satellite image

Fig 35: CIR orthophoto

Fig 36: Land cover layer

These update suggestions support the administrators in the interactive updating process (Figure 37) by taking them through the ATKIS® project suggestion by suggestion.

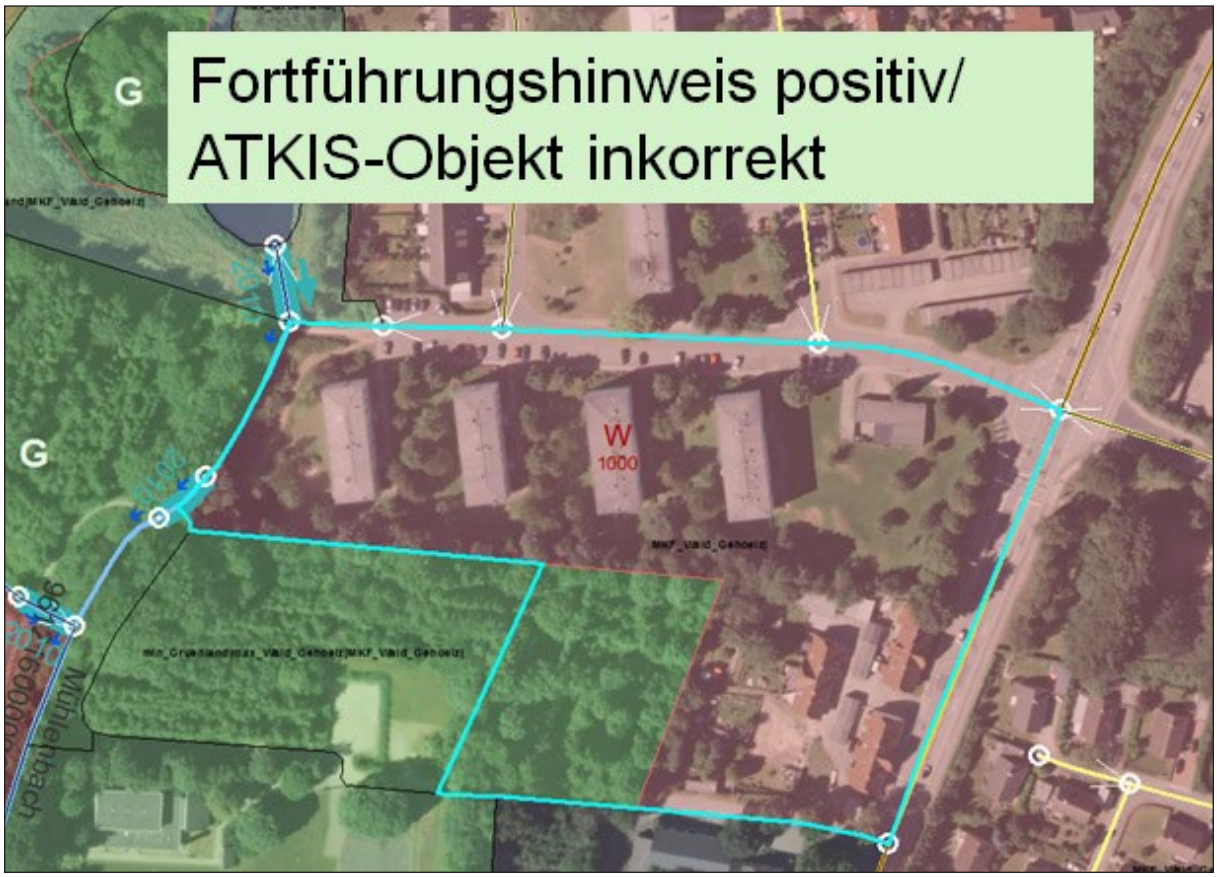

Fig 37: Correct update suggestion

In summary, the following results have already now been established:

- the remote sensing data can be used in updating ATKIS®
- the workflow of the remote sensing module automatically accesses the required ATKIS® data and the digital orthophotos
- a change detection between the classified land cover and the ATKIS® Basis-DLM is automatically performed
- the prototype can be used for supported ATKIS® updating

This project shows that satellite image data from the Copernicus mission can be used in combination with digital orthophotos for a semi-automated updating of the ATKIS® Basis-DLM and that the results of this can be integrated into the workflow in a simple way.

Open Geospatial Consortium (OGC)

Around 20 international norms and standards are currently being used in various AdV specifications. Since these standards are constantly being adapted and new ones added, ongoing monitoring is necessary as well as participation in standardisation bodies such as the OGC. From a strategic perspective, the GIS standardisation in OGC and ISO for the maintenance and development of the AAA® data model and the interoperable geospatial data provision by services continue to play a central role in order to make the official geographic reference data fit for INSPIRE and the requirements of e-government.

Through the cooperation agreement between OGC and ISO/TC 211 many standards are initially developed in OGC as OGC specifications (e.g. Geographic Markup Language – GML) and only then developed as a formal ISO standard. Furthermore, the new AdV profiles (e.g. the AdV WMTS profile) are based, in part, solely on OGC specifications because there are no corresponding ISO standards. For this reason AdV, represented by the Information and Communication Technology Working Group, is actively involved in OGC and, as a Technical Member, is also a long-standing voting member.

ISO/TC 211

The Geographic Information/Geoinformatics Technical Committee develops and maintains formal geoinformation standards. Establishing and maintaining the compliance of the AAA® data model and the AdV services profiles with the ISO standards is the stated goal of the AdV. However, the standardisation projects are becoming increasingly complex, making it ever more difficult to assess the relevance of individual standards and further developments. Here again, the Information and Communication Technology Working Group acts in a proven manner as an expert body. With the available resources it represents the interests of the AdV and implements the relevant standards within the AdV, in particular through technical profiles and product specifications.

So far there are 65 different standardisation projects (see **www.isotc211.org**). Although not all the standards are of equal importance for the AAA® data model and for the provision of data via standardised services, a number of important standards (e.g. the metadata standard ISO 19115) are currently undergoing systematic revision, in which amendments proposed by the AdV have also been introduced. The ISO/TC 211 conferences take place worldwide twice a year.

Permanent Committee on Cadastre in the European Union

On 1 July 2014 Italy 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 2014. To conclude the presidency, the PCC General Assembly was held in the rooms of the Italian Ministry of Foreign Affairs in Rome on 20 and 21 November 2014. Forming the focus of the conference were lectures on organisational changes to cadastral administration. Particular attention was directed to efforts to amalgamate the real estate cadastre and the land register, as is to be observed in some EU Member States, while in other states the real estate cadastre and land register authorities are kept organisationally separate. Further topics were data quality in the real estate cadastre, linking different registers (real estate cadastre, land register, address directories, etc.) and aspects of maritime spatial planning.

On 1 January 2015 Latvia assumed the presidency for the first half of the year. On 12 and 13 May 2015 the Latvian real estate cadastral authority invited people to the spring PCC General Assembly in the Latvian capital of Riga. The real estate cadastral authorities of the three Baltic states have a relatively recent history: they emerged subsequent to the collapse of the Soviet Union around 1990. Thanks to this recent history, the introduction of electronic processes was comparatively easy for the three real estate cadastral authorities. Current projects focus on merging different registers into one system, such as the "Geosurveyor" system in Lithuania, with which all kinds of previous registers (land register, real estate cadastre, address directories, register of companies, land appraisal and valuation, directories of mortgages, etc., forest cadastre and many more) are merged and standardised. Further projects that have already been or are about to be completed relate to e-payment, digital archiving, WMS and WFS for cadastral maps, etc.

Furthermore, the Latvian real estate cadastral authority reported about a survey on the topic of open data, this topic having been recognised internationally as a trend in recent years. The opinions as to the extent to which real estate cadastre data should be offered free of charge as open data varied widely among the EU Member States. Additional topics at the conference related to data acquisition in the real estate cadastre field through crowdsourcing

Fig 38: The representatives of France, Germany and Finland (left to right) at the PCC General Assembly in Rome. Photo: Bruno Frugis

On 1 July 2015 the presidency of the EU, and thus of the PCC, for the second half of 2015 is being transferred to Luxembourg; the autumn PCC General Assembly is planned in the city of Luxembourg.

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
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	Service Centre of the BKG
DOP	Digital Orthophoto
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
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 Geo-Topography
ZSHH	Central Office for House Coordinates and Building Polygons
ZSS	SA*POS*® Central Office

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