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

National Report

2013 / 2014

AMTLICHES DEUTSCHES VERMESSUNGSWESEN

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2014 / 2015

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Dear Reader,

The Working Committee of the surveying and mapping authorities of the Laender of the Federal Republic of Germany (AdV) coordinates the official surveying and mapping in the federal structure of Germany with the aim to provide a uniform inventory of geospatial reference data and procedures oriented to the needs of the information society as well as uniform services and sales structures consistently oriented towards the customer. The Laender have cooperated with the federal government in partnership in the AdV for decades.

Buzzwords such as digitization, broadband or Open Data are currently on everyone's lips. They are representative of the desire and need to have information available at any place and at any time quickly, reliably and easily. The wide range of geodetic tasks of the official surveying and mapping is therefore consistently aligned to the growing needs of information and knowledge society of the 21st century. The digitization of administrative procedures in the context of e-government and the preparation of transparency, participation and cooperation under the paradigm of the Open Governments increasingly influence the framework of AdV. The best example is the federal E-Government Act of 25 July 2013, according to which future registers based on federal law must incorporate coordinates with reference to addresses and parcels; at the fall meeting of the AdV-plenary, therefore, a geocoding service with high performance, centrally managed by the Federal Agency for Cartography and Geodesy on behalf of Laender, shall be enacted, and will be effective from the beginning of 2015.

A special role is played by the geospatial data infrastructures being established at all levels of government. With the Internet-based provision of geospatial reference data via standardized geodata services, based on a coordinated strategy in the AdV, the surveying and mapping authorities undoubtedly meet a fast-growing social significance of public infrastructure performance. In ensuring this spatial basis functions, the AdV is oriented towards the specific needs of the user.

This activity report is intended to give you an insight into the activities of the AdV. Convince yourself that the official surveying and mapping in Germany – coordinated by the AdV – shall in the future be a reliable partner of politics, business, science, administration and the citizens.

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 authorities of the Laender and the Federal Ministries of the Interior, Defence as well as Transport, Building and Urban Development responsible for official surveying and mapping have been cooperating in the Working Committee of the Surveying and Mapping Agencies of the Laender of the Federal Republic of Germany (AdV) in order to deal with technical issues of fundamental and national importance. The German Geodetic Commission (DGK) as representative of geodetic teaching and research and the Working Committee for Rural Development 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 both technically and methodically, the main area of focus being 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 to create the foundation in the cluster for the infrastructural and spatial planning policy.

The surveying, mapping and geoinformation agencies are split into various departments, the interior department being most frequently represented. Structural changes have taken place in a number of agencies. In certain Laender, the real estate cadastral authorities and in some cases also the regional development/farmland consolidation authorities are being integrated into the higher-level geoinformation authorities. In other Laender, local fields of activity 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®), comprising both terrestrial control points and their documentation as well as the satellite-supported positioning service SA*POS*®,
- The storage of a nationwide image of the earth's surface via 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, in the future all over the Federal Republic using the Official Authoritative Real Estate Cadastre Information System – (ALKIS®) and
- The harmonisation of the data from real estate cadastre and from surveying and mapping.

Federal Agency for Cartography and Geodesy

Bundesamt für Kartographie und Geodäsie

The Federal Agency for Cartography and Geodesy (BKG) is a federal authority responsible to the Federal Ministry of the Interior. The BKG is the central service of the federal government for topographic basic data, cartography and geodetic reference systems. It operates the federal service centre (DLZ) for Geodesy and Geoinformation. Through the DLZ, BKG advises its customers, offers practical solutions and provides a variety of geospatial data, web services and web applications. In cooperation with the Laender, the BKG fulfils the following duties and responsibilities in the field of geodesy and geoinformation:

- 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
    - Services pertaining to surveying and mapping as well as the 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,
- The representation of the interests of the Federal Republic of Germany in the field of geodesy and geoinformation at international level

BKG also coordinates the development and expansion as well as the preservation of the Federal share of spatial data infrastructure for Germany (GDI-DE).

Federal Ministry of Defence
Bundeswehr Geoinformation Service

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

The mission of the BGIS consists in ensuring the military core capability of "Bundeswehr GeoInfo support" on operations and routine duty. With the motto "Geoinformation from a Single-Source Provider", BGIS forces assume responsibility for both availability of quality-assured geospatial and environmental information during operations and for the identification and evaluation of geo factors (e.g. terrain, weather, transport, economy, climate, and water) with a potential impact on the course of action.

In the framework of the transformation of the Bundeswehr, the Bundeswehr Geoinformation Office (BGIO) was converted into the Bundeswehr Geoinformation Centre with effect from 1 October 2013. The tasks have remained nearly unchanged. The BGIC will continue to ensure cross-sectional provision of geospatial and environmental information on foreign crisis regions and mission areas on behalf of the Bundeswehr.

The BGIC serves as the central technical office of the BGIS, which uses an interdisciplinary personnel and process approach involving eighteen geosciences (including but not limited to geodesy, geopolitics/ethnology, geology, remote sensing, meteorology) to develop, elaborate and field the processes of GeoInfo data collection, GeoInfo data management and GeoInfo production that are relevant for GeoInfo support. For the territory of the Federal Republic of Germany, the BGIS closely cooperates with the Federal Agency for Cartography and Geodesy and also derives substantial data and product volumes from the Land Survey organisations in the German Laender.

This ensures that Bundeswehr forces deployed on German territory have the same 1:50 000 and 1:100 000 maps produced in civil-military cooperation as civilian relief or security forces potentially employed in parallel. Along these lines, the aim of the BGIS as to digital geospatial and environmental information is that, for the Federal territory and across Laender borders, standardised and updated geodata models be maintained whose data can be transferred to the Bundeswehr GeoInfo Database and thus be exploited militarily. With the drafting and successive implementation of the AFIS®–ALKIS®–ATKIS® (AAA®) concept of the Working Committee of the Surveying Authorities of the Laender of the Federal Republic of Germany in the period under review, substantial progress has been made in this regard.

Federal Ministry of Transport and Digital Infrastructure (BMVI)

The Federal Ministry of Transport and Digital Infrastructure (BMVI) has been a member of the AdV since 1950, represented by the Geo-coordination agency (Referat LR 01). For the operation and maintenance of the approx. 7 300 km of Germany's inland waterways and approx. 17 800 km² of navigable waters, the BMVI is supervising the Federal Waterways and Shipping Administration (WSV), 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, necessitating close consultation within the AdV. Along its 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 continuance of the ATKIS®-Basis-DLM. In the area of responsibility for Surveying and Geoinformation, the WSV works closely together with other authorities of BMVI: Federal Maritime and Hydrographic Agency (BSH), Federal Institute of Hydrology (BfG) and Federal Institute for IT-services business – Service Centre 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 mostly travelled waters of the world. Marine surveys and cartography provide the requisite 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 prediction services for the water level, tides and waves and drift are available over an internet-based geospatial portal as a maritime component of the GDI-DE.

The Department “Geodesy” of the Federal Institute of Hydrology (BfG) supports the WSV in the task fields Geodetic reference systems, Geokinematik, water measurement, Geotopography and object measurement. For the scientific advice, the special knowledge required in the context of applied research and project execution is available. An intensive cooperation with universities and other research institutions is required in this context.

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

In addition, the BMVI coordinates on behalf of the Federal Government the earth observation program "Copernicus" of the European Union (formerly Global Monitoring for Environment and Security – GMES). Through the implementation of a national "Copernicus program of measures" citizens and companies in Germany shall noticeably benefit from the European earth observation program "Copernicus" in that the resulting potential for a more effective and efficient public service shall be usable. In this context, the derivation of change information for the ATKIS®-Basis-DLM from remote sensing data shall be tested in a pilot project ("DLM-update") under the auspices of the Land Schleswig-Holstein. The question whether the previous manual tracking of ATKIS®-Basis-DLM by a semi-automated method with the aid of satellite remote sensing data and aerial images can be optimized and accelerated should be answered.

Organisation of the AdV

The graphic below (Figure 1) shows how the AdV is organised. Its bodies are the President and the Plenum. The AdV is supported by the working groups, the Task Force PRM and the management.

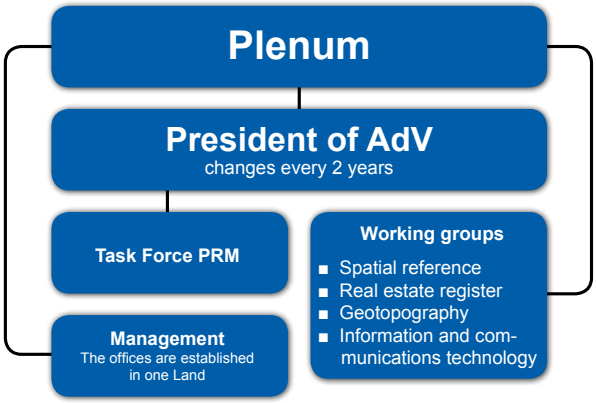

Fig 1: Organisation of the AdV

Objectives, duties and responsibilities of the AdV

The member agencies collaborate in the AdV

- To regulate technical matters of fundamental and national importance to official surveying and mapping in a standardised manner,
- To create a stock of standardised geospatial reference data geared towards meeting the requirements of the information society and
- To provide the infrastructure for geospatial reference data as an important component for modern eGovernment architectures.

In order to achieve these objectives, the AdV fulfils the following duties and responsibilities:

- Creation and coordination of future-oriented joint concepts for the nationwide standardisation of real estate land cadastre, surveying and mapping and the geospatial reference data information system, to meet the needs of politicians, industry and administrative units,
- Assistance with the joint execution of projects of national importance,
- Facilitating and coordinating normalisation and standardisation procedures for the recording and management of geospatial reference data, as well as methods of access and distribution,
- Support for establishing and refining the national and European spatial data infrastructure and the corresponding electronic services,
- Representation and presentation of official surveying and mapping to the outside world,
- Involvement in international technical organisations for encouraging the transfer of expertise,
- Collaboration with dedicated organisations and agencies, as well as geodetic research and teaching institutions,
- Agreement on technical training issues.

Geobasis Steering Committee

The Geobasis Steering Committee, on which all Laender are represented, was established on 8 December 2010 under the Administrative Agreement for cooperation on official surveying and mapping in Germany. The Administrative Agreement aims to continuously improve the operative implementation of the strategies arranged in the AdV and to further optimise cooperation across Germany. The Geobasis Steering Committee is also supposed to ensure that the geospatial reference data are consistently provided to all users in the quality required.

The Geobasis Steering Committee must perform the following tasks to implement the strategic resolutions adopted by the AdV:

- Monitoring and analysis of work and development situations, including compliance with the defined quality benchmarks and standards,
- Analysis of cooperation potentials and devising suggestions as to how they can be realised,
- Facilitation of the collaboration between individual Laender or several Laender,
- Quality review based on AdV standards regarding content and format consistency.

Official surveying and mapping statistics

Land	Inhabitants	Territory area in km²	Land parcels in thousands	Number of authorities		
				Laender authorities (- enterprises)	regional offices	Chartered Surveyors (ÖbVI)
Baden-Wuerttemberg	10.569.111	35.751,36	8.871	1	60	168
Free State of Bavaria	12.519.571	70.550,23	10.699	1	51	—
Berlin	3.375.222	891,70	397	1	12	50
Brandenburg	2.449.511	29.485,63	3.108	1	17	149
Free Hanseatic City of Bremen	654.774	419,24	206	1	1	6
Free and Hanseatic City of Hamburg	1.734.272	755,30	250	1	—	8
Hesse	6.016.481	21.114,93	4.982	1	7	83
Mecklenburg-Western Pomerania	1.600.327	23.210,55	1.906	1	7	71
Lower Saxony	7.778.995	47.613,78	6.150	1	—	102
North Rhine-Westphalia	17.554.329	34.109,70	9.251	1	53	440
Rhineland-Palatinate	3.990.278	19.854,10	6.341	1	6	83
Saarland	994.287	2.568,70	1.288	1	—	11
Free State of Saxony	4.050.204	18.420,01	2.692	1	13	106
Saxony-Anhalt	2.259.393	20.450,64	2.657	1	—	54
Schleswig-Holstein	2.806.531	15.799,61	1.880	1	—	43
Free State of Thuringia	2.170.460	16.172,46	3.113	1	—	69
Total for Germany	80.523.746	357.167,94	63.791	16	227	1.443

Tab. 1: Statistics:

Population and land area as of 2012-12-31, results based on the 2011 Census

Area in Rhineland-Palatinate: including the area "Joint German-Luxembourgian territory" of 6.20 km². Differences in area are possible due to rounding of figures. Source: Federal Statistical Office, Status 2012-12-31.

2. Spatial reference

The global reference systems and the national geodetic spatial reference have a close mathematical correlation and cannot therefore be considered independently. This is particularly evident in the modern measuring systems – in particular the global navigation systems. Changes in the system parameters directly affect the measurement results and must therefore be considered. The continuation of realization of the international reference system (currently, the ITRF2008 is used) to a new era results in systematic changes of the satellite orbit data and the coordinates of the global reference stations, which has impact up to the SA*POS*®-scope. 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 responsibility.

Connection to the global reference systems

One of the core tasks of the BKG is participation in bilateral and multilateral work on the creation and maintenance of global geodetic reference systems and networks and the development of measurement and observation technologies applied for this purpose. With this the BKG contributes to national, European and international services. With the expertise gained the BKG can contribute in committees for developing technologies and influence the results according to national interests. The focus is on the services for

- Very Long Baseline Interferometry (VLBI – radio interferometric measurements of quasars)
- Satellite Laser Ranging (SLR – distance measurements to satellites)
- Global Navigation Satellite Systems (GNSS – Observations on the satellite navigation systems GPS, GLONASS and Galileo)

and the central office of the International Earth Rotation and Reference System Service (IERS) and the gravimetric working groups (including height requirements).

The requirements for accuracy and long term stability of reference systems have increased significantly in the last ten years. A significant driver in this context is the need to capture the phenomenon of climate change and to make results available on a secured basis. One aspect is the monitoring of sea-level rise. This is globally considered at only 3 mm per year, the realization accuracy of the reference systems, however, at about 10 mm.

The Global Geodetic Observing System (GGOS) was established in 2007 as a permanent monitoring system of the International Association of Geodesy (IAG). GGOS is closely linked with the services of the IAG and significantly supports the establishment of a global infrastructure for geo-referencing. The geo-referencing and the spatial reference of a geographic information is to be understood not only as a geometrical problem, but requires for the modelling of geo-processes (such as climate, environment, sea level changes, earth surface deformations) also the knowledge of the essential physical components of the gravity field and the rotational behaviour of the earth. With the help of GGOS initiative, the conditions should be created to define the reference systems with an accuracy of about 1 mm and a stability of 0,1 mm per year in future.

As a contribution of the Federal Republic of Germany to the international geodetic reference systems, BKG operates the Geodetic Observatory (GO) Wettzell together with the research institution Satellite Geodesy of the Technical University of Munich. This observatory is equipped with all major measurement methods of geodetic spatial techniques and makes observations in the field of SLR, VLBI, GNSS, and necessary additions from local sensors in accordance with the internationally coordinated services. A precision gravity laboratory realizes the absolute gravity reference for Germany and provides the necessary conditions for integration into the international metrological standards. This gravity laboratory is also part of a global network of reference stations and thus forms an important basis for projects such as the GGOS or for research on global climate change. In addition to this, the following measurements are carried out:

- Time and frequency measurements for the provision of the time scale and reference frequencies,
- Measurements using superconductive gravimeters for the recording of local gravity variations,
- Determinations of the variation in earth's rotation using large ring lasers.

On 26 April 2013 the Federal Agency for Cartography and Geodesy opened the new TWIN radio telescopes of the Geodetic Observatory Wettzell. After five years of construction, the test operation could start. These new radio telescopes meet the GGOS- or VLBI2010 requirements. The Geodetic Observatory Wettzell is a technology pioneer in this field. The TWIN-Telescope-pair represents the world's first implementation of such telescopes. The new telescopes have greater movement speed of the antenna compared to the older radio telescope Wettzell (RTW). This allows more data to be collected in an equal period of time, as more radio sources can be approached.

This advantage of the VLBI2010-compliant telescopes comes, however, by antennas with a smaller aperture (diameter of the antenna). This is offset by the recording of broadband signals.

To improve the global reference networks, BKG is also participant in the Transportable Integrated Geodetic Observatory (TIGO) and in the German Antarctic Receiving Station (GARS) O'Higgins on the Antarctic Peninsula.

In addition to operation and further development of these geodetic observation techniques BKG also operates analysis, combination and data centres, thereby supporting the use and provision of geodetic data and products:

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

The VLBI data of all available 24-hour observation periods since 1984 are analysed at the BKG and station positions, earth orientation parameters (polar coordinates, the difference between UT1 and the coordinated global time UTC, Nutation), troposphere parameters and coordinates of the radio sources determined.

The one-hour Intensive VLBI periods that are used for daily determination of the difference between UT1 and the International Atomic Time (TAI) are also evaluated at the BKG. From all available Intensive sections since 1999 a time series UT1-TAI with daily resolution occurs, which is constantly maintained and updated. The IVS Combination Centre is operated at the BKG with the support of German Geodetic Research Institute (DGFI) and the University of Bonn. The contributions of all IVS analysis centres are combined to form the official product of the IVS. This results in time series of earth orientation parameters and station positions. In addition, a VLBI reference frame is calculated every three months, which includes station coordinates and velocities.

As part of the ILRS analysis centre, the SLR observations to the LAGEOS- and Etalon satellites of the last seven days are analysed and therefrom station positions, earth rotation parameters (polar coordinates, day length) and satellite orbits determined.

The central office of IERS was established in the BKG in 2001. Tasks include, inter alia, the creation of the IERS annual reports, the protocols of the meetings of the IERS Directing Board (twice per year) and update of IERS sites. The associated data management system and address data management system has been constantly maintained and renewed.

The observation stations and analysis centres of the BKG are part of the global activities for the application of the spatial techniques for geodesy, geography, navigation, space flight and chronometry. In carrying out these activities, the BKG is contributing to the global reference systems which provide the basis for both the European and national position, height and gravity reference systems.

The GREF stations (GREF – Integrated Geodetic Reference Network of Germany) of the BKG are evaluated in various networks, inter alia, jointly in a subnet comprising 125 stations of the European Reference Network EPN and as part of SA*POS*® reference frame under the name DREF-Online (project SA*POS*® coordinate monitoring). The GNSS observation data is analysed daily by post processing using Version 5.2 of the Bernese analysis software. The networks are calculated daily in consideration of the precise satellite orbit and satellite clock data of the International GNSS Service (IGS) and the centre for satellite orbit determination in Europe (CODE) and daily calculated and every seven days summarised to form a weekly solution.

Gravity field modelling

A sub project within the scope of the work for renewal and modernisation of the German main height network (DHHN) is the calculation of a new model of the height reference surface of Germany (AdV-Quasigeoid). The new quasigeoid model will match with the other results of the DHHN-renewal and should be adopted at the same time with these in the authoritative spatial reference. To further improve and update the gravimetric data base for this model, extensive work is being carried out by the Laender and the BKG. Example of this are extensive gravity measurements in the Laender of North Rhine-Westphalia (see Figure 2), Hesse, Bavaria and Saxony. Also in Baden-Württemberg a significantly more extensive gravimetric data base compared to the German Combined Quasigeoid 2011 is ready.

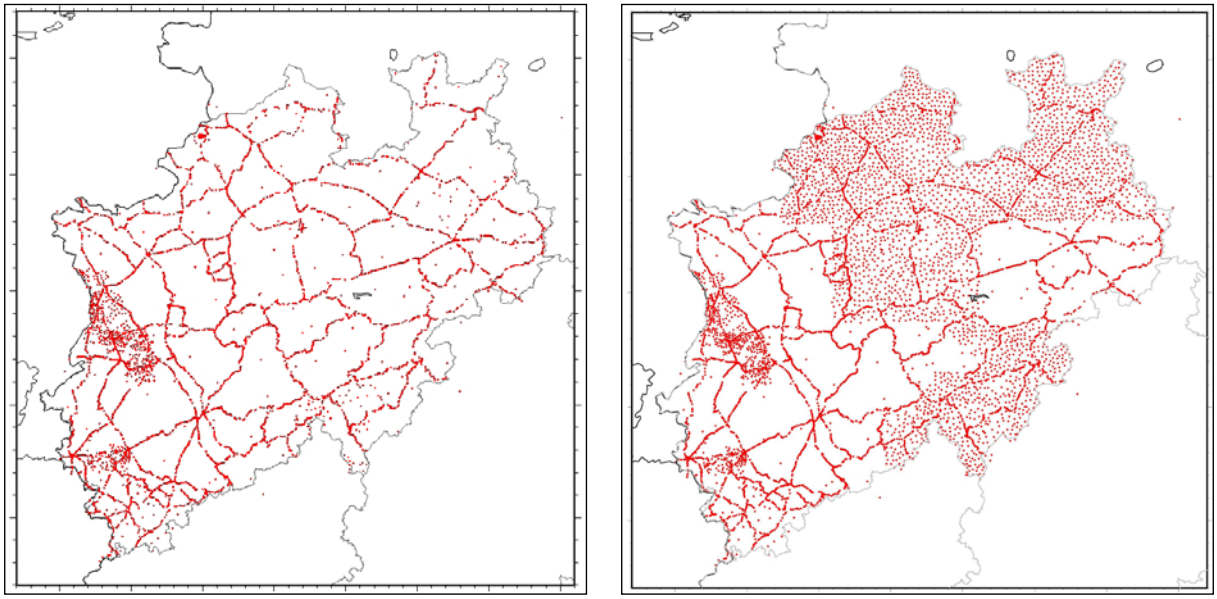

Fig 2: Gravity data of North Rhine-Westphalia 2007 (left) and 2014 (right, intermediate level)

Areas of the Baltic Sea, Greifswald Bodden and the Oderhaff and Stettiner Haff were measured gravimetrically in June 2013 (Figure 3). The measurements were performed in a collaboration between the Federal Agency for Cartography and Geodesy, the Federal Maritime and Hydrographic Agency (BSH, provision of surveying, Wracksuch- and research vessel Capella) with the Helmholtz Centre, Potsdam, of the GeoForschungs Zentrum (GFZ, providing the gravimeter and evaluation of the measurements). The project was supported by the Polish Geological Institute (PGI) in Warsaw. A total of 1 500 kilometres of profiles were run on 10 measurement days. The evaluation of the results is not yet complete.

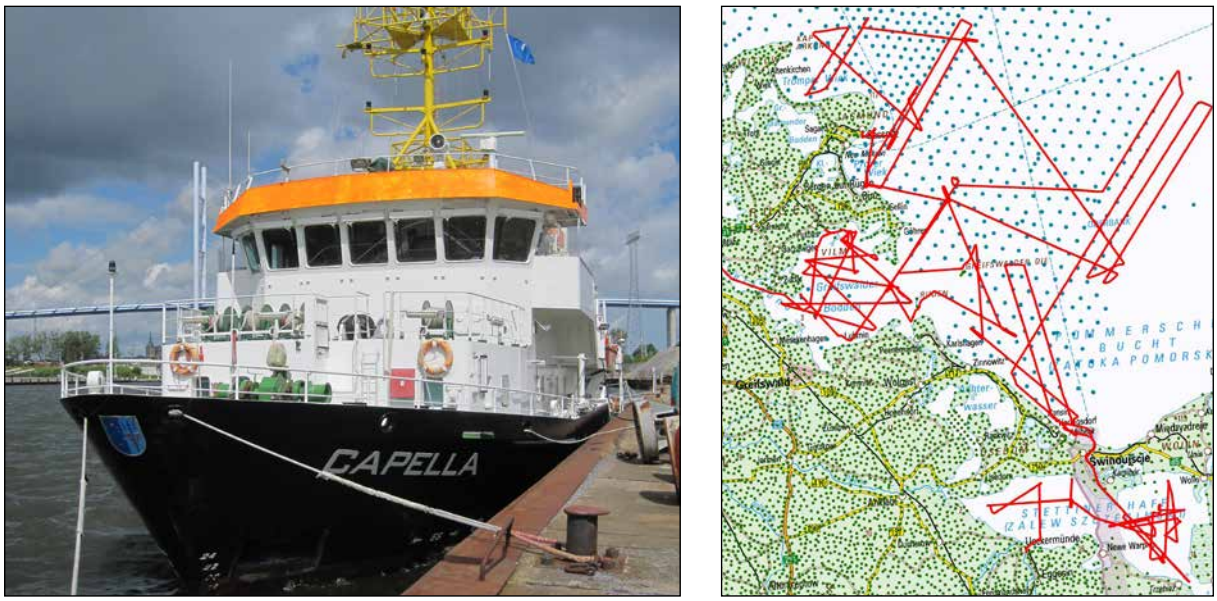

Fig 3: Survey vessel "Capella" of BSH (left); mileage measurement lines (red lines on the right)

The gravimetric measurements contribute significantly to a more reliable determination of the height reference surface of Germany and thus improve the possibility and accuracy of GNSS-based height determination in the official height reference system.

National geodetic spatial reference; renewal of the DHHN

After completion of the extensive field work in the years 2006 to 2012, in which a hundred of the 250 GNSS points were determined with absolute gravity measurements, nearly 30 000 km precision levelling on most of the lines of the German main height network 1992 (DHHN92) could be repeated.

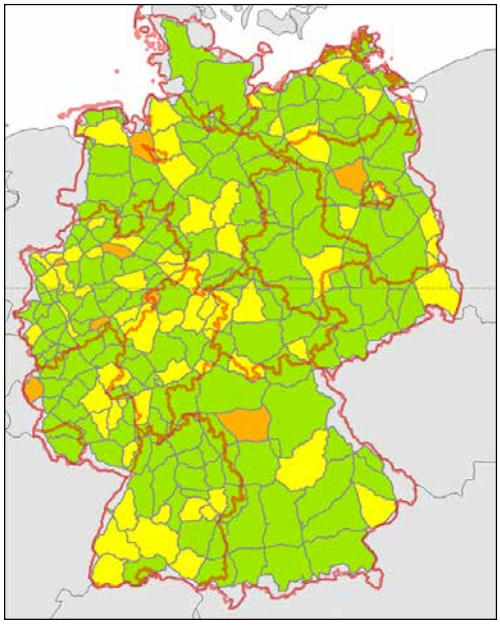

Fig 4: Quality of Levelling network 2006–2012, according to the loop closure error. Status: December 2013

If one calculates the miss-closure of all measured levelling loops of many quality parameter of a levelling network and divides the values which are below the allowable a priori accuracy amount by three, one obtains a statement about the quality of the measured network. Figure 4 shows that the largest part (72 % - green) of all loops of the levelling network 2006–2012 are in the first third, a quarter of all loops in the second third (25 % - yellow) and the predominantly smallest proportion with 3 % of all loops (orange) in the last third of the quality guideline. These studies confirm that the total measurements – also in other geodetic measurement techniques – show very high accuracies and consistencies.

Based on the interim results, which were achieved in the year under review, the AdV has decided in 2013 to concurrently introduce the results of DHHN renovation project for all methods of measurement and other products. This includes not only the results of levelling, of the GNSS measurements and of the absolute gravity measurements, and also the provision of a novel AdV-quasigeoid and a Germany-wide transformation module to ensure the transition between the DHHN92 and the new vertical reference frame. Thus, the AdV is up to the task to provide all the results promptly and uniformly nationwide by fulfilling professional demand and user-side requirements.

Satellite geodetic developments in the working group spatial reference

With further expansion of GNSS systems (GPS, GLONASS, Galileo, Compass / Beidou / BDA) the conditions for the Satellite Positioning Service of German national survey (SA*POS*®)are increasingly changing. Significant technical enhancements affect the SA*POS*® data formats (RTCM and RINEX), due to the significant increase in satellites and new frequencies, the data communication with a trend for satellite communication and the increased importance of global reference systems and their realizations. In all developments, the working group is actively involved in spatial reference.

In 2013, the AK spatial reference of the Geodetic Post-processing Positioning Service (GPPS) of SA*POS*® was extended by the introduction of an online calculation service with the name “GPPS-PrO” by a new GPPS service level. The users can, in areas without cell phones, perform the calculations of individual items on the basis of RINEX data without proprietary software. This process is successively being established in the German Laender.

A new SA*POS*® product definition was developed in 2013 by the project group SA*POS*® quality management (retrievable under **www.adv-online.de**). It is the AdV-standard of the product SA*POS*® in the German Laender and is implemented by the operators of the service. The contents of product definition form the basis of the annual inventory of the technical design of the service. This standard was not only coordinated within the SA*POS*® operator community in advance, but in a comprehensive process also with renowned companies providing the SA*POS*® operation and its users with essential software and hardware blocks. It is this coordination with industry, ensuring a user- and future-oriented shaping, that contributes significantly to the acceptance of SA*POS*®.

The SA*POS*® quality management was further consolidated and developed in the reporting year. In addition to data collection and their processing, the statistical information of the operator community derived therefrom are used for internal controlling. A commonly available quality report available under **www.adv-online.de** is offered for download. The SA*POS*® quality management includes not only a multipath index of the reference stations to be updated annually also permanent coordinate monitoring that allows the statements to be made about the horizontal and vertical stability of the SA*POS*® stations (see Figure 5) and also allows information about potential soil movements. Further information will be provided on different data availability to afford the operators holistic quality information – even in discussion with our users.

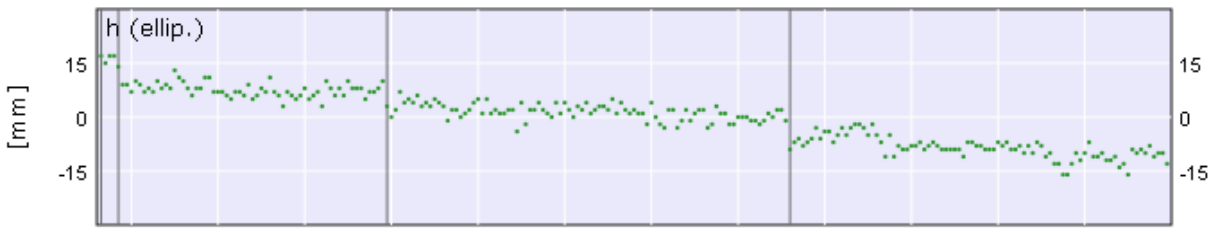

Fig 5: Vertical Trend of a SA*POS*® *reference station in the form of a sink*

For further development of the SA*POS*® service, activities on the method for absolute position determination "Precise Point Positioning (PPP)" were further investigated during the reported year. This refers to the computation of precise absolute station coordinates of a single point. The basic method has been used in the past in regional network calculation with GNSS data in post processing with certain evaluation approaches called parameter estimation. The new process applications relate to the global data networks that are used for the calculation of satellite orbits and satellite clock parameters. If one provides the user with path and clock parameters (e.g. via the Internet), today already a global decimetre positioning under an hour is achievable, without further correction data having to be used. For real-time application in high-precision application (e.g., real estate cadastre or surveying engineering) the atmospheric errors (ionosphere and troposphere) have yet to be modelled. This can be derived exclusively from regional networks such as the SA*POS*® network.

Figure 6 includes the current and future methods of high-precision satellite-based positioning methods. The lower portion (green) shows the current situation of high precision SA*POS*® application in which data of the reference stations in the network headquarters are collected, processed (ambiguity resolution) and differential correction data are provided.

The user positions with respect to the nearest reference station (observation room). In the upper part the PPP process is seen as it is implemented today in the first prototype applications. The target model is shown in dashes, in which data from global and regional networks can be used together in PPP Real Time Kinematic approaches (PPP-RTK). The main novelty will be that users no longer connect to an individual station, but use parameters of a globally and a regionally compressed model (state space).

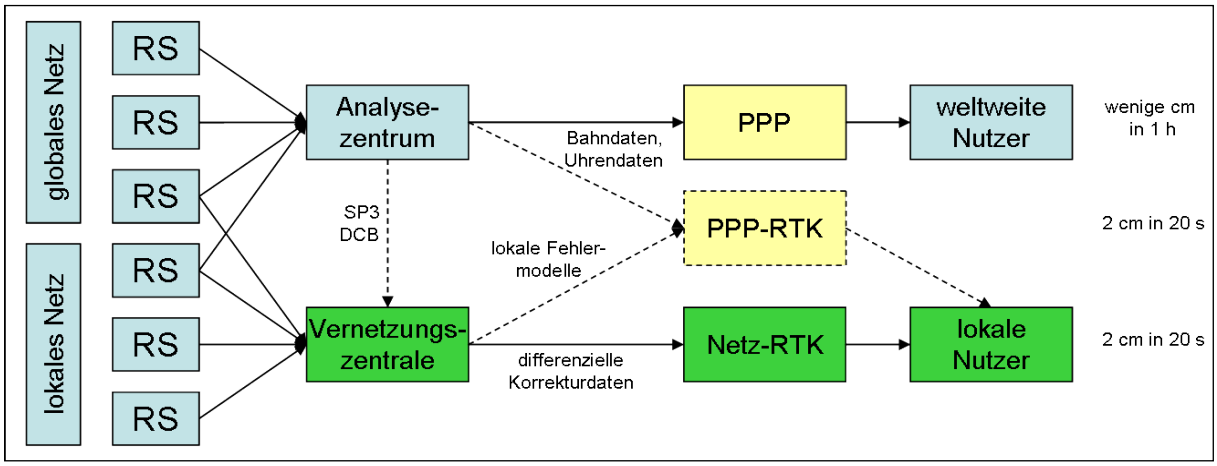

Fig 6: Current and future PPP applications

3. Real estate cadastre, land valuation

The ALKIS® introduction in the 16 German Laender is nearing completion. All German Laender are expected to have converted to ALKIS® by 2015.

In order to be able to provide users with uniform ALKIS® data via web services across Laender, the working group real estate cadastre in addition to the product specification for an ALKIS®-WMS (Web Map Service) has now compiled specifications for an ALKIS®-WFS (Web Feature Service) and ALKIS®-Shape-Data.

The official area statistics has among others the task to document the annual development of housing and transport in the context of the national sustainable development strategy, and makes actual use of the information provided by the real estate cadastre. The statistical authorities have so far a great interest in ensuring that rules for the collection and proof of actual use are uniform nationwide. The working group will draw up a medium to long-term concept. AdV looks forward to findings on the one hand from the working group Harmonization ALKIS®-ATKIS®, on the other hand, from two studies assigned by the Federal Institute of Building, Urban Affairs and Spatial Development and deal with the issue of official area statistics.

The operational implementation of the AdV-technical concept "ALKIS® output product for the official area statistics" can only take place with the introduction of GeoInfoDok 7. A transitional solution was conceived under the framework conditions of GeoInfoDok 6 (see page 25), which is applied after the nationwide introduction of ALKIS®.

The working group accompanies with a project group legislation proposals through which the interests of the official surveying and geoinformation, especially the real estate cadastre, are affected. Thus, for example, the measurement and calibration law of the federal government was adopted on 25 July 2013.

As a result, the measurement and calibration regulation is currently being adapted. The concern formulated by the working group that the Measurement and Calibration Act and the relevant regulation shall not apply to public surveying because the fact that instruments used should already be checked and calibrated regularly, under the

regulations of Laender law, was fully recognized in the current draft of the regulation. Other examples of legislative procedures, which were accompanied by the working group, are the law imposing a database of land register, the Judicial Compensation Act, the third decree implementing the law on the protection from aircraft noise, guidelines for Real Estate Valuation Ordinance and the implementation of the EU PSI Directive in national law.

ALKIS® introduction

The AdV-member organisation of Thuringia completed the migration in March 2014, so that ALKIS® has now been introduced in nine German Laender (Figure 7). Saxony-Anhalt has started the migration and will complete it in the current year. The introduction of ALKIS® in Berlin, Bremen, Mecklenburg-Vorpommern and Saarland is likewise scheduled for 2014. Bavaria and Saxony will follow in 2015, whereby migration has already begun in the two Laender.

The website **www.adv-online.de** provides information about the state of deployment of ALKIS® together with an overview of the state of AAA® migration in the Laender.

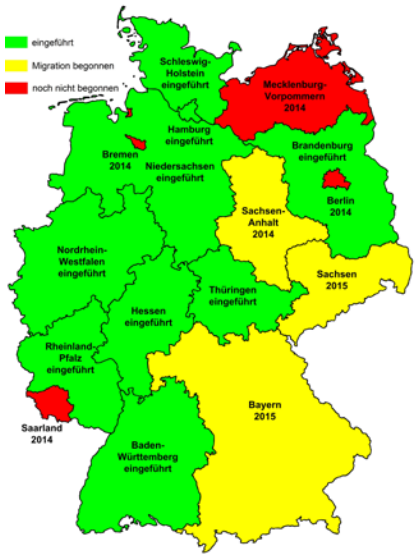

Fig 7: ALKIS® introduction by March 2014

ALKIS® geodata services

In the working group real estate cadastre product specifications have been developed on geodata services and adopted in the AdV-plenary. It was recommended to the Laender to establish an ALKIS® geodata service according to the product specification AdV-ALKIS®-WFS and to deliver ALKIS® geodata as needed according to the product specification AdV-ALKIS® shape. The extrapolation of these product specifications is adopted as the permanent task by the working group real estate cadastre; they must be guaranteed, since technical conditions and relevant standards are subject to constant changes.

The AdV-ALKIS®-WFS specification is based on professional and technical conditions of the target groups. Low professional and technical hurdles shall help the users to get started. The AdV-ALKIS®-WFS is a service for flexible display of property information on web technologies; thus, paves the way for a federal level output of ALKIS® data via WFS services.

For users who mainly use standard GIS, the data format Shape gains importance as complementary to standard-based exchange interface (NAS), both for conventional and for a services-based output of geodata. Shape is a simple-structured data format. It differs from the data structure of the AAA® model. But here, too, the goal is to promote uniform data output at federal level with the product specification AdV-ALKIS® shape.

The INSPIRE product specifications for ALKIS® and ATKIS® services are currently being dealt with in the AdV.

Official area statistics

In the transnational unification of the rules for collection and proof of actual (TN) collection lower limits, update cycles and collection methods are in focus. Therefore, currently the AdV working group "Harmonisation of ALKIS®ATKIS®" deals with this issue, especially with the possibility to combine collection methods and to standardise collection criteria. The goal of all efforts is to accomplish redundancy-free collection and proof of actual use beyond ALKIS® and ATKIS® and, for example, to create a harmonised TN data record. This is to be fed from both highly accurate orthophotos and from event-related real estate surveying and shall take the utmost account of the needs of all users, especially those of official area statistics.

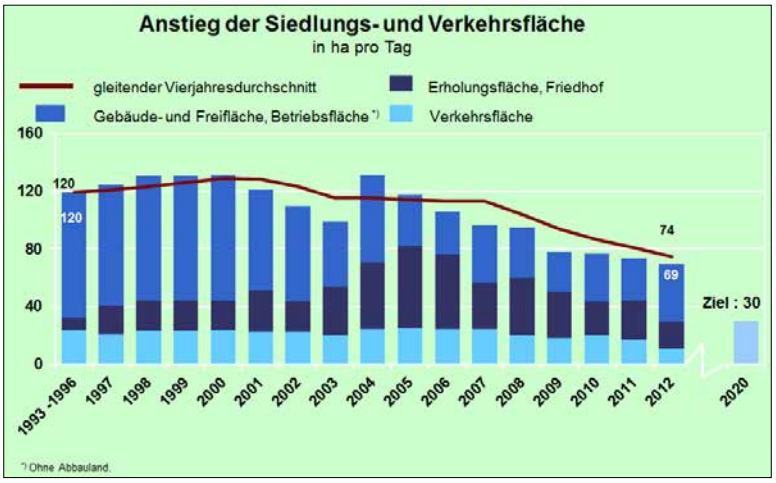

Fig 8: Increase in housing and transport area (Source: Federal Statistics Office 2013)

The AdV looks forward to further findings also from the Federal Institute for Building, Urban Affairs and Spatial Development (BBSR) awarded "Study on Monitoring of Land Use – evaluation of relevant data basis", the term of which is planned from July 2013 to July 2015. The performance of different data records, in particular ALKIS® and ATKIS® for observing the housing and transport development shall be put to the test. In the study, the sources should be identified and proposals for optimisation of monitoring put to the test. The aim is to ensure a robust, nationwide uniform data base for monitoring the evolution of housing and transport on the basis of the official land use survey. The contractor shall perform in close consultation with the AdV. Another BBSR study was presented

on the topic “Implementation of an internal development potential-surface elevation in the official area statistics”. Another BBSR study was presented on the topic "Implementation of an internal development potential area survey in the official area statistics”. Also this study is accompanied by the AdV.

ALKIS® output product for the official area statistics

The statistics authorities receive geospatial reference data for the official area statistics about the area according to the type of actual use from the real estate cadastre. The current procedure shall be replaced no later than the 31st December 2015 with the land use after a nationwide ALKIS® introduction by a new composite program that adapts to the rules of “AdV technical concept for the realisation of an ALKIS® output product for the official area statistics”.

The operational implementation of the AdV-business concept in the real estate cadastre will only take place with the introduction of GeoInfoDok 7 in the Laender. This has the consequence that the Cadastral and Surveying Authorities cannot yet operate the output format (CSV) described in the technical concept and agreed with the statistics by 31st December 2015.

Against this background, the working group real estate cadastre has decided to implement the technical concept after the nationwide ALKIS®-introduction under the conditions of GeoInfoDok 6 as an interim solution until the introduction of GeoInfoDok 7. Associated with this, minor limitations in the data content are considered acceptable by the Federal Statistics Office. As the previous solutions, also the new composite program will include routines for checking the plausibility of the area information provided by the surveying and mapping authorities.

4. Geotopography

Using the Authoritative Topographic Cartographic Information System (ATKIS®), the surveying and mapping authorities of the Laender are managing landscape-describing geospatial reference data in the Digital Landscape Models, Digital Terrain Models, Digital Topographic Maps and Digital Orthophotos product groups. The individual products in these product groups are kept current with regular updates. For key topographic objects in the digital landscape models, the updates take no more than a few months. After the migration of ATKIS® was completed nationwide in the AFIS®-ALKIS®-ATKIS® data model, the main tasks in the reporting period involved the introduction of AAA® processing in cartography and construction of databases in the field of 3D building models.

Digital Landscape Models

One of the key tasks of the surveying and mapping agencies for geotopography is to manage and update the digital basic landscape model (Basis-DLM) as the basis for establishing various technical 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 Basis-DLM database takes place under different update periods. These cover the period from the emergence of change in landscape up to the release of updated database. A distinction is made between a peak update of three, six or twelve months for most important object types for the customers and/or attributes and basic update of the entire database within at least a five-year period during which the Basis-DLM is checked and continued in case of changes. Taking the example of the motorway junction Erfurt (A4/A71), Figure 9 shows a visualized Basis-DLM in the course of the survey and qualification process.

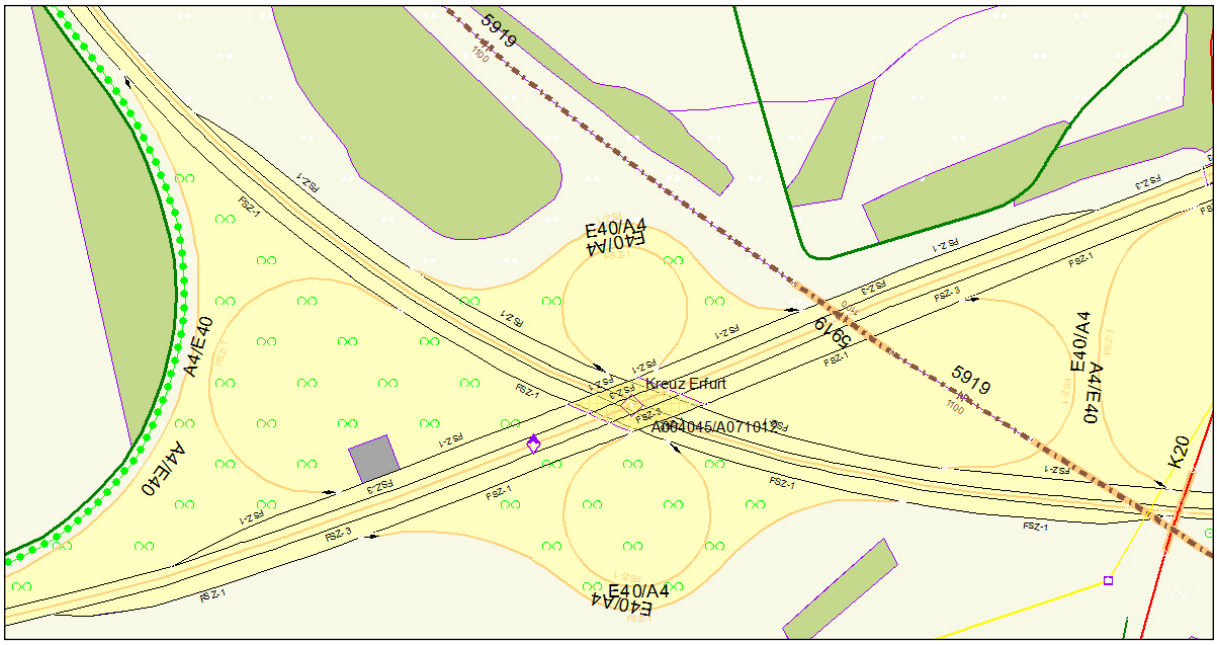

Fig 9: Junction Erfurt as visualized Basis-DLM in the survey and qualification process

With the joint project “ATKIS®-Generalisation” the conditions were created to derive the DLM50 full-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 Basic 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 tough user requirements for up-to-date information and 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 widely available and updated on an annual basis. The content is being continuously expanded to create the EuroGeographics products EuroRegionalMap (1:250 000) and EuroGlobalMap (1:1000 000) and also to link technical data and for reporting at 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 updating of the joint AFIS®-ALKIS®-ATKIS®-data model thus improves harmonisation of the data in the real estate cadastre and in geotopography, so that data is captured only once and can then be provided for as many products as possible.

Requirements resulting from the European projects Copernicus (see page 40) and CORINE Land Cover (CLC) and INSPIRE for the geotopographic reference data of Germany, will be able to be met with the adoption of

Version 7.0 of the “Documentation for the modelling of geoinformation through official surveying and mapping (GeoInfoDok)”.

The migration to the AFIS®-ALKIS®-ATKIS®-data model is completed in the Laender. A first national database of the Basis-DLM in this data model is available since mid 2013.

Digital elevation models

In addition to the position-describing digital landscape models, the surveying and mapping authorities are managing, to represent height as the third dimension, digital terrain models (DGM) with varying levels of accuracy. These models will be available to administration and businesses as part of the geotopographical core data for establishing Geographic Information Systems (GIS). Digital elevation models are digital, numerical, models of the terrain heights and shapes of the earth's surface reduced to a regular grid. DGM can also include additional information (e.g. edges, or terrain skeleton lines or distinctive terrain points). They do not contain 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 width. DGM of larger grid size are derived automatically from the DGM with the least available grid width. For the ATKIS® technical concept, the object type catalogue DGM is available in GeoInfoDok.

Currently, national DGM databases with a grid width of 10 m (DGM10), 25 m (DGM25), 50 m (DGM50), 200 m (DGM200) and 1 000 m (DGM1000) can be provided. The data quality is documented in the ATKIS® product standard for digital terrain models. For the DGM10, this envisages a terrain type-dependent height accuracy of the grid points of ± 0,60 m to 2,10 m with a confidence level of 95 % (2 σ).

In the period under review, the set-up, completion or continuation of high-accuracy DGM with grid widths of 5 m (DGM5), 2 m (DGM2) or even 1 m (DGM1) are being further operated in almost all the German Laender. DGM5 data will be available nationwide in the course of 2014. The geodata centre at the BKG offers the DGM to customers jointly with the Laender.

In the surveying and mapping agencies, digital surface models (DOM) are created in addition to DGM. DOM are digital, numerical models of the heights and shapes of the earth's surface including buildings and vegetation, reduced to a regular grid. As with the DGM also the DOM are structured according to their grid spacing and DOM of larger grid spacing are automatically derived from the DOM with the lowest available grid width using new interpolation.

DOM are based on the method employed by airborne laser scanning or digital image matching. An increasing demand for these DOM among users is being observed. The digital quality can be documented using the ATKIS®-standard for digital surface models.

3D building models

The surveying and mapping authorities offer the 3D building models since 2013. The data is collected on the basis of AdV-product standards for 3D building models and the data format description in the AdV-CityGML Version 1.0. Nationwide 3D building models a first detail stage are created with the Level of Detail 1 (LoD1).

Here all buildings and structures are provided with flat roof ("block model"). The completion of the comprehensive initial collection of 3D building models in LoD1 is expected essentially at the end of 2014.

The central office for coordinates and building polygons (ZSHH) is providing these data to users across Laender. Figures 10 and 11 show an example comparing the database for the city of Würzburg (View of the Fortress Marienberg) in LoD1 and LoD2. Furthermore, the AAA®-model was extended by the 3D building and 3D structures. These are components of the GeoInfoDok 7.0.

Fig 10: 3D building model in the level of Detail 1 (LoD1), city of Würzburg

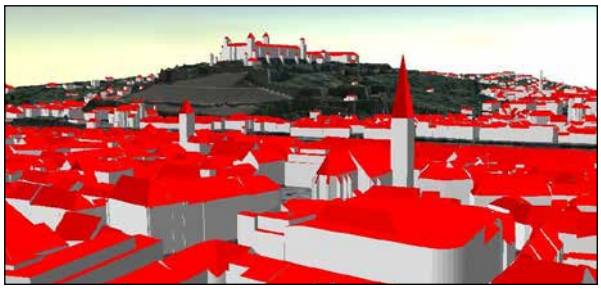

Fig 11: 3D building model in the level of Detail 2 (LoD2), city of Würzburg

Digital Topographic Maps

Based on the digital landscape and terrain models the surveying authorities create the topographic maps in modern map graphics. This is documented in the ATKIS® signatures catalogues as part of the GeoInfoDok of the AFIS®-ALKIS®-ATKIS® project. Digital topographic maps (ATKIS®-DTK) are already available in numerous Laender. The DTK1000 published by the BKG is also available.

For the DTK50 and DTK100, the surveying and mapping agencies have agreed with the Federal Ministry of Defence that these will be managed and published as joint civilian/military map series. Already, since the end of 2012, the DTK100 is nationwide for the Federal Republic of Germany available in a standardised format. In 2013, the previous DTK200-V was last updated by BKG; from 2014 the DTK250 derived from DLM250 with automation-assistance will first be provided as sheet-line-free web service, later also per map sheet.

Procedures for a largely automated cartographic generalisation of various map series are available and in use increasingly in more German Laender. These procedures enable a much more efficient derivation from digital landscape and terrain models.

So far as DTK is not yet created on the basis of ATKIS® signature catalogues, the Laender will continue the conventional topographic map series to the extent required and keep them ready in printed form and as grid data records. The proportion of these preliminary DTK has decreased further during the reported period. To meet customer requirements, the possibilities of web-based presentations will increasingly continue to be used.

ATKIS® geodata services

Based on the knowledge of necessary harmonisation also in the provision of geospatial reference data via web technologies and building on the web profiles for representation and download services created technically neutral by the AdV in the area of geotopography, in a similar manner to developments in the real estate cadastre, designs for product specifications on ATKIS®-DLM-WMTS (Web Map Tile Service), ATKIS®-DLM-WMS (Web Map Service) and ATKIS®-DLM-WFS (Web Feature Service) have been created. These designs can already be applied by member administrations during the implementation of their own services in order to avoid differing developments, but a formal decision will be taken only in the fall 2014.

WebAtlasDE

The need for official map services among various kinds of user has risen dramatically in recent years. In addition to good performance, “continuous” zooming, high availability, provision in the Viewer and as a service, font and signature adjustment at every scale level, a simple, standardised map style and a provision throughout Germany and across the Laender are expected.

DLM and DTK were unable to fully meet these requirements. Based on the activities of some member administrations, in 2012 a common web-based map service was implemented by the Federal government and the Laender under the name “WebAtlasDE” which was already been linked in the Federal and Laender geoportals. From the digital landscape models, grid map tiles of various scales are created and provisioned via a Web Map Tile Service (WMTS) with good performance and high reliability. In particular, the complete representation of all buildings available in the real estate cadastre, including their house numbers and periodic comprehensive update of geotopographic data similar to the DLM updating are unique features of the WebAtlasDE. The service was linked, for example, in the homepage of adv-online.de and can be accessed there. In order to maintain the high quality of this service in the future and/or even improve it, the steering committee Geobasis has identified measures for comprehensive quality assurance and initiated their implementation.

Digital Orthophotos

The surveying and mapping agencies of the German Laender periodically commission aerial imagery flights in order to provide the latest aerial photographs to external customers, and also for internal use for updating 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) therefore completes the ATKIS® concept in this manner. Thanks to the image-based documentation of the landscape, DOPs are suitable for observation-based applications. DOS with a ground resolution of 20 cm (DOP20) and in colour are available throughout Germany. Individual German Laender already provide DOP10.

Because the results of aerial photography are crucial to the real-time updating of the geo-topographical core data of ATKIS® the high resolution DOP20 is subject to an updating cycle of no more than three years. The specification for the product standard and the technical rules and regulations for DOP data exchange effectively meet the requirements for pooling the data of the Laender at the geodata centre of the BKG. The BKG offers DOP with the Laender and visualises them jointly in a DOP viewer available online.

The DOP20 is now a standard product for practically all technical applications with a spatial reference inside and outside the surveying and mapping authorities. The introduction of digital aerial survey camera systems

poses new requirements to the surveying and mapping authorities, while offering new opportunities. The high efficiency of multichannel acquisition permits the simultaneous use of black/white, colour and infra-red aerial photograph data. The addition of the infrared channel meets the criterion for pooling the requirements ensuing from the surveying and mapping, forestry and environmental authorities into the aerial photography flight projects of the Laender.

As well as questions regarding the quality requirements for digital photography flights, data transmission and analysis, the surveying and mapping agencies are focussing on the problems of long-term data security and history management, as series of aerial photographs are becoming an indispensable tool for the work of more and more users. The data security of aerial photograph databases should therefore also meet consistent minimum standards in the future. Through this long-term preservation of historical aerial images in digital databases, the member administrations of the AdV offer a set of data that meets the customer requirements in time series in particular way.

The digital aerial photographs as the basis for deriving ATKIS®-DOP are increasingly provided as oriented aerial images by the surveying and mapping authorities to specialist users. Oriented aerial photographs are aerial photographs that contain all the parameters required for stereoscopic analysis. Rapid IT developments and the cost-efficient provision of user software is making stereoscopic aerial photograph analysis and presentation an affordable option for users. The high data quality combined with the various information in the digital aerial imagery also offers the possibility of image-based classification. In perspective, the aim is to identify change information of various kinds in an automated manner and make it usable in the topographical information systems. First methods in this case are in a trial.

Toponymy

In collaboration with the permanent committee for geographic names (StAGN), the BKG provides a standardised (gazetteer) service which provides the toponymy (GN-DE) from the vector data of the DLM250, VG250 and GN250 products. GN250 (Geographic name 1:250000) is available in a classification of names corresponding to the object types ATKIS® in the AFIS®-ALKIS®-ATKIS®-data model. The database comprises around 134000 entries of geographic names, including local authorities, local authority sections, landscapes, mountain ranges, mountains, islands, rivers, canals, lakes and oceans. 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 of the BKG.

5. Information and Communications Technology

Information and communications technology forms the technical interface between activities in the fields of spatial reference, real estate cadastre and geotopography. It helps to establish the spatial data infrastructure (GDI) based on official geospatial reference data using networks and geoservices. 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 information technology coordination of the GDI activities for the AdV at national level.

AAA® model

With its work on the AAA® model, the AdV designed an integrated and harmonised modelling of all geospatial reference data of the surveying and mapping authorities – split into Base schema and a common tech-

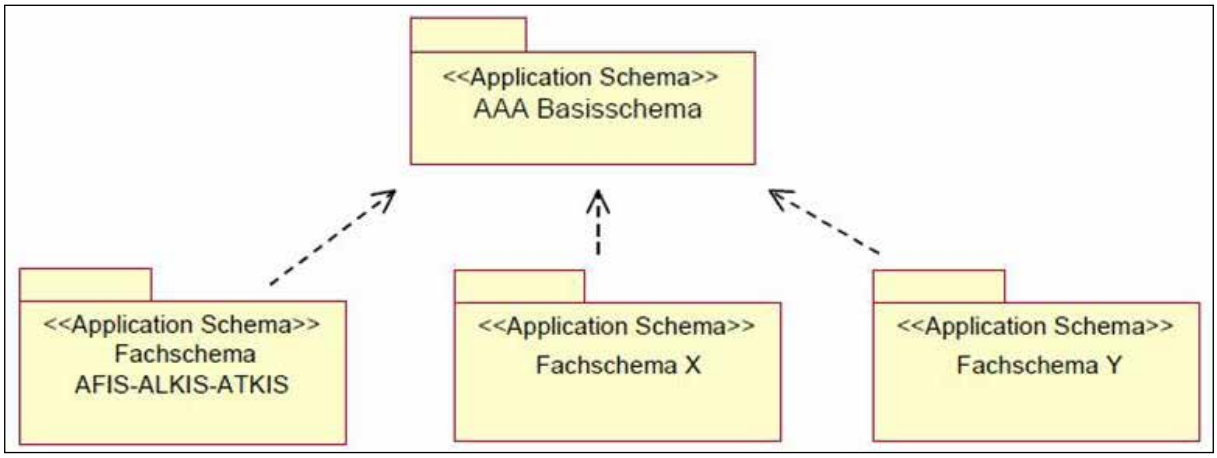

Fig 12: The neutral AAA® basic schema as a basis for modelling application-specific technical schema (E.g. AFIS®, ALKIS® and ATKIS®)

nical schema AFIS®, ALKIS® and ATKIS®; this was implemented by its member administrations. The AAA® basic scheme (Figure 12) forms the basis for the technical application scheme for modelling the AFIS®-, ALKIS®- and ATKIS®-objects as well as for data exchange via the standardised interface NAS. The procedure is described in detail in the "Documentation for modelling the geoinformation of the official surveying (GeoInfoDok)", which in the current version is being published **www.adv-online.de**.

To be emphasised is the application of international norms and standars, consistently implemented in the AAA®-project. Through the full speciality-neutral modelling of the AAA®-basis scheme, also other technical information can use the classes defined in the AAA® basis scheme for their own modelling, which was done, for example, through the establishment of the Information System for Rural Development (LEFIS) as object-oriented application data model by the administrations for rural structure. LEFIS is a planning system for continuous processing of land consolidation projects under the land consolidation and agricultural adjustment Act. To support an extensive use of the AAA® model in technical information systems the software scripts forming the modelling basis are available to third parties free of charge.

Further developments on the AAA® model are steadily continued within the AdV to meet the requirements of users and GIS manufacturers requirements. In addition to diverse revision requests, the following important novelties were entered into a new design of GeoInfoDok (version 7.0):

- The 3D building model,
- The far-reaching changes in digital elevation model,
- Adjustments for future data exchange with the land registry authority and
- The extensive revision of the land valuation.

To ensure the shortest possible transition period, the current focus of the work lies in the completion of the GeoInfoDok 7.0, so that the AdV committees can first decide on content modelling.

For companies and users, this produces the necessary content security for planning their next steps. In addition, an approach to migration between the current GeoInfoDok version 6.0 and the new version 7.0 is being developed to support a smooth transition. Version 7.0 will only be declared the new reference version of the AdV when all member authorities of the AdV manage their geospatial reference data in compliance with Version 6.0 of GeoInfoDok. GeoInfoDok 7.0 shall be provided as before in English after completion of the German documentation.

Geodata infrastructure

The AAA® data model's compliance with the requirements ensuing from the INSPIRE Directive and the implementation of these requirements in the geospatial data access laws and spatial data infrastructure laws of the government and the Laender is of central importance. Accordingly, AdV's technical network INSPIRE is taking a close look at INSPIRE data specifications and their effects on the AAA® model and creates mapping tables as template for the transformation of the AAA® data into the INSPIRE data model. The mapping tables of the INSPIRE data themes of Annex I are available to member administrations for piloting. After completion of the data specifications for Annex II and III themes in December 2013 the formation of the corresponding mapping tables that are then also provided for testing is currently taking place. Beyond the INSPIRE expert network of AdV, the representation of AdV in the European Spatial Data Infrastructure process of INSPIRE now exists through the participation of experts from the AdV in European committees (“Pool of Experts” and “Maintenance Implementation Group”).

Harmonized provision of geospatial reference data

In light of the developments in the provision of geodata via web technologies and the requirements ensuing from the INSPIRE process, the AdV is currently creating a series of technical web profiles for viewing and download services (Web Map Service – WMS, Web Map Tile Service – WMTS, Web Feature Service – WFS). Furthermore, a professionally neutral AdV Shape profile was defined. These technical profiles form the basis for the respective technical expression as regards the specialist data to be provided (product specification). With the approach of the definition of general technical profiles and differentiated specialized product specifications, the aim for nationwide provision of geospatial reference data as the basis for geodata infrastructures in Germany and in Europe is to harmonise, to standardise the content and further expand the services and data formats produced by the AdV member agencies. These profiles are complemented by the soon finished AdV metadata profile, which describes the structure and semantics of metadata for geospatial reference data and spatial data services of the member administrations.

To keep abreast of the advancements and updates occurring with standardisation and the INSPIRE process, the AdV profiles are also being regularly updated in order to guarantee the interoperability of the web services of the AdV member agencies. These activities are embedded seamlessly in the mentioned in the preface overall strategic approach to AdV-strategy for deployment of spatial data services as mentioned in the preface. The most current versions of the profiles are available under **www.adv-online.de** – AdV products – product standards.

6. Public Relations and Marketing Task Force

All spatial planning and decision processes require geospatial reference data to link the relevant technical information to the corresponding location on the earth's surface. This geospatial reference data come in the form of descriptions, which are not specific to any particular interest or application, 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 geospatial reference data and geodata services for the government, for business, for science and society, the surveying and mapping authorities of all the German Laender are under a legal obligation to collect, manage and provision geospatial reference data.

Requirements

The constitutional and legal responsibility for official surveying and mapping lies with the German Laender. However, because the need for many spatial applications goes beyond the provision of geospatial reference data within a German Land and users increasingly put greater demands on technical trans-nationally standardised and quality content of geodata, a nationally standardised, up-to-date and high-quality database must be maintained and made accessible to the technical users and to the interested public. The use of digital geospatial reference data and geodata services in industry and administrative units is continually increasing. These developments take account of the surveying and mapping authorities with use-oriented data provision: In addition to digital output on data carriers, web-based data provisions are standard. The surveying and mapping authorities provide digital databases with different characteristics for searching, viewing and for downloading via geoportals, geodata services and geoviewers. The meta-information system provides data on availability, characteristics and points of contact for the products. With these standardised Internet services, the official German surveying wants to actively contribute to the development of spatial data infrastructure and of the e-government and promote modern information, knowledge and civil society in Germany.

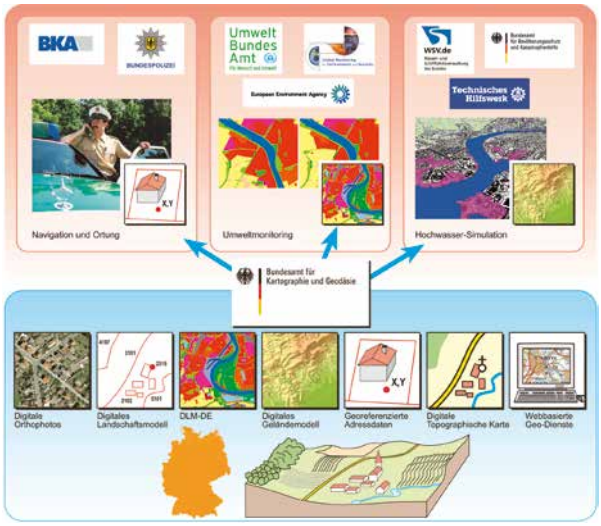

Fig 13: Central supply of government institutions with geospatial reference data by the BKG geodata centre

To enable a nationally standardised product range, the distribution points are networked and provision is standardised. Currently, certain product groups are provided at federal level and harmonised in three central distribution points: in the Central Office for House Coordinates and Building Polygons, in the Central Office SA*POS*® and in the geodata centre of the Federal Agency for Cartography and Geodesy (BKG), which also supplies the federal facilities with geodata.

To achieve the goals of optimally satisfying the national requirement over the long term and standardising the provisioning of products for Germany's official surveying and mapping, the Public Relations and Marketing Task Force (TF PRM) of the AdV performs, with the involvement of the member authorities and the Working Groups of the AdV, the operative PRM tasks to ensure that geospatial reference data is available throughout the country. In doing so, the following subject areas must be covered:

- The collection and documentation of the requirements of state and society for the collaboration and their comparison with the geospatial reference data product range (requirements survey and requirements analysis),
- The maintenance of the licence and fees models and model licence agreements, as well as execution of model-based licensing for the use of the geospatial reference data and geodata services (conditions and distribution policy),
- The implementation of measures to provide information on the availability and usability of the geospatial reference data and geodata services (product information) and
- The implementation of measures for the positive perception of the Germany's official surveying and mapping and its national geospatial reference data product range (image promotion).

Services

Needs survey and needs analysis

To achieve optimum distribution of the geospatial reference data products, user and purpose-oriented geospatial reference data products must be produced and provisioned as part of the official activities of the surveying and mapping agencies. When information about users' needs and requirements for the geospatial reference data (product, intended use, product satisfaction) and provision conditions and product information (information

and contact channels to the surveying and mapping authorities) are required, the central distribution agencies conduct an Internet-based user survey using a standardised questionnaire and analyse the results jointly with the TF PRM.

Licence and Fee Model

To regulate rights of use in connection with the provision of the geospatial reference data and geodata services, there is a need for a clear and simple, nationally standardised licence and fee model that satisfies current requirements and regulates the use of all currently offered geospatial reference data products. Germany's official surveying and mapping has approved the directive for fees for the provision and usage of geospatial reference data of the surveying and mapping authorities of the German Laender (AdV fees directive) and published it at **www.adv-online.de**. It is used by the central distribution points and implemented in the individual German Laender. To guarantee a standardised and proper design of the AdV fees directive, the TF PRM has developed a series of recommended actions. The TF PRM updates the licence and fee model according to AdV's requirements and in consultation with the Working Groups, if the AdV fee directive has to be adapted to keep abreast of technical advancements and in line with user requirements.

The TF PRM is currently investigating how the fee tariffs can be simplified for external use by applying transparent and flat rate regulations, and also how area and time-based flat rate models for download services can be developed.

Furthermore, the TF PRM sees itself as communications platform for the distribution agencies of all surveying and mapping authorities and for the central distribution points. It also supports the sharing of knowledge regarding the application of the AdV fee directive.

Model Licence Agreements

Given that the nationwide provision of geospatial reference data and geodata services continues to be standardised and that the surveying and mapping authority community, with its nationwide provision of geospatial reference data, is being increasingly perceived as a supplier community, the TF PRM has updated the standardised model licence agreements for complex applications, the small contract template for a geoproduct license and the General Terms and Conditions of Business and Use (AGNB). In addition, online brief and easily understandable sample text modules on licensing for geodata services were developed. These sample agreements are used in the central distribution points and are recommended for licensing within the Laender. The interested public can view and download them from **www.adv-online.de** for its own purposes.

Information Documents and Corporate Design

To ensure that Germany's official surveying and mapping has a standardised appearance in both word and image, the AdV in 2009 adopted a common corporate design and made it available to all member authorities. It was optimised in accordance with practical requirements and released for use by the Chair of AdV in March 2011. The updated version introduced the three new logos for AFIS®, ALKIS® and ATKIS®.

Fig 14: Logos for AFIS®, ALKIS® and ATKIS®

Fig 15: Product prospect for SAPOS®

AdV's information documents are created according to the design rules defined by Corporate Design. The purpose of the materials is to provide the interested public with information on the applicability and availability of the geospatial reference data products in the language of the geomarket concerned. The TF PRM is publishing the AdV product folder with the title "Basis for your decisions", which focuses on the geospatial reference data product range of the surveying and mapping authorities and its potential use.

Further product brochures and leaflets containing detailed information on the nationally available products are published in consultation with the AdV's Working Groups on this basis.

Web portals and works of reference

The website of the AdV (**www.adv-online.de**) provides information about tasks, product range and developments with a user-friendly interface. In a further step, the various product-related websites will be merged and adapted accordingly. AdV's presence in online works of reference is important because its role, tasks and product range can be widely communicated via this medium. The websites are being revamped to enable the interested public to easily call up information on AdV with just a few clicks.

Image Promotion

For the surveying and mapping agencies to be perceived in a positive light, public relations activities must be actively pursued, with appropriate media and effective public images being created for this purpose. The TF PRM has produced a video describing the organisation, role and product range of Germany's official surveying and mapping authorities in a form suitable for a wide audience. To make its usage effective for the public, the film is published on the AdV website (**www.adv-online.de**) and has German and English subtitles. It also carries sign language. Furthermore, the surveying and mapping authorities provide regular information events to the interested public.

Public relations and trade fair appearances

As part of establishing geospatial data infrastructures in the Federal Republic of Germany, the AdV endeavours to increase the awareness of geospatial 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 at the world's leading fair for surveying and mapping INTERGEO® 2013 in Essen (Figure 16) with a trade fair stand. Apart from the presentation of the products and services of the official German surveying and mapping, accompanying presentations and discussion forums also took place.

Fig 16: Joint stand of AdV at the INTERGEO® 2013 in Essen

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. The collaboration for EuroGeographics comprises the development of transnational, harmonised products, as well as joint working groups and projects. EuroGeographics members are wanting in particular to support the European Commission in establishing the European Geodata Infrastructure in connection with the INSPIRE framework guideline and the program Copernicus. EuroGeographics is registered at the European Commission as the largest "Spatial Data Interest Community" (SDIC).

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

EBM, ERM, EGM and EuroDEM

EuroGeographics offers, in a harmonised manner and beyond the national borders, the following official pan-European data records based on standardised specifications and with the data currency required:

- EuroBoundaryMap (EBM) – the administrative units at all national administrative levels in Europe, with names, unique code numbers and a reference to classifications NUTS (Nomenclature des Unités Territoriales Statistiques) and LAU (Local Administrative Units) of Eurostat, the Statistical Office of the European Union. The data record on a scale 1 : 100 000 currently covers 41 European countries.
- EuroRegionalMap (ERM) – of the topographic reference data set in the scale 1:250 000. ERM covers a region of 35 European countries.

- EuroGlobalMap (EGM) – of the topographic reference data set in the scale 1 : 1 000 000. EGM covers a region of 37 European countries and is free of charge on the Internet since 2013.
- European Digital Elevation Model (EuroDEM60) – a digital terrain model computed by the BKG from the national data records with a position resolution of 2'' (approx. 60 m) and a height accuracy von 8 – 10 m.

The BKG as product coordinator is responsible for merging the national contributions, for the updating and development of EuroBoundaryMap (EBM) and for the European digital terrain model (EuroDEM). The experts of the BKG provide the German contributions to the products and are very active in EBM and EuroRegionalMap (ERM) in the respective technical teams, working intensively on a sustainable maintenance and development of the products. For the EuroGlobalMap (EGM), the BKG also acts as the regional coordinator for ten countries. It is responsible for organisation, technical support and for the quality control and integration of data supply to these partner countries. The service centre in the BKG is the distribution centre for EuroGraphics and delivers European data records to both German and international customers.

European Location Framework

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

The project started on 1 March 2013 and is funded under the "Competitiveness and Innovation Framework" program of the European Commission to 50 % of the project budget. In the first year of the project the development of technical specifications based on INSPIRE was in the foreground. These specifications describe the requirements for geospatial reference data, the necessary processes of data harmonisation and ELF data records and geodata services. 30 Partners from government, academia and industry – including 15 European surveying and cadastral organizations – work in the remaining two years to build an infrastructure that makes European official geodata easily and widely accessible. The structure shall occur in three phases. In the first phase, the Euro Geographic data records of medium and low resolution, i.e. EuroBoundaryMap (EBM), EuroRegionalMap (ERM) and EuroGlobalMap (EGM), converted into the ELF data specification and set as data in the ELF data in the ELF platform.

In Phase II geodata of higher resolution in selected test areas (Finland, Norway, Sweden, Poland, Czech Republic) and the first spatial data services and applications are added. In the further course of the project the availability of data is expanded – gradually – geographically and thematically.

Copernicus

The European earth observation program Copernicus (also known under the abbreviation formerly used GMES – Global Monitoring for Environment and Security) 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 to build Copernicus. Copernicus uses satellite data from existing missions, while building its own observation capacity with the Sentinel missions. The satellite data flow together with expert and reference data from the Federal and geodata of the Laender in Copernicus information services that deal with the six themes – land monitoring, marine environment monitoring, disaster and crisis management, monitoring of the atmosphere, climate change monitoring and security.

Topographic data of the official German surveying and mapping authorities are available to the European Commission under an agreement for urgent damage mapping of Copernicus Service “Emergency response”.

Open Geospatial Consortium (OGC)

Since the standards used in the AAA® modelling are constantly evolving, it also requires close monitoring and participation in standardisation bodies such as the OGC. From a strategic perspective, the GIS standardization of OGC and ISO for the maintenance and development of AAA® data model and the spatial data provision by services continue to play a central role in order to make the Geodata Infrastructure fit for INSPIRE and future requirements in an e-government.

Through the cooperation agreement between OGC and ISO/TC 211 many standards are developed first by OGC as OGC specification (e.g. Geographic Markup Language – GML) and only then developed as a formal ISO standard. In addition, the new AdV profiles (e.g. the AdV WMTS profile) are based partly only on OGC specifications because there are no corresponding ISO standards. Therefore, AdV, represented by the Information and Communication Technology working group, actively works with OGC and as technical member is also a long-standing voting member.

ISO/TC 211

The technical committee Geographic Information/Geoinformatics develops and maintains formal geographic information standards. The creation and preservation of the conformity of the AAA® data model with the ISO standards is the declared goal of the AdV. However, the standardisation projects are becoming increasingly technical,

so that the relevance of individual standards and further development is more difficult to estimate. Again, the Information and Communication Technology working group acts in a proven manner as a professional body, with the possible resources represents the interests of the AdV and implements the relevant standards within the AdV, in particular through professional profiles and product specifications.

So far there are about 60 different standardisation projects (see **www.isotc211.org**). Although not all standards are of equal importance for the AAA® data model and the provision of data via standardised services, there are currently a number of important standards (e.g. the metadata standard 19115) in the systematic revision, in which amendments of the AdV were introduced.

The conferences of ISO/TC 211 take place world twice per year. From 2 to 6 June 2014 the 38th Meeting of TC 211 took place in Berlin.

Permanent Committee on Cadastre in the European Union

On July 1, 2013 Lithuania took over the EU Presidency and thus the Presidency of the Permanent Committee on Cadastre in the European Union (PCC) for the second half of 2013. The General Assembly of PCC to conclude the presidency was held in the Lithuanian capital Vilnius. In the centre of the conference were presentations among others on the topics of sustainable land management, trends in the field of e-services, professional image of the surveyor today and tomorrow and the cooperation between European institutions. Finland also reported on experiences with the recently introduced open-data policy.

For Germany, Director Peter Creuzer, as invited speaker, lectured on “Recent Developments in Use and Dissemination of Geospatial Data in Germany – for example Lower Saxony” about the AAA® concept and modern data delivery methods in Lower Saxony as example.

On 1 January 2014, Greece took over the presidency for the 1 half-year of 2014. The General Assembly to conclude the presidency was held in Athens in mid June 2014. Before the social and economic challenges of climate change, the Greek Presidency of the PCC saw their main task to contribute to a strong, united Europe to cope with the upcoming tasks. It is important to have a holistic approach – which in the area of cadastre – must also take the maritime part sufficiently well into account. Here, the cadastre should be the basis for modernisation of structures of Greece and serve as an aid for many developments. Completion of the Greek Cadastre therefore has high priority.

A broad scope at the Greek general assembly was taken by reports by the member states about the current status in the respective national cadastre. On this occasion the AdV-Secretary General presented a lecture on

the current situation in Germany and spoke about the importance of the cadastre as a basis for a variety of public and private planning and other activities, on the introduction of ALKIS® and on the profession of the surveyor in Germany.

The results of the survey on the state of implementation of the vision paper “Cadastre 2014” created over 15 years ago was presented and from this initial conclusions drawn on continuation under the title “Cadastre 2034”.

On 1 July 2014, the Presidency of the EU and thus the PCC moved for the second half of 2014 to Italy; the Autumn General Meeting of PCC is planned in Rome.

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