National Report 2012/2013

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

AMTLICHES DEUTSCHES VERMESSUNGSWESEN

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German Geodetic Commission (Deutsche Geodätische Kommission)	www.dgfi.badw.de

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Dear readers,

In October 2012 the Federal Government submitted the 3. Geoprogress report and thus initiated the formulation of a national geographic information strategy. The geospatial reference data of the Laender that are collected and provided by the surveying and mapping agencies within their constitutional responsibility form an essential component of such a national strategy. In this respect, the geospatial reference data were again the focus of the activities of the AdV within the reporting period, in particular the further development of technical standards for the management and delivery, but also the continuation of uniform costs and licensing models.

With the continuously growing importance of geospatial reference data and geospatial data infrastructures it should not be forgotten that the surveying authorities of Federal Government and Laender provide very essential fundamentals to satisfy the need for a highly accurate and uniform spatial reference. Two highlights of the reporting period are therefore briefly mentioned at this point: The completion of the field work for the renewal of the German First Order Levelling Network (DHHN) at the end of 2012 and the commissioning of the two TWIN radio telescopes of the Federal Agency for Cartography and Geodesy in the Geodetic Observatory in Wettzell.

The works on the levelling network were primarily for the DHHN renewal of 1992. But they were also of key importance as for the first time highly accurate position, height and gravity measurements were performed in a measurement period and for a large number of basic geodetic network points (CBPs). With an astrogeodetic quasigeoid in which these measurements have been incorporated, the target position of precisely determining physical heights by means of satellite geodetic method in future may have moved a little closer. Thus the fundamental work done is also a contribution to the economic implementation of many surveys with height reference, starting from the map to complex engineering structures. With the TWIN radio telescopes, the German surveying makes an important contribution to regular monitoring and adaptation of international and European reference systems.

Another specialty field where the AdV was engaged in 2012, is the further development of Networked Land Values Information System (VBORIS). At CeBIT in March 2013 VBORIS 2.0 was presented to a wider public. Besides the official land valuation policy emphasis has been placed on the development of VBORIS in particular on a SDI compliant modelling. The users can thus be provided with improved access to official land values.

As mentioned above, geospatial reference data provide a fundamental building block in the national geographic information strategy. Against this background, the AdV established a working group in the autumn of 2012 to develop a comprehensive strategy for the provision of geospatial reference data. Objective of this strategy shall be a transnational geospatial reference data provision via standardised geo-services at uniform cost and terms of use.

Already on the briefly illustrated task fields is the multifaceted work of the official German surveying evident. This activity report presents further task fields, such as 3D building models, the provision of the geospatial reference data in the context of spatial data infrastructures or the involvement of the AdV in national and international organisations.

I hope you enjoy reading this activity report and gaining interesting insights into the AdV's complex range of activities.

Ulrich Püß
President of AdV

1. Organisation and Performance of Tasks

In the Federal Republic of Germany, the Laender are responsible for the performance of 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 Authorities 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 (ARGE LANDENTWICKLUNG) 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 network cluster for the infrastructural and spatial planning policy.

The surveying, mapping and geoinformation authorities are assigned to 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 authorities of the surveying and mapping 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 reference surveys/official reference systems – are the responsibility of the Laender. The original services include:

- The widespread 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 widespread 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 widespread 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
- Harmonisation of the data from real estate cadastre surveying and mapping.

Federal Agency for Cartography and Geodesy (Bundesamt für Kartographie und Geodäsie)

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. In cooperation with the Laender, the BKG fulfils the following duties and responsibilities in the field of geoinformation and geodesy:

- Provisioning and mapping up-to-date analogue and digital topographic and cartographic information, as well as the advancement of the procedures and methods required for this purpose;
- Provisioning and updating of geodetic reference networks in the Federal Republic of Germany, including the required
    - 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;
- Representation of the interests of the Federal Republic of Germany in the field of geodesy and geoinformation at international level.

Federal Ministry of Defence (BMVg) Geoinformation service of the Federal Armed Forces

GEOINFORMATIONSDIENST DER BUNDESWEHR

Federal Ministry of Defence (BMVg) is represented in the AdV by the Head of the Federal Armed Forces Geoinformation Service (GeoInfoDBw) and Head of the Federal Armed Forces Geoinformation Authority (AGeoBw).

The AGeoBw is responsible for guaranteeing the military core capability of "Geoinfo support for the Federal Armed Forces" in deployment and basic operations. Under the guiding principle of "Geoinformation from one source", the teams at GeoInfoDBw assume responsibility for both the availability of quality-tested geoinformation in deployment and also for the recognition and assessment of geofactors (including terrain, weather, traffic, commerce, climate, water) that can impact deployment progress.

The AGeoBw acts as the central department of the GeoInfoDBw which, taking an interdisciplinary, i.e. eighteen geo-sciences (including geodesy, geopolitics / ethnology, geography, geology, cartography, remote reconnaissance, meteorology), global approach both in relation to personnel and processes, to develop, train and deploy the processes of geoinfo data acquisition, geoinfo data management and geoinfo production relevant to geoinfo support. For the territory of the Federal Republic of Germany one falls back in a comprehensive form to the Federal Agency for Cartography and Geodesy (BKG) and products of the national surveying organisations in the Laender.

This ensures that on German territory, forces of the Federal Armed Forces have the same maps produced in civil-military cooperation in the scales 1:50 000 and 1:100 000 as well as, where applicable, parallel-deployed civilian police and support staff. Another of the GeoInfoDBw's objectives for digital information is for uniformly structured and current data models to be managed across all German Laender, the databases of which can be transmitted to the geoinfo database of the Federal Armed Forces in just one process step, enabling them to be used for military purposes. With the design and successive implementation of the AAA® -concept of the AdV, considerable progress has been achieved in this regard during the period under review.

As part of the reorientation of the Bundeswehr, AGeoBw will be converted with effect from 1 October 2013 into the Centre for Geoinformation (Zentrum für Geoinformationswesen der Bundeswehr ZGeoBw). The assignments are virtually unchanged. The current head of department (Amtschef AGeoBw) as commander will lead the newly established ZGeoBw. The ZGeoBw will continue to ensure the interagency provision of geoinformation of foreign crisis regions and deployment areas on behalf of the Bundeswehr.

Federal Ministry of Transport, Building and Urban Development (BMVBS)

WSV.de
Wasser- und Schifffahrtsverwaltung des Bundes

The Federal Ministry of Transport, Building and Urban Development (BMVBS) has been a member of the AdV, represented by the Waterways Department, since 1950. 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 BMVBS is supervising the Federal Water and Shipping Administration (WSV), an agency 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.

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.

For scientific advice and applied research, the WSV receives support from the "Geodesy Department" of the Federal Institute of Hydrology (BfG) for the focal points of geodetic reference systems, geokinematics, hydro and object surveying, as well as geotopography. The department collaborates closely with universities and colleges.

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

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.

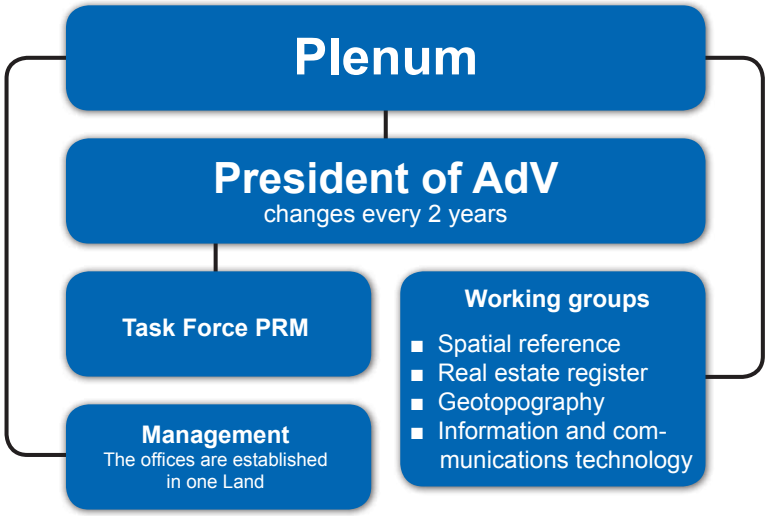

Fig. 1: Organisation of the AdV

Objectives, duties and responsibilities of the AdV

The member authorities 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 authorities, as well as geodetic research and teaching institutions and
- 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 shall 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 in km²	Land parcels in thousands	Number of authorities		
				Laender agencies (operations)	Regional agencies	Chartered Surveyors ÖbVI
Baden-Wuerttemberg	10,786,227	35,751.48	8,878	1	60	168
Free State of Bavaria	12,595,891	70,550.11	11,811	1	51	-
Berlin	3,501,872	887.70	396	1	12	48
Brandenburg	2,495,635	29,483.13	3,100	1	17	150
Free Hanseatic City of Bremen	661,301	419.24	206	1	1	6
Free and Hanseatic City of Hamburg	1,798,836	755.16	249	1	-	8
Hesse	6,092,126	21,114.91	4,978	1	7	84
Mecklenburg-Western Pomerania	1,634,734	23,190.76	1,906	1	7	71
Lower Saxony	7,913,502	47,612.88	6,132	1	-	102
North Rhine-Westphalia	17,841,956	34,092.25	9,251	1	53	443
Rhineland-Palatinate	3,999,117	19,854.06	6,335	1	6	82
Saarland	1,013,352	2,568.75	1,288	1	-	10
Free State of Saxony	4,137,051	18,419.71	2,667	1	13	112
Saxony-Anhalt	2,313,280	20,449.54	2,646	1	-	54
Schleswig-Holstein	2,837,641	15,799.25	1,872	1	-	43
Free State of Thuringia	2,221,222	16,172.50	3,106	1	-	69
Total for Germany	81,843,743	357,121.43	64,821	16	227	1,450

Tab. 1: Statistics: Inhabitants and territory Status 31.12.2011, Source: Federal Statistical Office
Land parcels and ÖbVI Status 01.07.2013
Number of authorities Status 01.07.2013

2. Spatial reference

The global reference systems and the national geodetic spatial reference have a close mathematical correlation and cannot therefore be considered in isolation. This becomes especially clear when the modern measurement systems – especially the global navigation systems – are examined. Changes in the system parameters directly affect the measurement results and must therefore be considered. The further realisation of the international reference system ITRF2005 to ITRF2008 during 2010 brought about systematic changes in the satellite orbits and the coordinates of the global reference stations, which expand to the SA*POS*® *application 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. The various institutions of the Federal Agency for Cartography and Geodesy (BKG) and the German Laender make important contributions here to their respective remits.*

Connection to the global reference systems

The BKG operates, as its contribution to the global networks, three geodetic observatories in Wettzell (Bayerischer Wald, Figure 2), in Concepción (Chile) and O'Higgins (Antarktis, Figure 3). These represent cornerstones of the services offered by the International Association for Geodesy (IAG). The Geodetic Observatory (GO) in Wettzell is operated together with the Satellite Geodesy Research Institute at the Technical University of Munich.

The primary functions of the BKG's geodetic observatories are data acquisition for the ongoing maintenance of the national, European and global reference systems, the operation and advancement of the measurement systems, the development of new measurement systems and the representation of this sector on international committees. Specifically, the following products are developed:

- Data acquisition VLBI: Radiointerferometric measurements to quasars (VLBI),
- Data acquisition SLR: Distance measurements to man made satellites and to the reflectors on the moon (SLR/LLR),
- Data acquisition GNSS: Observations to the satellites of the GPS, GLONASS and Galileo navigation systems.

In addition, location based observations that supply location information for the space techniques are also carried out. This activities are performed in the product "local measurement data and specialist services". Including:

- 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,
- Determination of the variation in the earth's rotation using large ring lasers,
- Recording of environmental parameters (meteorology, hydrology, ground deformations),
- Recording of earthquakes using seismometers and
- Geodetic measurements for determining the connection vectors between the individual measurement systems and for local stability control.

The International VLBI Service for Geodesy and Astrometry (IVS) has set itself a target in 2000 to create a new visionary concept for VLBI requirements of the next 20 years. In the specially launched "Working Group 3" a specification for a new design of radio telescopes and other VLBI hardware was created (VLBI2010) in the period from 2000 to 2006. The BKG has decided on the basis of this concept to build two radio telescopes with approximately 13.2 m in diameter, which were designed specifically for the specifications of VLBI2010. The special requirements (broadband reception system, fast axial movements, very high availability) to be placed on a VLBI2010 receiving system is accounted for with the TWIN concept.

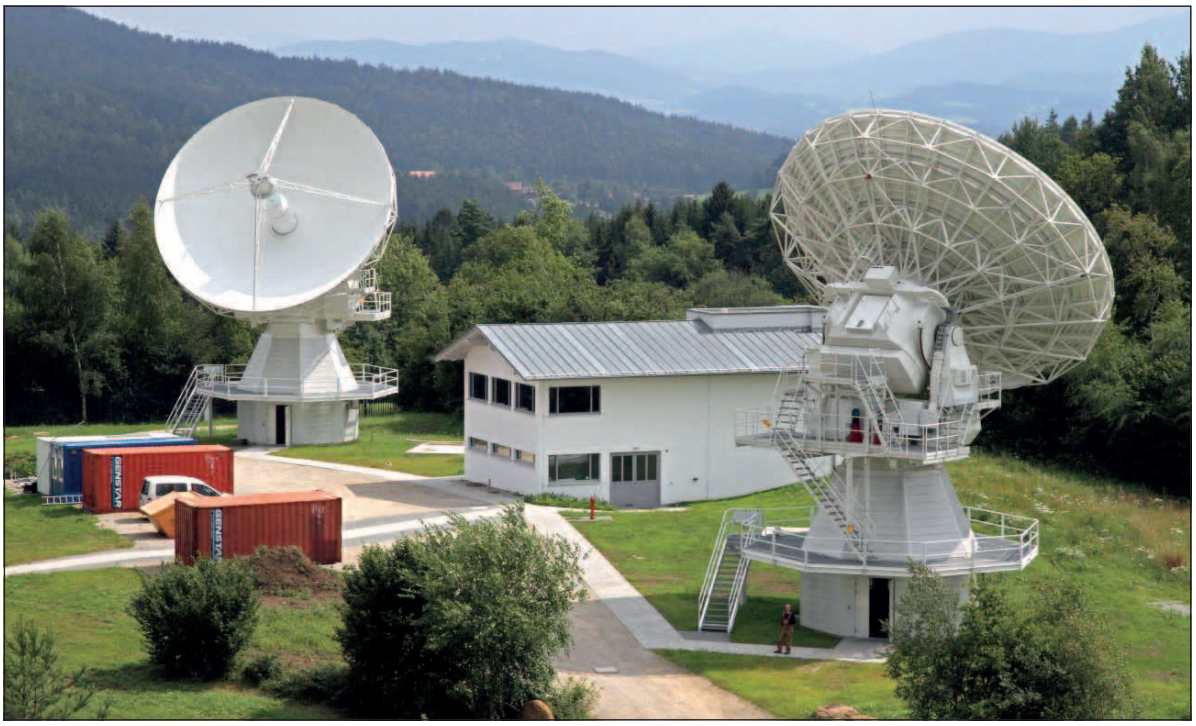

Fig. 2: The new twin-radio telescopes

The final acceptance of the TWIN radio telescopes took place at the beginning of 2012. Both telescopes are therefore operable with respect to the control and rotational motion. Following the handover, the first installations began in April. The necessary conversion and finishing work took place inside the operation building.

A milestone in 2012 was the successful site acceptance test of the first signal converter, whose measured data indicate a very good prospect of the reception properties of the telescope TTW1.

In March 2012 an international VLBI2010 meeting under the auspices of the BKG in cooperation with the Research Satellite Geodesy / Technical University of Munich (FESG / TU Munich) was held at the request of the IVS in Bad Kötzting in which all development tasks on the new VLBI technology were presented. With more than 80 participants from geodesy, the industry and research, the event was extremely helpful for the coordination of current developments in the VLBI sector.

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.

The central office of the International Earth Rotation and Reference Systems Service (IERS) was established in the BKG in 2001. The BKG acts as a data and analysis centre of the International VLBI Service (IVS) and as the analysis centre of the International Laser Ranging Service (ILRS). The observation stations and analysis centres of the BKG are part of the global activities for the application of the space 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. Furthermore, modern observation and analysis approaches will be implemented at national level as geodetic technology continues to be advanced.

The Stations of the Integrated Geodetic Reference Network Germany (GREF) of the BKG will be evaluated in various networks, including in a subnet of the European Reference Network EPN comprising approx. 125 stations and as part of SA*POS*® reference framework under the name DREF-Online (Project SA*POS*® coordinates monitoring). The GNSS observation data is analysed daily during 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 IGS (International GNSS Service) and the centre for satellite orbit determination in Europe (CODE) and combined every seven days for a weekly solution. Prior to that, the networks are pre-evaluated using the rapid orbits of the IGS.

The GNSS Monitoring Network DREF-Online

The shared network DREF-Online (see Figure 3) of BKG and the Laender currently comprise 30 SA*POS*®stations, 28 GREF stations and 15 other EPN/IGS reference stations at home and abroad. Network solutions are calculated daily in the post-processing and made available as week combination including coordinate time series. As a result of the annual workshop on the evaluation of the SA*POS*®coordinates monitoring, additional cumulative multi-year solutions are also provided and compared with the official coordinates. In April 2011, the reference system was converted from ITRF2005 / IGS05 to ITRF2008 / IGS08.

In April 2012, the third workshop of the evaluator of the coordinates monitoring of SA*POS*® and DREF-Online took place at BKG in Frankfurt. Focal point was the changes in the coordinates of the reference stations and of the reference to the official system and their effects.

The weekly results of the DREF-Online network are depicted since the beginning of the year 2012 also in the web-based "SA*POS*®coordinates monitoring" of the Land Baden-Württemberg as time series (see Figure 4).

Fig. 3: Network image DREF-Online

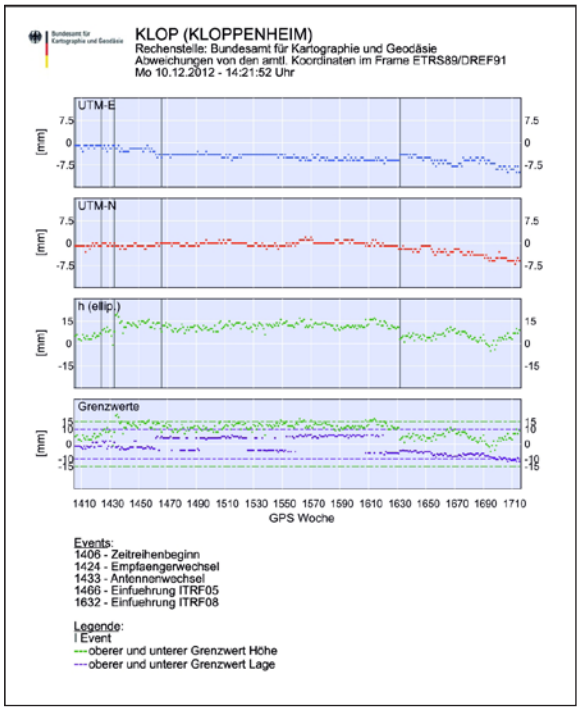

Fig. 4: SAPOS® coordinates monitoring, deviations of the weekly solutions from the official coordinates

Near real-time parameter estimation

Because of the conductivity and permeability of the material present in the atmosphere, the run time of the satellite signals is delayed by the atmosphere. The near real-time estimate (NRT) of these time delays is the most widely used application for the integration of tropospheric zenith total delay (ZTD) to determine atmospheric water vapour distribution for the early prediction of future weather patterns. Since 2000 BKG participates on various projects like COST Action 716 (2001–2005) for weather forecasting and climate research. Since the beginning of the GPS week 1176 (21 July 2002), BKG has participated in the follow-up project E-GVAP (EUMETNET – The Network of European Meteorological Services – GNSS Water Vapour Programs) with a proprietary solution at the hourly estimates of tropospheric propagation delays. Currently, the second phase of E-GVAP project is running under the title "E-GVAP II". The E-GVAP network includes more than 1,500 GNSS stations, most of which are in Europe. The evaluation of the measured data takes place at about 10 GNSS analysis centres. The calculated values for the ZTD stations are examined by various meteorological institutions first towards quality and then included for validation.

The NRT network of BKG arises from about 110 stations (see Figure 5). In the context of near real-time parameter estimation, two variants of data analysis are performed in parallel at BKG on two different computers with the Bernese GNSS Software (BSW Version 5.0) per hour. To shorten the duration of evaluation, which consists of a block of data for the last four hours (so-called "sliding window" technique), the evaluation equipment was installed on a new machine. Thus, the duration of the hourly data evaluation was shortened by about 12 minutes.

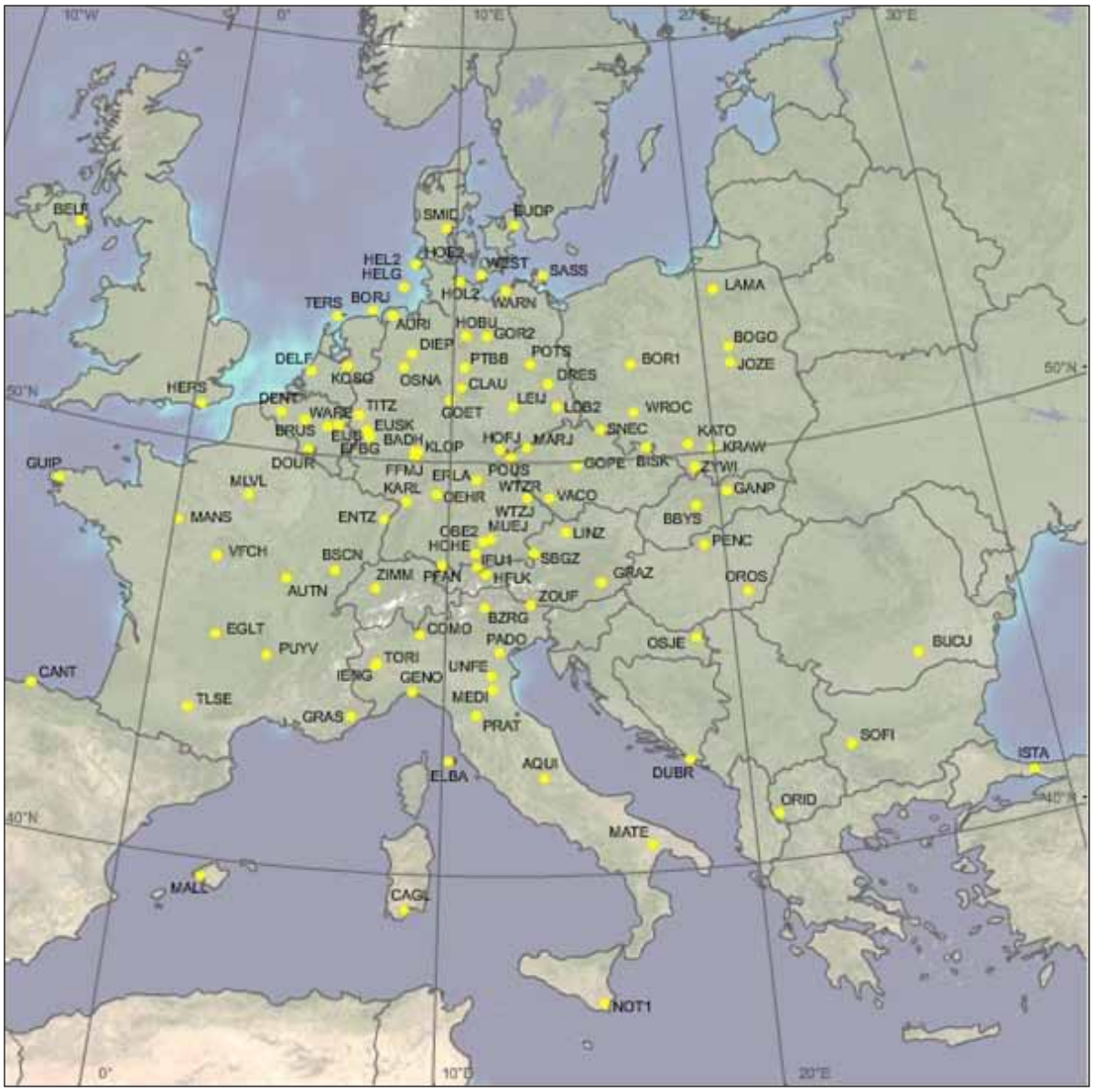

Fig. 5: The NRT network of BKG

In the past years, recent developments in the area of real-time data transmission in the IGS and EPN have resulted in a new range of applications, including the possibility of estimating the propagation delays in real-time with resolution in seconds (RT). A comparison of RT and NRT solutions, by which the data analysis was carried out with the software BNC (BKG Ntrip Client) RTNet (Real-time Network processing engine) and BSW (Version 5.0) has shown that the NRT solution features better positioning and/or ZTD accuracy than the real-time solutions with BNC and RTNet. The difference of the calculated ZTD values between the NRT and RTNet solutions varies up to 10 mm (see Figure 6), while a greater range up to 15 mm was present between the NRT and BNC solutions (see Figure 7).

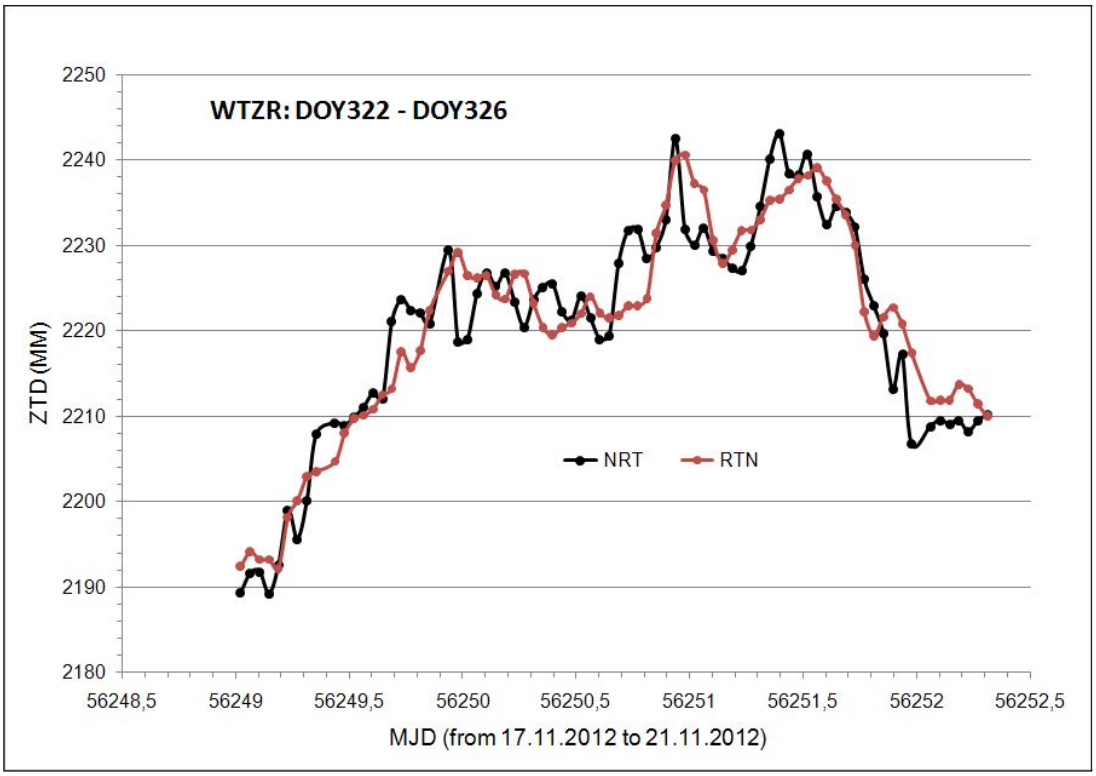

Fig. 6: The comparison of the NRT and RTNet results. The NRT solutions with BSW5.0 were calculated hourly, the real-time results with RTNet output with five-second data rate.

The reason for this lies on unconsidered parameters in the modelling process during the data evaluation with BNC. Unconsidered parameters are, e.g., the phase centre variations of the ground antennas, oceanic loading effects, as well as the tropospheric horizontal gradient.

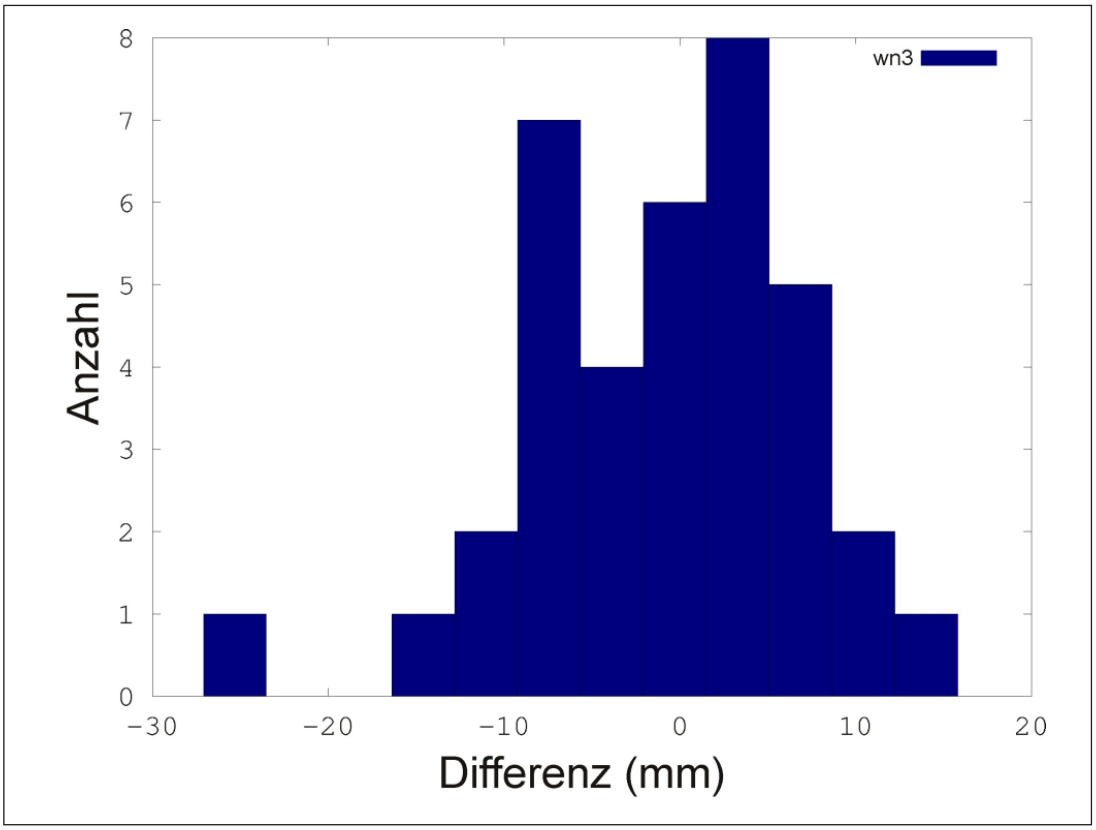

Fig. 7: The comparison of the NRT and RTNet results. The NRT solutions with BSW5.0 were calculated hourly, the real-time results with BNC output in seconds data rate. The difference in the ZTD values between the two solutions varies by up to 15 mm, except for an outlier of 25 mm. wn3 means that for the signal variation (white noise) in the Kalman filtering, the value 36 mm per hour was set.

Since 2009, another near real time hourly evaluation is running in parallel, carried at E-GVAP II as a test solution “bkgh”. The main difference lies in the calculation routine used in the RINEX files, which are generated for the solution of the "bkgh" from real-time data flow generated by means of the BNC program. These so-called high-rate files are generated for approximately 120 stations of the regional and global networks with a data rate of 1 Hz and a length of 15 minutes, and uploaded to the BKG data centre. By this calculation technique, also performed hourly, it is investigated whether accuracy of the estimated parameters achieved through the introduction of high-rate files is sufficient to accelerate the evaluation in the direction of short-term forecast (Nowcasting) for future weather patterns.

On 12 and 13 March 2013 the BKG organised an international symposium under the title "PPP-RTK and Open Standards". Around 180 participants from four continents followed the balanced mix of scientific and application-oriented presentations. Particularly pleasing was the relatively large number of participants from Asia.

The precise single point determination in real time is on the best way to establish itself as an alternative to the existing differentially operating procedures. A key element is the provision of appropriate correction parameters. To promote the dissemination and acceptance, it is necessary to define the essential correction parameters, to model and then to standardise them. For the main parameters, satellite orbit and clock corrections, this has already happened, for other parameters such as propagation delays and ambiguity estimates the standardization is pending.

The presentations and posters of the symposium are found on the BKG website:
http://igs.bkg.bund.de/ntrip/symp#PresentationFiles

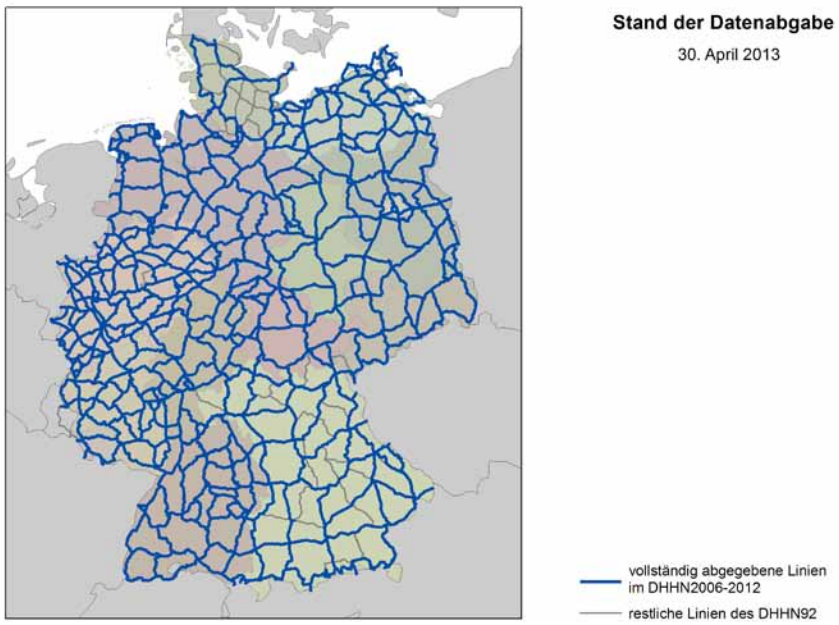

Fig. 8: The entire levelling line network in the DHHN project as of April 2013

National geodetic spatial reference – renewal of the DHHN

With the waning of the year 2012, the last field work in the AdV project for the renewal of the German First Order Levelling Network 1992 (DHHN92) has come to an end. One of the major projects of national geodetic spatial reference in recent years, is thus ending from its practical measurement activity point of view. This project is aimed at the final nationwide measurement of the combined German First Order Levelling Network in the wake of German reunification, in order to reveal tensions and height changes to the lines of the first order. In addition to the standard method of precise levelling that took place in 2008, i.e. in the same measurement period, precise GNSS observations on 250 selected basic geodetic network points (GGP). For 100 of these GGP, absolute gravity values were determined in 2009 and 2010 using the BKG's absolute gravimeter A10. With this, for the first time throughout Germany, a high number of earth-marked points was determined within one measurement epoch using standard geodetic measurement procedures (geometric and physical parts).

When the measurements were complete at the end of 2012, about 90 % of all lines of the DHHN92 were measured repeatedly (see Figure 8). The measurement data were pre-processed in the German Laender (crude error search, creation of output formats) and then submitted to the processing centres at the Cologne district government and the BKG. Here several studies on data quality and consistency, as well as an error analysis, were performed. Currently, these qualification measures are being completed (in the year 2013). The calculations of different results, final data analyses, combining of partial results of the calculation points and the final documentation are planned for the years 2014 and 2015.

The "Renewal of the DHHN" project is being managed by the AdV Spatial Reference working group and the "Coordination of DHHN measurements" Project Group employed by it. The activities of this project group range from organisational tasks to technical refinements. Models are currently being investigated by the project group, which provide necessary technical and economically feasible ways of introducing a new height reference frame.

Technical developments in the Spatial Reference working group

In addition to the renewal of the DHHN, also the core tasks "SA*POS*®", "AFIS®" and "uniform Federal spatial reference" are being tackled in the Spatial Reference working group. These tasks are part of the infrastructure services of the state.

The Satellite Positioning Service of the German Land Survey (SA*POS*®), which now provides positioning data of the GNSS systems (Global Navigation Satellite System) in the Federal Laender for over a decade, offers two real-time and post-processing service (EPS, HEPS, GPPS).

SA*POS*® uses various communication channels to transmit correction data under international standards. Main customer segment of the HEPS service is the surveying and mapping authority. Other users are found in all areas with positioning tasks.

With the establishment of the central bureau SA*POS*® in 2003, the Laender have taken the opportunity to provide Federal users with centralised SA*POS*®data from a single source. Today contractual arrangements exist with numerous customers. Private positioning services use the SA*POS*®infrastructure for their own tasks. Therefore our customers base their own products and services on a consistent quality-assured state infrastructure.

With the operational start-up of the European satellite navigation system Galileo expected in 2014/2015 also SA*POS*® will integrate this third system after GPS and GLONASS. Numerous technical and economic effects will result as consequence, which are already prepared intensively in the AdV. The changes range from software products to the process paths.

The official reference point information system (AFIS®) contains the information of the geodetic spatial reference in terms of its coordinates and gravity values and the corresponding situation sketches. A history management also provides the storage of different measurement periods, which allows statements about the implementation of various reference systems and analyses of coordinate changes.

With the development of the documentation for modelling geo-information of the official surveying (GeoInfoDok), changes will also flow into the AFIS® model, which arose from the practice in the previous years. These changes will be prepared in the AdV internal audit process and serve for the error correction and/or the changes in the application or the basic scheme (version types). Basic model changes, however, are not planned by the working group for Version 7.0 of the GeoInfoDok.

With the introduction of guidelines for uniform spatial reference of the cadastral survey system in the Federal Republic of Germany in 2006, the Spatial Reference working group has created the requirements for future-oriented structure of reference point fields on the basis of the same strategy decision of the AdV Plenum. The newly defined basic geodetic network points (GGP) serve as the physical realisation and protection of the three-dimensional spatial reference and the incorporation of space, height and gravity reference system. The height and gravity reference points (HFP, SFP) represent the respective reference point first-order networks. Also the SA*POS*®reference stations (RSP) are included in the guideline.

Currently, the working group is working on the refinement of this policy, for example, to sharpen the understanding of an integrated geodetic spatial reference. Time-dependent considerations in the sense of technical coordinates can provide long-term statements about the movement of the earth's surface in three dimensions. Uniform procedures for monitoring and verification of fixed points are matched between the Laender in a common approach.

3. Real estate cadastre, land valuation

The migration of the Official Real Estate Cadastre Information System (ALKIS®) in the Laender is in full swing. In parallel, modelling experts of the AdV are currently working hard on updating the documentation for modelling geo-information of the official surveying (GeoInfoDok). In particular, adjustments for future cooperation with the real estate cadastre and the changes to the ALKIS® object type catalogue that have emerged from the amended land valuation law are being updated in the application schema of AFIS®-ALKIS®-ATKIS® (AAA®). On the introduction of a new reference version the AdV will decide after all the Laender have switched over to ALKIS®.

To meet the ever increasing demand for delivery of ALKIS® data in market-standard formats, a project group of the Real Estate Cadastre working group is currently working alongside the product specification for an ALKIS®-WFS (Web Feature Service) also on a shape product specification for ALKIS® data. Both specifications are still to be decided in 2013 by the AdV committees. Thus, a user requirement for a transnationally uniform distribution of ALKIS®-data is being met.

In addition, the working group has accompanied different legislative procedures that affect the real estate cadastre, for example, the change of the Judicial Remuneration and Compensation Act (JVEG), the draft law on the introduction of uniform Federal land register database (DaBaGG) and the draft law of the Federal Government to regulate legal metrology (Weights and Measures Act - MESSEG).

ALKIS® introduction

Meanwhile, the ALKIS®-real operation is adopted in eight Laender. Thuringia is expected to complete the migration in 2013. The remaining Laender will then follow in 2014 (Figure 9).

The state of the AAA®migration in the Laender has been updated and posted on the website www.adv-online.de.

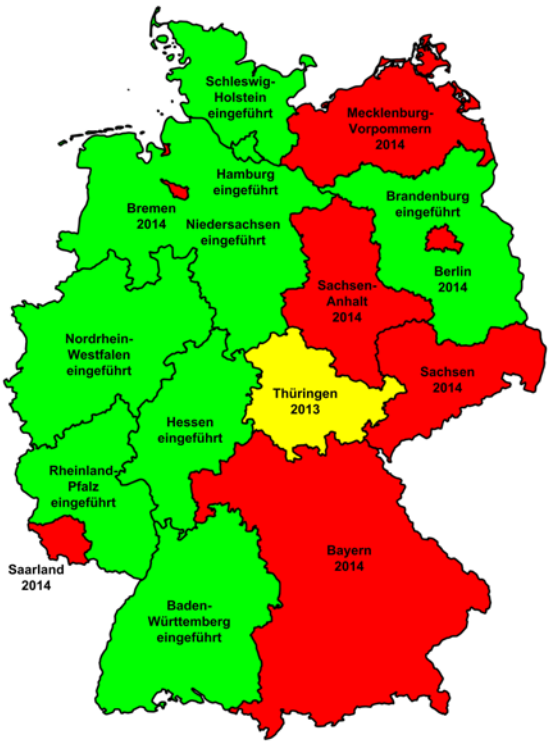

Fig. 9: Status of ALKIS® implementation

Interaction of ALKIS® and computerised land register

In connection with the introduction of the land register database a technical concept was created for restructuring the land use classification types in the land registry. The new concept is necessary because the land use types currently listed in the land registry no longer match the usage type classification in ALKIS®. With this new concept, the AdV aims at the continuation case, the derivation of the land use types from the actual usages of the real estate cadastre during data transfer from ALKIS® to the land registry database by means of a Federally uniform allocation table. The fact that the handling of the land use types is not uniform across the Federal territory complicates this task.

The technical approach is being coordinated with the Ministry of Justice and will be presented to the AdV committees still in 2013 for approval.

Networked land value information system VBORIS 2.0

Land market data are of great importance to business, government, science, and not least to citizens. Therefore, the provision of valuation and presentation of information, especially of land values, via modern telecommunication media has become an important task.

On the initiative of the AdV, the networked land value information system VBORIS was developed several years ago with the aim to provide land values (Bodenrichtwerte, BRW) online, nationwide, uniformly and comprehensively – with the quality seal "official" – on the basis of reference data of the surveying and cadastral authorities of the Laender. A first version of VBORIS was introduced by the AdV in September 2006.

Due to the increased requirements of the BRW in connection with the present opportunities offered by information and communication technologies that allow for improved provision of land values, VBORIS was updated by the same project group of the Real Estate Cadastre working group to version VBORIS 2.0 and in September 2012 approved by the plenary session of AdV. VBORIS 2.0 consists of the following model components: model specification, data model, SDI model, community portal and conditions model.

In the **model description**, the goals of operating a networked land value information system (VBORIS) and the technical specifications for the presentation of the BRW are explained in the light of changing technical and legal requirements and the increased technical capabilities.

In the **data model** the Appendix 3 of the land value policy (interface description) is incorporated and represented as land value file. The data model is based on the AAA®-components and is modelled conforming to GDI. Based on this interface description, the description within the data model was written anew in Unified Modelling Language (UML). The data model allows management and provision of BRW past dates; the design space required for this is depicted in the management of the BRW in the data model.

The technical requirements are reflected in the **SDI model** taking into account the information and communication technology in VBORIS. The core of the SDI solution is the delivery of the land value file and its provision. Metadata, services and standards are mentioned. Through the web services, data access (the data provision) for the joint application to data from the peer review committees – the land value portal – and for third parties (speciality data providers under licensing agreements, GIS operators) is implemented. The data distribution and provision in the portal is future-oriented towards Web Feature Service (WFS) services. The zone boundaries are provided as Web Map Service (WMS) for easy integration into one's own applications. The land value portal of the WMS service provides the map displays or orthophotos as background for the land value representation.

The land value information will continue to be provided in existing community portal through a network to the individual Laender portals. The care of the community portal will continue through the district government of Cologne, Department of Geobasis NRW. The Laender are responsible for updating the content of the community portal.

The existing **conditions model** leave the Laender flexibility that are also required as a result of widely differing emphasis in the Laender at present. The conditions for the release of land values should be made based on the classification of AdV-fees policy for geo-data taking into account the INSPIRE policy. The Task Force PRM of the AdV is currently reviewing whether further harmonization is possible in the model conditions.

There was big resonance from the information and orientation session conducted by the working group at the CeBIT in Hanover in March 2013. VBORIS 2.0 for land parcel valuations was presented to the responsible authorities in the Federal Laender (Figures 10 and 11).

Fig. 10

Fig. 11

The functionalities of VBORIS were presented to the public at the joint stand of the Land of Lower Saxony, with the application BORIS.NI realised in Lower Saxony.

Currently in connection with the development of VBORIS, the land valuation policy (BRW-RL) of the Federal Government is being updated by the BMVBS.

4. Geotopography

Using the Authoritative Topographic Cartographic Information System (ATKIS®)®), the surveying and mapping agencies 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. Once the migration from ATKIS® to the AFIS®-ALKIS®-ATKIS® data model could be completed, a key task during the period under review was to work out and introduce joint standards in the area 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 (Basic 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 common web-based map service of the Federation and the Laender (WebAtlasDE).

Regular updating of the basic 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 3, 6 or 12 months for customers most important object types and/or attributes and basic update of the entire database within at least a five-year period.

With the joint project "ATKIS®generalisation" the conditions were created to derive the DLM50 full-automatically from the basic 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 1:50000 (DTK50) and 1:100000 (DTK100), the corresponding automated, interactive processes were developed and are now ready for use. This marked an important milestone in the effective and efficient provision of ATKIS®products given the increasingly tough user requirements for up-to-date information and shrinking human resources in all surveying and mapping agencies.

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

(1:250000) und EuroGlobalMap (1:1000000) 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 geo-topographical reference 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 ensuing from European projects GMES and CORINE Land Cover (CLC), as well as INSPIRE, for Germany's geo-topographical reference data are being discussed and will be addressed with a view to accomplishing the task in the most efficient manner possible.

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

Digital elevation models

In addition to the position-describing digital landscape models, the surveying and mapping agencies are managing, to represent height as the third dimension, digital terrain models (ATKIS®-DGM) with varying levels of accuracy. These models will be available to administration and businesses as part of the geographical reference data for establishing geographic information systems (GIS). Digital elevation models are digital, numerical, models reduced to regular grid models of the terrain heights and shapes of the earth's surface. DGM can also include additional information (e.g., edges, or skeleton distinctive terrain points). They contain no information on structures (e.g. bridges) and vegetation.

The products of the product group digital terrain models 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 1000 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 or completion of high-accuracy DGM with grid widths of 5 m (DGM5), 2 m (DGM2) or even 1 m (DGM1) are being further expedited in almost all the German Laender. DGM5 data are expected to be available nationwide in the course of 2013. 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 reduced to regular grid models of the heights and shapes of the earth's surface including buildings and vegetation. 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 of airborne laser scanning (airborne laser scanning) and digital image correlation (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

For the first time the survey administrations are jointly offering the 3D building models product as from 2013. The product standard for 3D building models and the data format description in AdV CityGML are adopted and in the first application. Nationwide 3D building models are created with the Level of Detail 1 (LoD1). Here all buildings and structures are provided with flat roof ("block model"). The central office for coordinates and building polygons (Zentrale Stelle Hauskoordinaten und Hausumringe – ZSHH) is providing these data to all users trans-nationally.

In the next stage, the Level of Detail 2 (LoD2), all buildings and structures will be modelled using standard roof shapes in future. The image sequence shows an example of a building with a domed roof in the side view (Figure 12), in the digital orthophoto (Figure 13) and the modelling LoD2 with the associated standard roof shape (Figure 14). The production of these records is already well advanced in some Federal Laender. Furthermore the AAA® model was expanded by the 3D building and 3D structures. These are components of the GeoInfoDok 7.0.

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. Since the end of 2012, the DTK100 is available for the whole of the Federal Republic in a standardised format. 2013 will be the last time that DTK200-V is updated by the BKG; as from 2014, the DTK250 derived from DLM250 automation-assisted will be provided.

Procedures for a largely automated cartographic generalisation of various map series are available and in use in the first 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.

The CD ROM series Top50 and Top200 are widely available for the whole of Germany; there are no plans for a new edition, as increased use is to be made of the potentials of web-based presentations for meeting customer requirements.

Fig. 12: Building with a domed roof, side view

Fig. 13: Building with a domed roof in the digital orthophoto

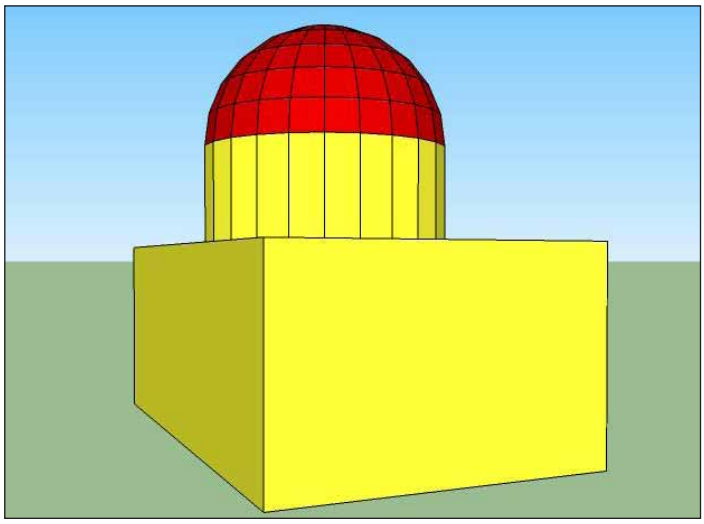

Fig. 14: Building with a domed roof in the 3D building model with LoD2 Standard roof shape

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, first 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 stopped by member administrations during the implementation of their own services in order to avoid differing developments. A formal decision is expected but only in 2014.

WebAtlasDE

The need for official map services among various kinds of user has risen dramatically in recent years. In addition to good performance, "infinite" 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, a joint web-based map service was implemented by the Federal government and the Laender under the name "WebAtlasDE" which was already been linked in many 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.

After a first application of the WebAtlasDE in March 2012 during the activation of the geoportal. DE could be presented at CeBIT, an improved version based on the newly designed signature catalogue (ATKIS®-Web-SK) was activated in autumn 2012 on the occasion of INTERGEO. In order to maintain the high quality of this service in the future and/or even improve it, the steering committee has identified geospatial measures through comprehensive quality assurance and initiated their implementation.

Digital Orthophotos

The surveying and mapping agencies of the German Laender periodically commission aerial photography 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 rounds 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.

Because the results of aerial photography are crucial to the real-time updating of the geo-topographical reference data from 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 meets the requirements for pooling the data of the Laender at the geodata centre of the BKG. The BKG with the Laender offers DOP and visualises it jointly in an available online representation service (DOP viewer). The DOP20 is now a standard product for practically all technical applications with a spatial reference inside and outside the surveying and mapping agencies.

The introduction of digital aerial photograph camera systems places new requirements on the surveying and mapping agencies, but also creates new potentials. The high efficiency of multichannel acquisition permits the simultaneous use of black/white, colour and infrared 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 security and history management, as series of aerial photographs are becoming an indispensable tool for the work of more and more users. The 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 database that meets the requirements of the customers for aerial view series in particular measure.

The digital aerial photographs as the basis for deriving ATKIS®-DOP are increasingly provided by the surveying and mapping agencies 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. Figure 15 shows a result in which landscape elements (vegetation) were automatically classified from the interaction of DOP, image-based DOM and DGM data.

Fig. 15: Image-based classification of landscape elements on the basis of DOP, DOM and DGM data

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 names 1:250.000) is available in a classification of names corresponding to the object types ATKIS® in the AFIS®-ALKIS®-ATKIS® data model. The database comprises around 134 000 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 Geospatial Data 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 information technology coordination of the GDI activities for the AdV at national level.

AAA® model

With its work on the AAA®model, the AdV devised an integrated and harmonised modelling of all geospatial reference data of the surveying and mapping agencies – split into a basic scheme and three technical schemata AFIS®, ALKIS® and ATKIS® – and realised through its member administrations. Therefore, the AAA® basic scheme (Figure 16) forms the basis for the technical application schemata for modelling the AFIS®-, ALKIS®- and ATKIS®-objects and realised such modelling through its standardised data interface NAS. The procedure is documented in the "Documentation for modelling the geoinformation of the official surveying (GeoInfoDok)", which in the current version (currently Version 6.0.1) is being published www.adv-online.de. To be emphasised is the observance consistently implemented in the AAA®-project and application of international norms and standards in the 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 land development information system (LEFIS) as object-oriented professional data model by the land consolidation authorities. LEFIS is a planning system for continuous processing of zoning for the land consolidation process and the agricultural adjustment Act. To support an extensive use of the AAA® model in technical information systems the software scripts forming the modelling basis is available to third parties free of charge.

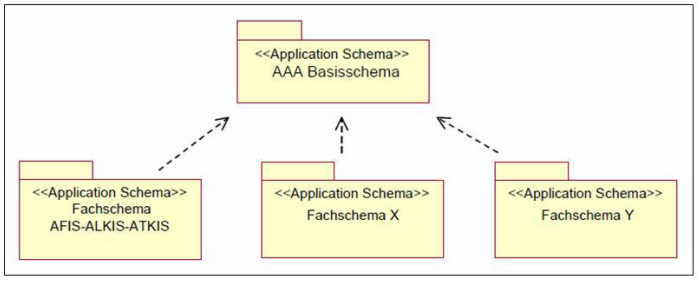

Fig. 16: The application-neutral AAA® basic schema as a basis for modelling application-specific technical schemata (e.g. AFIS®, ALKIS® and ATKIS®)

Developments on the AAA® model are steadily continued within the AdV to meet the requirements of users and GIS manufacturers requirements. With the work on the new Version 7.0 of the GeoInfoDok, AdV has processed 430 requests for revision, and included the GIS companies. In addition to considering the requests for revision documented in the revision list, the following were updated as important novelties:

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

In autumn 2012, a beta version of Version 7.0 of the GeoInfoDok was first discussed in the Member administrations. Until the introduction of Version 7.0 of the GeoInfoDok, the revision management will be continued. The documents for GeoInfoDok shall be made available as before in English after completion of the German versions.

The new Version 7.0 will only be declared the new reference version of the AdV when all member agencies of the AdV manage their geospatial reference data in compliance with Version 6.0 of GeoInfoDok.

Spatial data 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 INSPIRE technical network 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 comparative tables of the INSPIRE data themes of Annex I are available for testing to member administrations. With the adoption of the final data specifications for Annex II and III themes, to take place in 2013, for this conformity of the AAA® data model is yet to be verified. Beyond the INSPIRE specialist network of the AdV, through participation of AdV experts on European committees, the interest representatives of the AdV are present in the European geodata infrastructure process of INSPIRE.

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 applicationneutral AdV-shape profile is still defined in order to meet the increased demand for this data format requirements. These technical profiles form the basis for the respective technical expression as regards the specialist data to be provided (product specification). With this approach, the aim for widespread provision of geospatial reference data as the basis for spatial data infrastructures in Germany and in Europe is to harmonise and further expand the services and data formats produced by the AdV member agencies. 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 seamlessly embedded in the overall strategic approach mentioned in the preface.

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 services for the government, for business, for science and society, the surveying and mapping agencies 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 provisioning of geospatial reference data within a German Land, a nationally standardised, current and high-quality database must be stored and made accessible to the "geomarket" and to the interested public. The use of digital geospatial reference data in industry and administrative units is continually increasing. The surveying and mapping agencies are taking account of this development with application-based changes in the way data are provided: In addition to output on data carriers, web-based data provision has become standard. The surveying and mapping agencies provide digital databases with different characteristics for searching, depiction and for downloading, as well as technical aids, via geoportals and geoservices. The meta information system provides data on availability and characteristics of the products as well as about points of contact for the products.

To enable a nationally standardised product range, the distribution points are networked and provision is standardised. Currently, certain product groups are being provisioned across the Laender in a harmonised manner through the three distribution agencies: the central agency for house coordinates and building polygons (ZSHH), the central agency SA*POS*® (ZSS) and the geodata centre (GDZ) of the Federal Agency for Cartography and Geodesy (BKG), which also supplies the government with geospatial reference data.

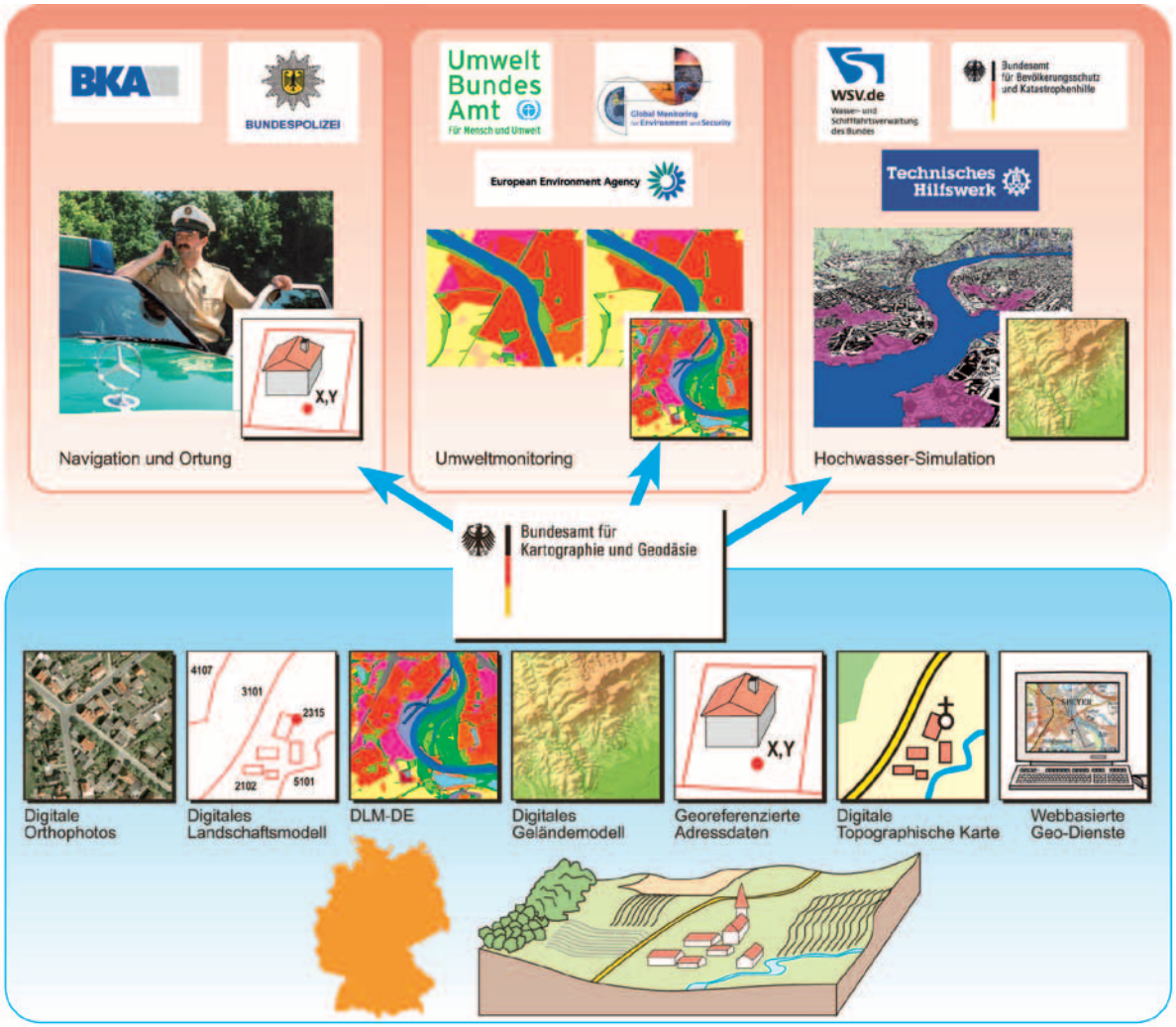

Fig. 17: Central supply of government institutions with geospatial reference data by the BKG geodata centre

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:

- Collection and documentation of the requirements of state and civil society and their alignment with the offer of geospatial reference data (requirements survey and analysis),
- 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 services (conditions and distribution policy),
- Supporting activities for achieving a strategic and technical infrastructure for the provision and use of geo-spatial reference data and services,
- Implementing measures for information on the availability and usability of the geospatial reference data and services (product information) and
- Implementing measures for the positive perception of the Germany's official surveying and mapping and its national geospatial reference data product range (image maintenance).

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. In order to obtain the requisite information about the users' needs and requirements for the geospatial reference data (product, intended use, product satisfaction), as well as the provision conditions and product information (information and contact channels to the surveying and mapping agencies), the central distribution agencies conducted an Internet-based user survey based on a standardised questionnaire and analysed the results jointly with the TF PRM. To obtain additional statements, a geodata survey took place at the municipal, Laender and Federal authorities.

Licence and Fee Model

To regulate rights of use in connection with the provision of the geospatial reference data and 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 authority has approved the guideline for fees for the provision and usage of geospatial reference data of the surveying and mapping agencies of the German Laender (AdV fees guideline) and published it at www.adv-online.de. It is used by the central distribution agencies and implemented in the individual German Laender. To guarantee a standardised and proper design of the AdV fees guideline, 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 guideline 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 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 agencies and for the central distribution agencies. It also supports the sharing of knowledge regarding the application of the AdV fee guideline.

Model Licence Agreements

Given that the nationwide provision of geospatial reference data and services continues to be standardised and that the surveying and mapping agency 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 geospatial reference data were developed. These sample agreements are used in the central distribution agencies and are recommended for licensing within the Laender. The interested public can view and download them from www.adv-online.de and use them for their own purposes.

Information Documents and Corporate Design

To ensure that Germany's official surveying and mapping authorities has a standardised appearance in both words and image, the AdV adopted a Corporate Design (AdV-CD) in 2009 and made it available to all member authorities. The AdV CD was optimised in accordance with practical requirements and released for use by the AdV President in March 2011. The updated version introduces the three new logos for AFIS®, ALKIS® and ATKIS®.

Fig. 18: Logos for AFIS®, ALKIS® and ATKIS®

Fig. 19: 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 agencies 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 Maintenance

For the surveying and mapping agencies to be perceived in a positive light, public relations activities must be actively pursued, appropriate media used and effective appearances sought for this purpose. The TF PRM has produced a geofilm 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 use effective, the film is published on the AdV website (www.adv-online.de) and has German and English subtitles. It also carries sign language. The interested public also receives regular information about information events. There are plans to hold a "Geo Day" on the same date every year, on which all surveying and mapping agencies provide information about the various geospatial reference data topics at the same time.

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 the products (geospatial reference data) of the surveying and mapping authorities in the Laender. As in previous years, the official surveying and mapping authority – represented by the AdV – took stands at INTERGEO® 2012 in Hanover (Figure 20), the world's leading fair for surveying and mapping, and also at other trade fairs. Apart from the presentation of the products and services of the official German surveying and mapping, accompanying presentations and discussion forums also took place.

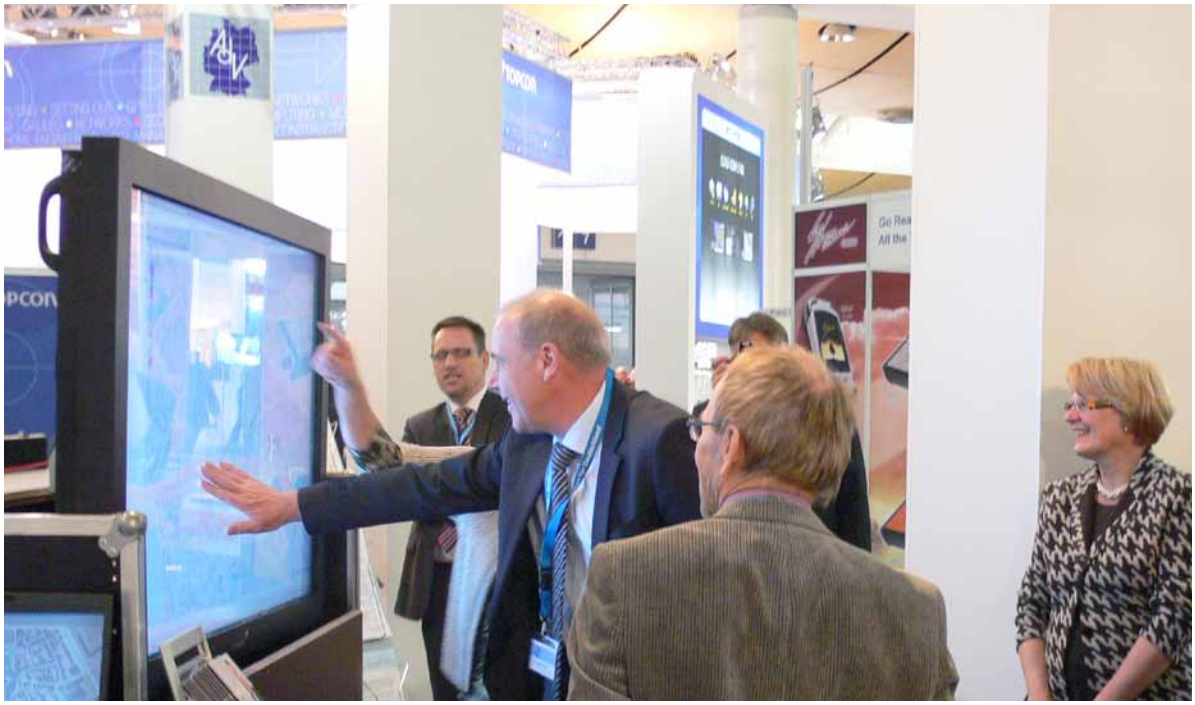

Fig. 20: Joint stand of AdV at the INTERGEO® 2012 in Hanover

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, surveying, cartography and 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 Geospatial Data Infrastructure in connection with the INSPIRE framework directive and the programme Copernicus (former "Global Monitoring for Environment and Security", GMES). 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 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 country 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 of 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 36 European countries.
- 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 of 8 – 10 m.

The BKG as product coordinator is responsible for merging of the national contributions, 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.

In December 2010, a new agreement was concluded between EuroGeographics and Eurostat for the continued supply of new versions of EBM, ERM and EGM. The agreement will run for four years, stipulates annual updates, the incorporation of further countries and several new object types and attributes. Another aim is to derive EGM largely automatically from ERM through generalisation. EGM is available on the internet free of charge since March 2013.

European Location Framework

With the completion of the project European Spatial Data Infrastructure Network (ESDIN, 2008 – 2011), EuroGeographics together with partners from science and industry successfully completed a project proposal under the European support ICT-PSP 2012, which builds on and further develops the knowledge and developments from the ESDIN project.

This new project "European Location Framework (ELF)" was launched on 1 March 2013. It has a term of 36 months and 30 partners are involved. The aim of the project is to make European official geodata more accessible and usable through the creation of a sustainable technical infrastructure.

Copernicus / GMES

Copernicus is the new name of the program "Global Monitoring for Environment and Security" (GMES) since 11 December 2012, 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 / GMES. Copernicus / GMES uses satellite data from existing missions, while building its own capacities with the Sentinel missions. The satellite data flow together with expert and reference data from the Federal and geodata of the Laender in Copernicus / GMES 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.

As part of his job as a technical coordinator for the land monitoring service, BKG has accompanied this service professionally. The technical coordinator is also the point of contact and the Federal Republic of Germany's representative at the GMES User Forum of the European Commission for the respective service. The User Forum met three times in 2012 and dealt with each service, user involvement and the GMES program of work.

The 2. Strategy Forum on remote sensing organised by the Federal Ministry of the Interior was carried out together GMES-Thementagen Deutschland 2012 hosted by the Federal Ministry for Transport, Building and Urban Development and the thematic coordinators. The joint event was held under the theme "Earth Observation in support of the energy transition and adaptation to climate change" and was held from 14–15 November 2012 in Dusseldorf. In twelve theme workshops users and providers could intensively discuss the latest developments. The BKG oversaw the theme workshop "Changing Landscape".

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 OGC. From a strategic perspective, the GIS standardization of OGC and ISO for the maintenance and development of AAA®data model continues to play a central role in order to make the basic geodata 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 with OGC (e.g. Geographic Markup Language – GML) and only then introduced with ISO and adopted as a formal standard. In addition, the new AdV profiles (e.g. the AdV WMTS profile) are based partly only on OGC standards because there are no corresponding ISO standards. Therefore, AdV represented by the Information and Communication Technology working group, actively works with OGC and is also a long-standing voting member.

ISO/TC 211

This technical committee 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 issues are becoming increasingly technical, so 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.

So far there are about 60 different standard projects (see www.isotc211.org). Although not all being of equal importance for the AAA® data model, 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 worldwide twice per year. In June 2014, it will be organised in Germany (Berlin).

Permanent Committee on Cadastre in the European Union (PCC)

On 1 July 2012, Cyprus took over the EU Council Presidency and hence also the Presidency of the PCC for the 2 half-year of 2012. The General Assembly of PCC to conclude the presidency was held in on the Island of Cyprus. In the centre of the conference was the establishment of a "common vision" of four European and/or international organisations relevant for cadastre:

- Permanent Committee on Cadastre in the European Union (PCC, www.eurocadastre.org) representing the cadastral authorities in the EU (for Germany: AdV as full member, represented by the Secretary General);
- EuroGeographics (www.eurogeographics.org) as representative of the surveying authorities (and increasingly also cadastral authorities), the EU and many other countries in Europe and neighbouring countries (for Germany: BKG as a full member and AdV as associate member);
- European Land Information Service (EULIS, http://eulis.eu) as a web portal, providing metadata to different land registry systems of the Member States of EULIS and (in a protected environment) allows direct access via the Internet to the individual registers (Germany is not yet a member here, a German membership being discussed);
- European Land Registry Association (ELRA, www.elra.eu) as the union of the land registry organisations in the EU Member States (for Germany: Member of the Federation of German judicial officers, currently represented by a judicial officer of the land registry Munich).

Core objective of this "common vision" is, among other things, the recognition of the fundamental importance of cadastral and land registry information and services in Europe for sustainable economic, social and environmental development. For this, continuous updating of the information and services and their adaptation to the needs for land ownership, value of land, land use and other land development functions at national and European level is important. This will be achieved through

- Awareness of the decision makers for the fundamental importance of cadastral and land registry information and services for safe and effective land acquisition, protection, use and purpose of legal claims, further ground for reliable values for efficient land use and sustainable rural development;
- Awareness of the crucial role of land registry and cadastre for the protection and prioritization of rights, for reliable and authoritative information and modern services that meet the needs of private and public users;
- Closer cooperation at European level between the cadastral, surveying and land registry authorities in order to facilitate communication with the European institutions, with the aim to promote the shared vision.

The General Assembly has additionally addressed other important topics as the state debt crisis in certain EU Member States, 3D cadastre (www.3dcadastres.nl) and the plans to create a "seabed cadastre" in some parts of the world in terms of increasing construction of off-shore wind farms as part of the energy revolution and increased activities in seabed mining. There is an initiative for "marine geospatial data infrastructure" also at the United Nations.

On 1 January 2013, Ireland took over the presidency for the 1 half-year of 2013. The General Assembly to conclude the presidency was held in Dublin in mid-June. On this occasion, the Head of the AdV Real Estate Cadastre working group presented a lecture on the ALKIS® implementation in Germany.

On 1 July 2013, the presidency of the EU and hence of the PCC will be transferred to Latvia for the second half of 2013.

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