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

National Report

2022 / 2023

AMTLICHES DEUTSCHES VERMESSUNGSWESEN

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2022/2023

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German Association of Publicly Appointed Surveyors	www.bdvi.de
German Federal Working Group Sustainable Rural Development	www.landentwicklung.de
German Geodetic Commission	www.dgk.badw.de

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

Updated 08/2023

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Dear Readers,

Just as for society, these are eventful times for the official German Surveying and Mapping. The current challenges require an organisationally modern and goal oriented AdV. The digital conferencing tools, which have proven their worth in the pandemic, are an additional element that enables quick, agile, and flexible coordination to be carried out. The impact of the pandemic on the official surveying system were less severe than for other areas. Rather the opposite: the need for reliable, up-to-date, and accurate geospatial data and geoservices has increased even further.

The surveying authorities of the Laender have traditionally been the custodians and curators of official geospatial data. The responsibility associated with this governmental function is to be exercised confidently with the aim of improving the use of official geodata and promoting their application to issues of economy, society and environment. In this sense, the efforts of the EU Commission also aim at promoting data use in general. The legal acts issued by the EU were evaluated by AdV with regard to the legal repercussions on AdV products in order to be able to implement them promptly via resolutions. The AdV Fee Directive was adjusted accordingly. The licensing of the majority of official geospatial reference data of the Laender and basemap.de will be carried out in the future through simple licensing conditions according to Open Data principles. In addition, much official geospatial reference data could already be provided, in advance, for the European Environment Agency as well as for Eurostat, thus ending the “shadow existence” of geospatial reference data on the European level.

The federal official surveying and geoinformation system leads to a competition of technical and legal implementation and is successful when different paths nevertheless lead to a uniform result on a national level. In order to be able to act successfully here, the central provision of AdV products and services must be advanced further. The operational use of the first products of basemap.de has started, the technical office for the new land cover product (Cop4All) is being set up and the central provision of a new positioning service (PPP-RTK) is firmly planned. Currently, there are further considerations on creating a central office for the real estate cadastre – so far a novelty – but from the provider’s and user’s point of view almost without alternative, because these data are increasingly demanded centrally, e.g. for own applications as well as in the financial administration.

Overall, the tasks are becoming more complex and of higher quality, and digitization with the use of modern and new processes such as artificial intelligence is increasing. AdV must focus on technical innovations, the comprehensive alignment of geospatial reference data towards a data-driven society and its secure and reliable provision. The new geopolitical situation also requires an examination of geospatial reference data as critical infrastructure or infrastructure requiring special protection. At the same time, like many other sectors, we have to deal with the shortage of skilled workers. To attract skilled workers, the attractiveness of official surveying professions must be increased. Here, it is important to try out new approaches, whilst ensuring the quality of training through uniform standards and examinations. As in the case of geospatial reference data, the nationwide uniform standards for professional training should also ensure the task fulfilment.

Thanks to many active colleagues who contribute to the AdV committees with commitment, competence, expertise, persuasiveness, ideas, and innovative spirit, AdV has developed into a federal-Laender body that need not shy away from comparison in this form.

I hope that this national report will provide you with interesting insights into the work of AdV as well as many new findings.

Andre Schönitz

(AdV-Chairman 2022/2023)

1. Organisation and Performance of Tasks

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

Organisation of AdV

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

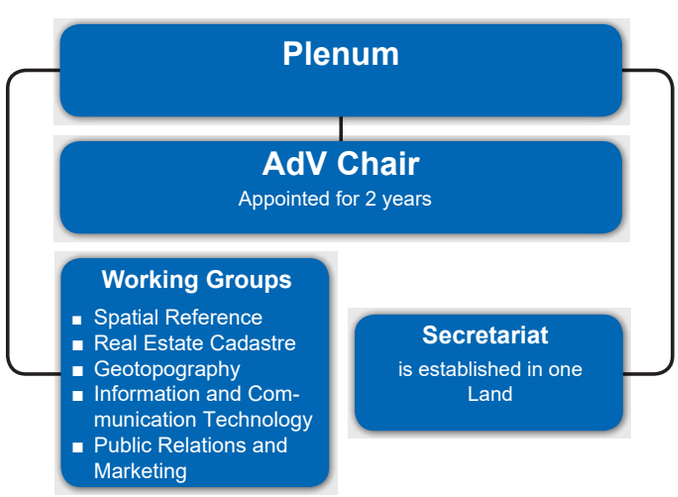


Figure 1: Organisation of AdV

Objectives and Tasks of AdV

The member authorities collaborate within AdV to:

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

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

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

Geobasis Steering Committee

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

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

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

Suveying and Cadastre Authorities of the Laender

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

The surveying and geoinformation administrations are attached to various ministries in the individual Laender, with the Interior Ministry being the most frequently represented. Structural changes have been made in many authorities. In certain Laender, the real estate cadastral authorities and in some cases also the regional development / land consolidation authorities are now integrated into the higher-level geoinformation authorities. In other Laender, local areas of responsibility have been expanded by the amalgamation of real estate cadastral authorities. The key aspects of the geoinformation system – management of the real estate cadastre and geotopography as well as land surveying including the provision of official reference systems – are the responsibility of the Laender. The original services offered include:

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

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

Land	Inhabitants	Reference Area in km²	Cadastral Parcels in thousand	Number of Authorities		ÖbVI
				State Offices (State enterprises)	Regional Offices	
Baden-Wuerttemberg	11.124.642	35.748	8.905	1	56	145
Bavaria	13.176.989	70.542	10.935	1	51	0
Berlin	3.677.472	891	403	1	12	46
Brandenburg	2.537.868	29.654	3.143	1	17	139
Bremen	676.463	419	207	1	—	5
Hamburg	1.853.935	755	259	1	—	7
Hesse	6.295.017	21.116	4.988	1	7	66
Mecklenburg-Western Pomerania	1.611.160	23.295	1.945	1	7	61
Lower Saxony	8.027.031	47.710	6.251	1	—	91
North Rhine-Westphalia	17.924.591	34.113	9.359	1	53	341
Rhineland-Palatinate	4.106.485	19.858	6.243	1	6	78
Saarland	982.348	2.572	1.294	1	—	9
Saxony	4.043.002	18.450	2.817	1	13	88
Saxony-Anhalt	2.169.253	20.464	2.692	1	—	44
Schleswig-Holstein	2.922.005	15.804	1.952	1	—	34
Thuringia	2.108.863	16.202	3.250	1	—	54
Total for Germany	**83.237.124**	**357.592**	**64.643**	**16**	**222**	**1.208**

Tab. 1: Source for number of inhabitants and reference area
https://www.destatis.de/DE/Themen/Laender-Regionen/Regionales/Gemeindeverzeichnis/Administrativ/02-bundeslaender.html
Note: As of the 2016 reporting year, the figures in the "Number of inhabitants" column are comparable with the previous year's figures only to a limited extent due to methodological changes and technical enhancements.
Area in Rhineland-Palatinate: Including the "joint German-Luxembourg territory" of 6.20 km2.
Area in Mecklenburg-Western Pomerania: Including "coastal waters incl. share of continental shelf" of 1.00 km2.
Area in Saarland: Including the "joint German-Luxembourg territory" of 1.03 km2.
Deviations in the area figures are possible due to figure rounding.
Due to technical and methodological changes in the surveying administration to the "Official Real Estate Cadastre Information System" (ALKIS®), the comparison of area data from 2014 with area data from previous years is only possible to a limited extent. © Data (commissioned by the Statistical Offices of the Federation and the Laender): Federal Statistical Office (Destatis), 2022
Source for parcels, number of authorities, ÖbVI: AdV, as of 31.12.2022

Federal Ministry for Digital and Transport

The Federal Ministry Digital and Transport (BMDV) has been a member of AdV since 1950. Division DP23 coordinates the multi-layered use of geospatial reference information provided by the Laender within the Ministry and its executive agencies with more than 16 higher-level authorities and the transfer of know-how from surveying units of the "wet" directorates-general (i.e. waterways and shipping) to AdV.

The Federal Waterways and Shipping Administration (WSV) is responsible for the maintenance (in terms of traffic and water-management) of the federal waterways (around 7,300 km of inland waterways and around 23,000 km² of sea waterways). In addition to its maintenance obligations, the WSV is also responsible for ensuring traffic safety of federal waterways. The surveying/geospatial information section provides, amongst other things, geo-referenced data, processed to form user-focused products, for instance data on water depths and the topography of the riverbed. Official surveying functions are performed nationwide, and they require close coordination in AdV. The WSV provides its own basic network along the waterways (location and elevation benchmarks) and keeps a set of 1:2,000 scale digital charts whose contents inform the evolution of the ATKIS® basis digital landscape model.

For the maritime sector, the Federal Maritime, and Hydrographic Agency (BSH) performs marine surveys in the German North Sea and Baltic Sea – the most navigated waters in the world. Maritime surveys and maritime cartography provide necessary basic information for environmental protection, the construction of offshore installations, coastal protection, and hydraulic engineering. The area surveyed of the BSH covers around 57,000 km², which is equivalent to one sixth of the land area of Germany. This area is displayed on a set of nautical charts with around 300 datasets for electronic navigational chart systems plus 144 nautical charts in paper format. In addition, comprehensive datasets on the current and historical chemical, physical and biological condition of the water column in the German territorial sea plus operational information and forecasting services for the water levels, the tides, sell and drift are provided via a web-based spatial data portal as a maritime component of the Spatial Data Infrastructure Germany (GDI Germany).

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

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

In addition, BMDV has lead responsibility in coordinating the European Union's Copernicus earth observation programme within the Federal Government. The Federal Government's Copernicus strategy, which was adopted by the Federal Cabinet in September 2017, defines Germany's objectives and fields of action for Copernicus so that government, public authorities, industry, academia but also all citizens can benefit substantially from the programme. The measures resulting from these fields of action fall under the responsibility of different departments. To support coordination, concrete national activities are formulated and adopted in regular work programmes of the Federal government.

More detailed information on geospatial information of the Ministry and its executive agencies can be found on the website www.bmdv.bund.de in the section: "Themen"/"Digitales"/"Digitale Gesellschaft"/"Geoinformationen" (in German only).

Digital terrain models of the watercourse (DGM-W) and use of UAS (drones)

Pursuant to § 8 of the Federal Waterways Act (WaStrG), the Federal Waterways and Shipping Administration (WSV) has the duty to maintain the federal waterways. This duty also includes maintaining the proper conditions for navigability.

Digital terrain models of the watercourse (DTM-W) have, for many years, provided the WSV with indispensable reference data.
It is of particular importance that the waterway is mapped in its entirety, as morphodynamical processes are not limited to the navigation channel, but also take place in groyne fields, river margins, embankments, banks, and foreshore areas up to the high-water mark.

To create a DTM-W, geotopographic data is collected using airborne laser scanning (ALS) flights of the land areas (dry areas) and echosounder soundings of the water bodies (wet areas), among other methods.

The DGM-W campaigns of the WSV are closely coordinated with the higher authorities in the business area of the BMDV as well as the relevant state authorities.
In the WSV, this task is usually performed by the Federal Waterways and Shipping Administration's Geodesy and Geoinformatics Unit (FGeoWSV).

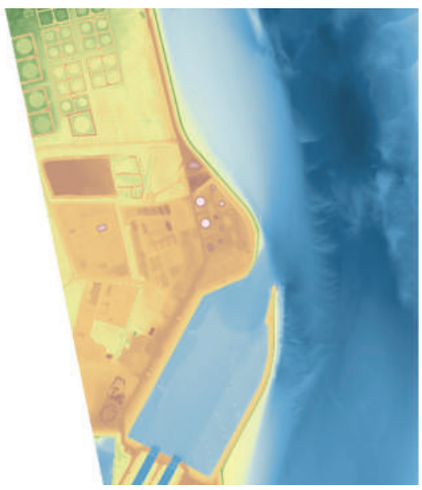


Fig. 2: Example of a DGM-W evaluation. Source: FGeoWSV.

As a nationwide bundling agency, the FGeoWSV assumes the tasks of constructional surveying as well as topographic and hydrographic surveying on federal waterways, with the aim, amongst other things, of creating digital terrain models of the watercourses.

Particularly on the Rhine, which is in the focus of national and international attention due to its importance in terms of transportation policy, also with regard to the important industrial locations, it is vital to ensure, maintain and promote the ease and safety of shipping traffic.
The great importance of the Rhine as a federal waterway is also made evident in the fact that the “Unloading optimisation of the fairways on the Middle Rhine” has been classified in the highest category of new projects (“priority need – bottleneck removal”) in the Federal Transport Infrastructure Plan 2030.

The FGeoWSV is currently commissioned to create a digital terrain model (DGM-W) of the entire free-flowing course of the Rhine as a basis for necessary implementation planning and future-oriented sectoral planning. The Middle Rhine section forms the data basis for the project “"Unloading optimisation of the navigation channels on the Middle Rhine”.

Laser scan data as the basis for 3D models

Due to the prolonged dry period in 2022 and the resulting low water levels of the Rhine, significantly more data than usual could be collected during the aerial survey of the area along the Middle Rhine, especially in the shallow water areas and hydraulic areas, which are otherwise inaccessible and therefore difficult to record.

This is where the so-called bathymetric airborne laser scanning (bALS) was employed. In contrast to conventional systems (ALS), this method works in the green spectral range, a wavelength that penetrates the water and with which the bed of the water body can also be recorded in shallow water areas.

In addition, further aerial surveys were also carried out with conventional systems. These ALS surveys were not only carried out with aircraft from high altitudes, but also by the usage of drones. A wide variety of sensors and measuring methods are used to record the underwater topography. The channel as well as other areas of the fairway are surveyed with the help of hydroacoustic and area-based sounding systems, including sounding ships of the WSV. The sounding data collected and validated in this way represent the riverbed as a 3D point cloud. The DGM-W is made freely available to AdV as part of the geospatial reference data.

Fig. 3: View from an aeroplane of the Middle Rhine at low water.
Source: AHM (AirborneHydroMapping GmbH)

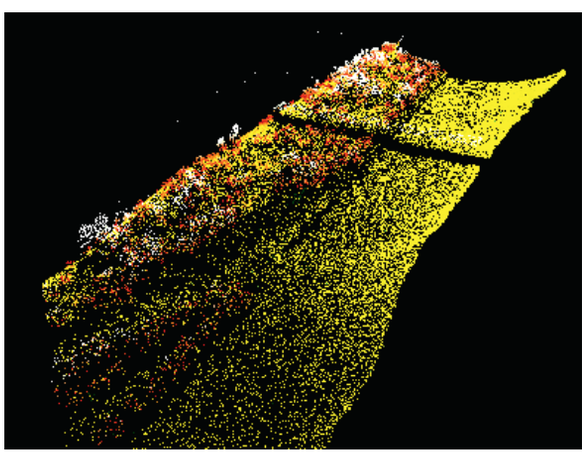


Fig. 4: Point cloud from a bathymetric ALS survey flight.

Working group “Drones/UAS in the WSV”

The abbreviation UAS stands for “Unmanned Aircraft System” and refers to a complete system consisting of an aircraft with ground control station, a communication infrastructure for sending and receiving data and an apparatus for image/video evaluation.

Such drones have been in use for several years for geodetic engineering tasks and also offer great potential for waterway and navigation administration.

Fig. 5: UAS deployment in WSV.
Source: WSA Elbe-North Sea

UAS are mainly used in the WSV's fields of activity for construction and surveying tasks of each waterways and navigation office (WSA), but also in the fields of cartography, hydrology, public relations and in the event of maritime accidents. The use of such unmanned systems is an efficient method, e.g. for recording and monitoring the condition of the numerous WSV facilities such as locks, weirs, bridges, and lifts.

Federal Ministry of the Interior and Community

The Federal Ministry of the Interior and Community (BMI) is a member of AdV. Division H II 5 "Geoinformation" in the Department of Community, Subdivision H II Equal Living Conditions, Demography, Municipalities promotes the provision of geoinformation, provides information on its possible uses and assumes the coordinating function between the parties involved in geoinformation within the federal administration, including through the Interministerial Committee for Geoinformation (IMAGI), as well as in dialogue with the Länder, e.g. within the framework of AdV and the GDI-DE. It supervises the Federal Agency for Cartography and Geodesy (BKG), the central service provider and competence centre for geoinformation and geodetic reference systems of the federal government.

The BKG deals with the collection and data management as well as the analysis and combination of geospatial data up to their provision. The work of the BKG serves federal institutions in particular. In addition, the public administration of federal states and municipalities as well as economy, science and almost every citizen in Germany benefit. Experts from a wide range of fields such as transport, disaster prevention, homeland security, energy, and the environment use geodata, maps, reference systems and information services from the BKG for their work.

The BKG fulfils the following tasks in the field of geoinformation and geodesy in cooperation with the Laender:

- The provision and presentation of up-to-date analogue and digital topographic and cartographic information and the further development of the necessary processes and methods,
- the provision and maintenance of the geodetic reference networks of the Federal Republic of Germany, and
- the representation of the interests of the Federal Republic of Germany in the field of geodesy and geoinformation in the international arena.

In the field of geodesy, the BKG provides a uniform spatial reference system (coordinate system) for the entire federal territory. For this purpose, it operates three geodetic observatories with partner institutions in Wettzell (Bavarian Forest), La Plata (Argentina) and O'Higgins (Antarctica). The BKG collaborates with a network of observatories and analysis centres worldwide to determine the orientation of the Earth in space. This includes, for example, the actual orientation of the rotation axis and the current rotation speed. At the observatories, the

BKG also observes the movements of the Earth's satellites. From this, satellite orbits, station coordinates and also changes in the Earth's surface are determined in international cooperation. All these measurements are a prerequisite for functioning satellite navigation.

In the field of geoinformation and cartography, the BKG is responsible for preparing, providing, and updating topographic (location-describing) and cartographic information. For example, the BKG provides digital maps, terrain models, elevation models, aerial photographs, administrative boundaries, toponomy and other topographical data, as well as paper maps, which are used as valuable aids by, for example, the Federal Police, the Federal Agency for Technical Relief (Technisches Hilfswerk) or the Federal Foreign Office. The BKG's service centre is the central point of contact. Whether standard maps or individual needs – public administration, businesses, science and interested citizens will find practical services and products here.

The Spatial Data Infrastructure Germany (GDI-DE) stands for the comprehensive networking of geodata at federal, state, and local authorities. With the GDI-DE coordination office, the BKG coordinates the development, expansion and maintenance of the federal share of the GDI-DE and operates its central components, for example the Geoportal.de (www.geoportal.de).

Beyond the borders of Germany, the BKG contributes in close cooperation with its European and international partners to the provision and realisation of a uniform spatial reference and the establishment of a European and global spatial data infrastructure.

Further information on the current work, services, and products of the BKG can be found on the website www.bkg.bund.de.

Data provision of AdV for Europe

The European Commission operates several internal spatial data services that form the basis for important policy decisions, e.g. in health, education, or the European Green Deal. Furthermore, the European Commission provides spatial data services to the public under a single open data licence.

From the European Commission's point of view, official geospatial data should form the basis of European spatial data services in order to ensure consistency, comparability, and reliability of data in all EU Member States. For Germany, this includes the official geospatial reference data of AdV, in particular. These geospatial data have been available in the BKG in a harmonised form throughout Germany and are made available centrally by the BKG for the performance of tasks in the federal administration. In order for the BKG to fulfil its task of external representation of the Federal Republic of Germany towards the European institutions, it takes over the provision of data to the European Commission and its agencies with the approval of AdV. In doing so, the terms of use of AdV, with the indication that the authorship of the data lies with the Laender due to their constitutional responsibility, are taken into account.

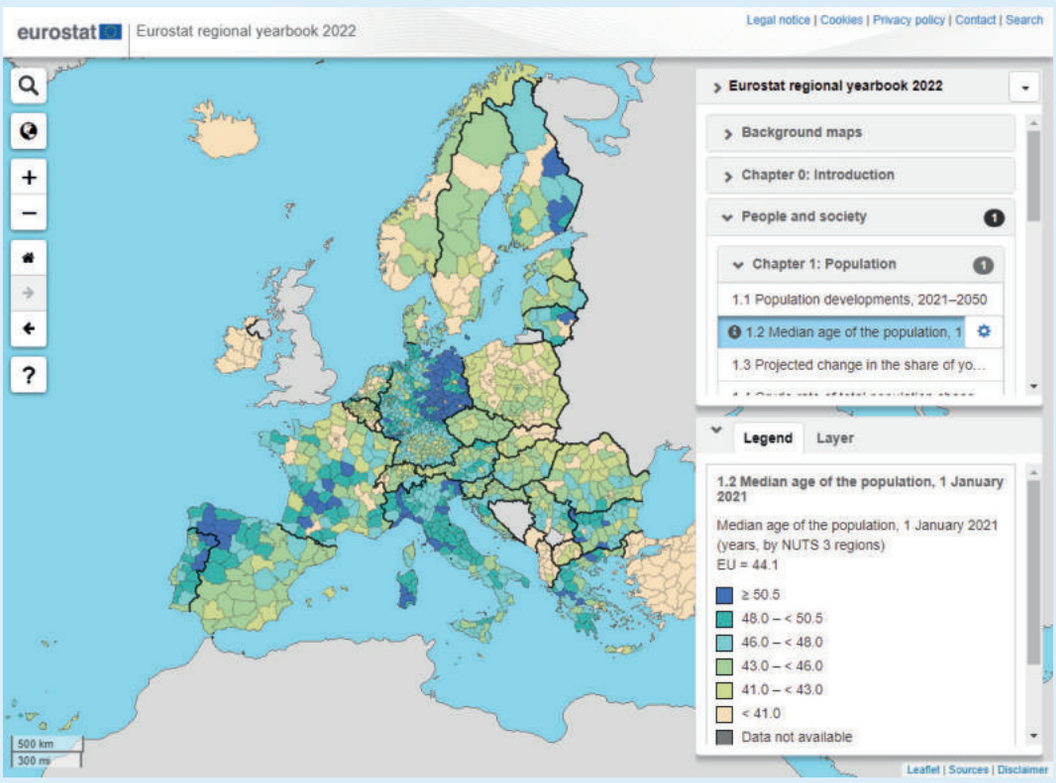


Fig. 6: Eurostat Statistical Atlas / digital edition of the statistical yearbook *Source: Eurostat*

Data provision of AdV for Europe

Data provision for the European Commission

Eurostat is the statistical office of the European Union and is responsible for providing high-quality statistics and data on Europe. This includes geographical information at EU, national and regional level. To meet these needs, Eurostat maintains the European Commission's Geographic Information System, GISCO.

Independently of the new Open Data Directive with its list of high-quality datasets, the BKG has transmitted, amongst other things, the administrative units at a scale of 1:25,000 and a selection of points of interest (POI) to Eurostat in 2022 already. Access to the orthophoto service DOP40 of the BKG was also granted in 2023.

This means that Eurostat can also use official German geospatial reference data within GISCO to provide GIS (reference) data, services, and software. In particular, cartographic, and spatial analyses are supported and Commission-wide geoinformation activities are coordinated and promoted. This also applies to activities for the integration of statistical and spatial information.

Data provision for the European Environment Agency (EEA)

On the basis of a decision of the then Steering Committee "Geodata Centre", an agreement between the European Environment Agency (EEA) and the BKG existed since April 2013 for the provision of geodata for the "Copernicus Emergency Management Service" (EMS). Since 2022, the data for the EEA has been provided by EuroGeographics in a coordinated manner via agreements for each Copernicus service.

The BKG signed the agreement on the EMS on behalf of AdV. The EEA can now retrieve orthophotos, topographic raster maps, georeferenced topographic vector data and digital elevation models of AdV from BKG. The EEA uses these data for emergency mapping and for early warning and monitoring. For the services "Copernicus Land Monitoring Service" (CLMS) and the "Copernicus Security Service" (CSS), the agreements were also signed by BKG on behalf of AdV in early summer 2023.

The geospatial data provided, such as orthophotos, digital elevation models, geodata on land use and land cover, topographic raster maps and georeferenced topographic vector data, are used for the creation and validation of the Copernicus services.

For the Land Surveillance Service, they are used, for example, to map land cover and land use, to monitor environmentally relevant hotspots, as imagery or for the European Ground Movement Service. The Security Service uses it to monitor Europe's borders, maritime traffic and support the EU's external action.

Data provision for EuroGeographics

In the project "Open Maps for Europe" (2020–2022), a user-friendly web interface was created in which freely usable maps from more than 40 European Laender are available for viewing and downloading.

The pan-European datasets are produced using official national data from EuroGeographics members and freely available Copernicus data. These include topographic maps (ERM, EGM – see chapter 7), the digital elevation model (EuroDEM), a European mosaic (created from satellite image data), a (prototype) cadastral map and the European name service Open Gazetteer.

In 2021, AdV has agreed to the publishing of the German part of the EuroDEM.

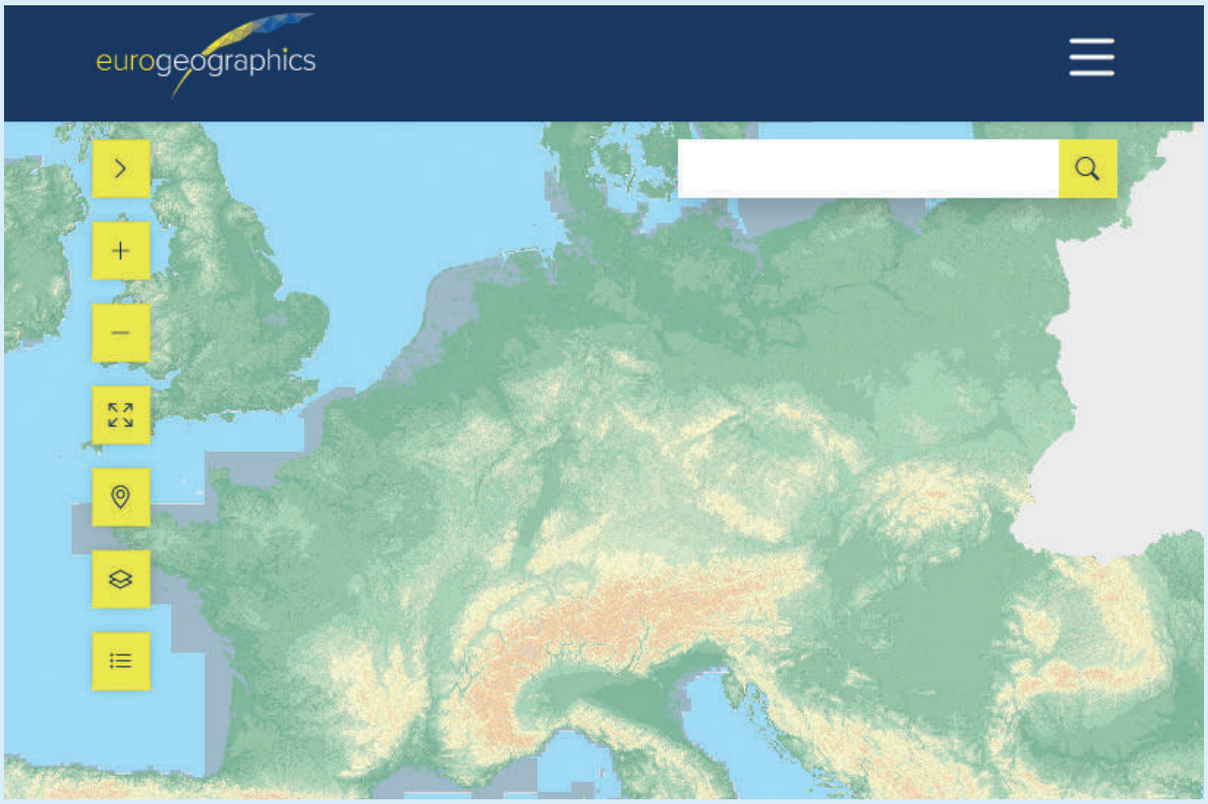


Fig. 7: Open Maps for Europe: EuroDEM (https://www.mapsforeurope.org/explore-map/euro-dem).

2. Working Group Spatial Reference

The integrated geodetic spatial reference adds value

The GNSS measurement campaign carried out in the summer of 2021 generated extensive data material for the 250 geodetic base network points (GGP). The evaluation is carried out at two computing centres – the BKG in Frankfurt/M. and the State Office for Geoinformation and Surveying of Lower Saxony in Hanover. Both computing centres thus have the 24-hour observation data from at least two point occupations. In the first stage of the evaluations, only the pure GGP network is considered in two variants. One variant using the GNSS antenna calibration results from the antenna measurement chamber and the other variant using the robot calibration results.

Fig. 8: Image of the GGP Altenberg from the south. Photo: Christian Lewerenz (BKG)

The evaluations show a high level of congruity and accuracy between the two calculation points and variants. In a first comparison with the results of the 2008 campaign, some significant movements of the points in position and height can be seen. The expected geological movement rates are also recognisable in the centimetre range. The requirement for a positional accuracy of 1 mm and a height accuracy of 2 mm for the point determination was met.

In the further evaluation steps, the GGP network is computationally supplemented by selected ground-based reference stations of the reference station network (RSN). This evaluation provides clues as to which RSPs are to be used as active date points in the future. The last evaluation step will be carried out with the addition of the reference stations of the SA*POS*® network and individual stations of the integrated geodetic reference network of the federal government (GREF stations). This result enables the provision of a possibly new realisation of the spatial reference and is an important basis for the quality assurance of the RSN monitoring and for the positioning services SA*POS*® as well as the precise single point determination by a real-time kinematic approach (PPP-RTK).

Technical transformation parameters published

Since 1 April 2020, the quality of the German reference station network (RSN) is ensured by weekly monitoring and the annual derivation of the coordinate time series of the reference stations. As of March 2023, uniform technical transformation parameters for the datum transition for coordinates in the global reference system ITRS into the official geodetic coordinate reference system ETRS89, valid for one year, will be derived from the permanent RSN monitoring and published on www.adv-online.de. By doing so, AdV provides all users with a means of transferring current observations within the global reference system into the official geodetic reference system.

Recording ground movements throughout the Land – the Saarland ground movement cadastre (SaarBoBeKa)

The Working Group on Spatial Reference as well as several Laender are working intensively on the topic of generating ground movements from radar images using the InSAR technique.

Ground movements may pose potential hazards to humans and the environment. This is particularly important in a mining affected state like Saarland. The identification of potentially hazardous ground movements is therefore an important tool for preventing damage to structures, transport infrastructure and the environment. In Saarland, the “SaarBoBeKa” project was implemented on the initiative of the Ministry for the Environment, Climate Protection, Mobility, Agriculture and Consumer Protection by the State Office for Surveying, Geoinformation and Land Development (LVGL) and in cooperation with RAG Aktiengesellschaft (RAG).

The Saarland ground movement cadastre aims to ensure thorough and comprehensive monitoring of the earth’s surface throughout Saarland.

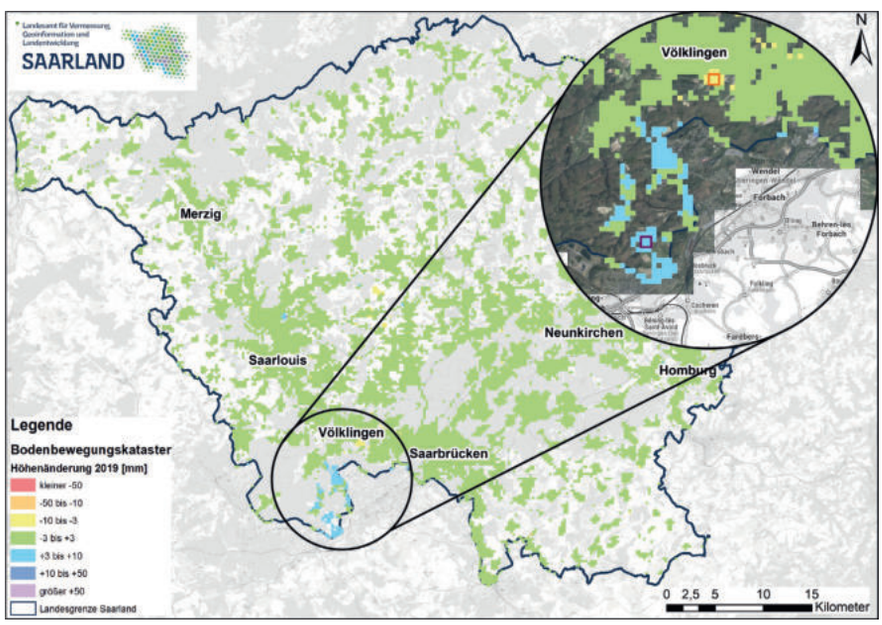


Fig. 9: Tile-based (generalised) representation of ground movements.
Source: LVGL 2022

The technical realisation of SaarBoBeKa is carried out by means of the “radar interferometry” method. The data required for this comes from earth observation satellites of the EU project “Copernicus”. In addition, eleven multi-sensor stations verify the radar data. RAG maintains six multi-sensor stations in the area influenced by the former mines. The remaining five stations are operated by the LVGL. The results of the monitoring are generated by the LVGL, made public on the Saarland Geoportal and updated annually.

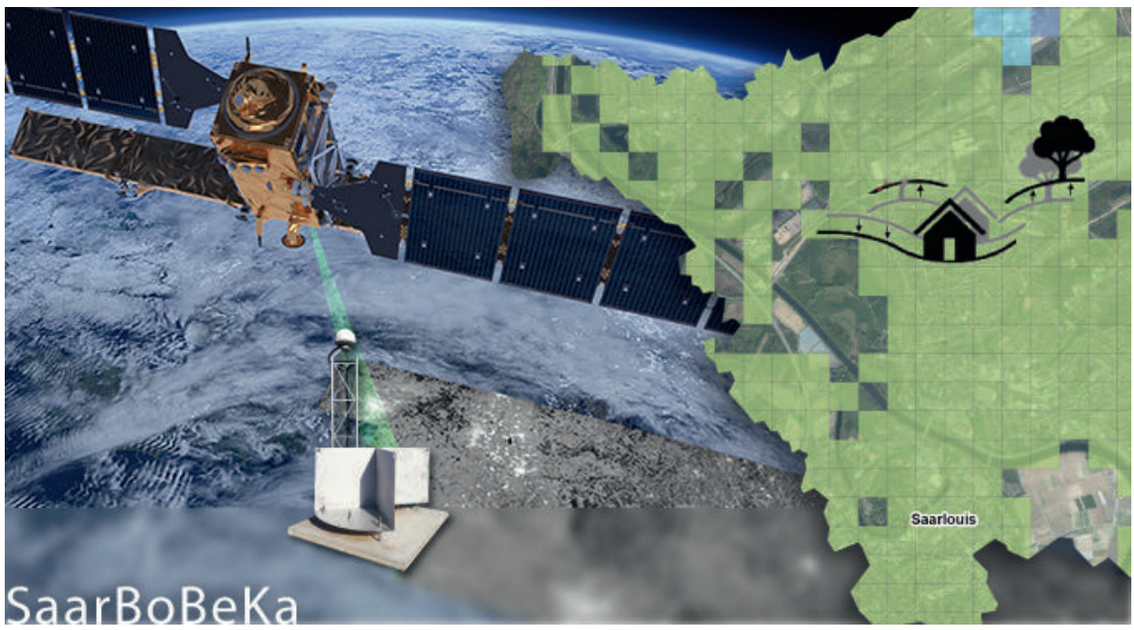


Fig. 10: The Saarland ground movement cadastre in Geoportal SL (www.saarland.de). *Source: LVGL 2022*

Official, quality-assured, and annually updated movement data is derived from the ground movement cadastre and is available to citizens free of charge and with transparency. With the equipment used and the number of measuring points, Saarland is a forerunner nationwide. With the data provided we create planning security. SaarBoBeKa provides a reliable basis for site assessments and is an important tool for preventing damage to structures, transport infrastructure and the environment.

Reinhold Jost, Saarland Minister of the Interior and previously Minister of the Environment

The Saarland ground movement cadastre can be found online at:
https://geoportal.saarland.de/article/Bodenbewegungskataster/

New satellite positioning service of the Laender and the federal government

Precise Point Positioning – Real-Time Kinematics (PPP-RTK) is a new technique for precise GNSS real-time positioning. It combines the advantages of regional network RTK services (short convergence times and centimetre real-time accuracy) with those of global PPP services (broadcast capability and data rate efficiency). This makes it possible to open up new broadcast transmission media that cannot be used with previous bidirectional network RTK technology (SA*POS*® HEPS), such as digital radio DAB+. Broadcast methods are not limited in terms of the number of users and are therefore also suitable for future mass market applications.

On 12 May 2020, the AdV plenum decided to examine the feasibility of a Germany-wide PPP-RTK service with centimetre accuracy and short convergence times in the official geodetic spatial reference equivalent to SA*POS*®-HEPS as a joint Länder-Federation development and, if possible, to implement it. Redundant provision of the service via the Central Office SA*POS*® (ZSS Länder) and the BKG is planned.

In addition, the AdV plenum recognises the need to test DAB+ as a redundant communication channel during the project phase. For implementation, the BKG concluded the necessary contract on 4 May 2021 with the transmitter network operator of the first national DAB+ multiplex (channel 5C), Media Broadcast GmbH. The reception tests carried out by WG Spatial Reference in the first half of 2022 proved the suitability of DAB+ (channel 5C) and subchannel 32 (“PPP-RTK-AdV”) used therein as a transmission channel of a future PPP-RTK service.

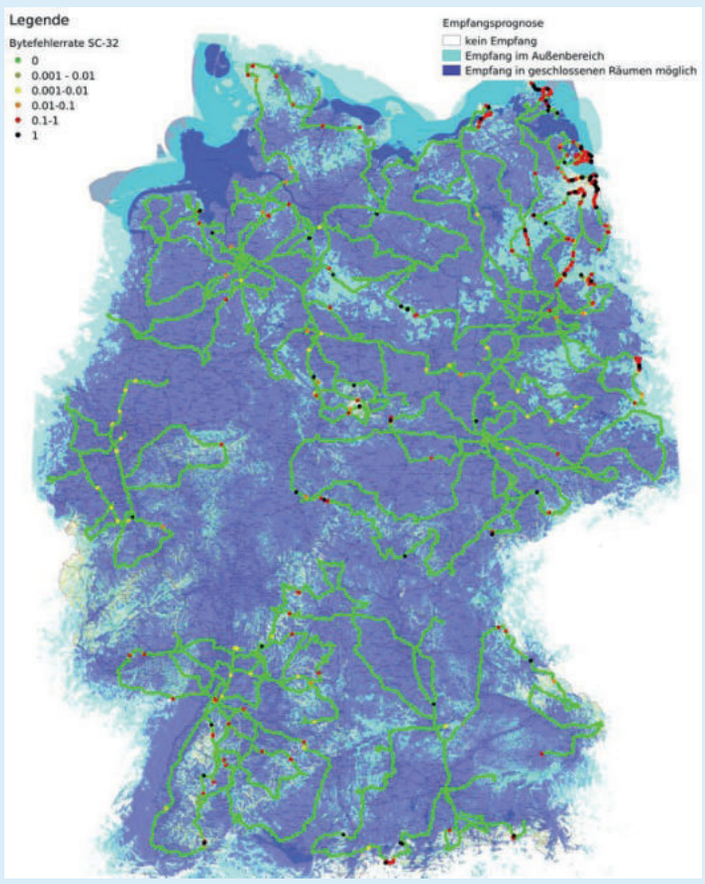


Fig. 11: DAB+ measurement runs in 2022 and byte error rate in subchannel 32.

Especially in rural and mountainous areas, DAB+ promises significant added value compared to mobile communication reception. The network operator's forecast map was confirmed. The operation of DAB+ sub-channel 32 (“PPP-RTK-AdV”) will therefore continue in the further project phase up to and including 2024.

In September 2021, the spatial reference working group identified the need to test the nationwide PPP-RTK networking at the ZSS and the BKG during the project phase. For this purpose, a PPP-RTK project network is set up at the ZSS for the period 1 April 2022 – 31 March 2024. For the project operation, the WG Spatial Reference will provide additional personnel resources in the PPP-RTK project operation working group under the leadership of the PPP project group. BKG invited tenders for its own PPP-RTK service as a productive service in 2021 and awarded the contract to a company in August 2022.

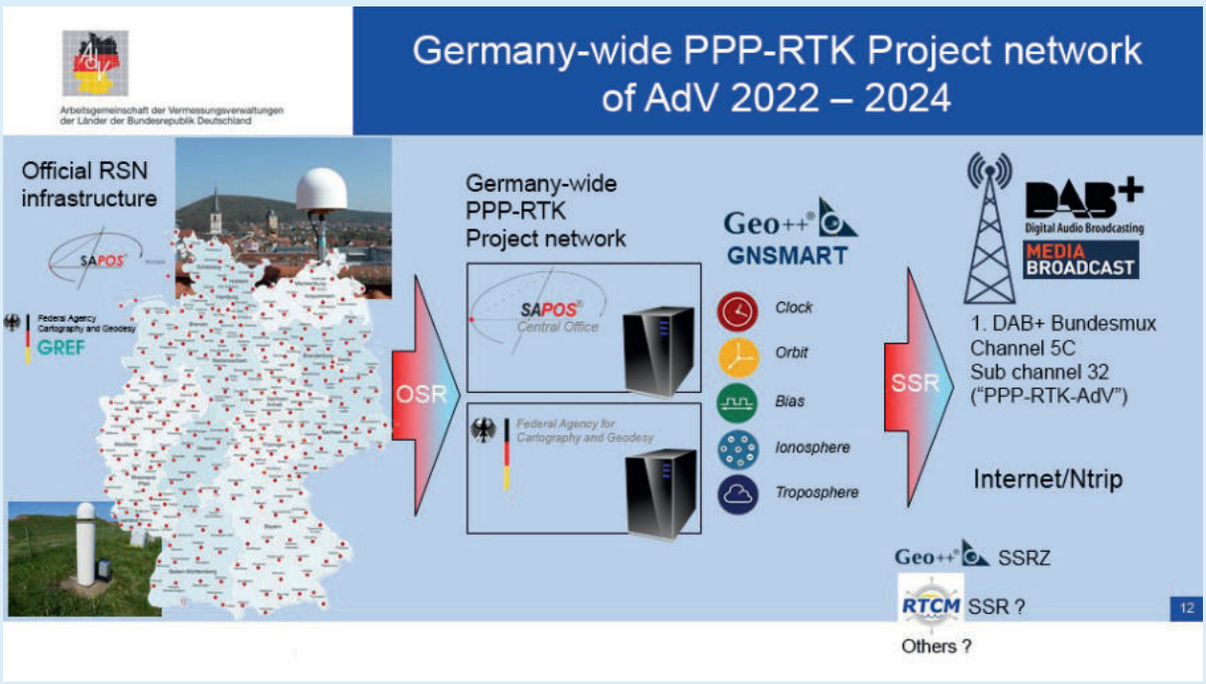


Fig. 12: Germany-wide PPP-RTK project network of AdV 2022–2024. *Source: AdV*

Based on the observations of the official RSN network in Germany (GREF and SA*POS*®), complete SSR corrections (State Space Representation) for PPP RTK positioning are estimated in real time, which are valid for the entire land area of the Federal Republic of Germany and can be provided unidirectionally (e.g. broadcast). These include “global” or satellite specific SSR corrections (orbit, clock, and bias corrections) as well as regional atmospheric corrections (ionospheric and tropospheric refraction influences).

Since the original GNSS errors are estimated, this is also referred to as State Space Representation (SSR) modelling, as opposed to Observation Space Representation (OSR) modelling, which is the basis of the classical differential GNSS methods. The SSR corrections are mapped internally in GNSMART in so-called MC streams and can be converted by corresponding output modules into various open SSR formats and made available via Ntrip. In addition to the open SSR format of the company Geo++ (SSRZ), the SSR formats SPARTN and RTCM SSR can also be transmitted, for example.

The Plenary plans to start the operational phase on 1 January 2025, thereby extending the project phase by the year 2024. The tests required for the feasibility study are to be carried out on the basis of the Germany-wide PPP-RTK project networks at the ZSS and BKG as well as the DAB+ subchannel 32 (“PPP-RTK-AdV”).

The satellite positioning service of the Laender and the Federal Government and the existing SA*POS*® services operate under the common umbrella brand SA*POS*®-DE. The name of the PPP-RTK satellite positioning service of the Länder and the Federation will be determined prior to the operational phase.

3. Working Group Real Estate Cadastre

The migration of the real estate cadastre and area statistics

For the official surveying and mapping, a magical date is fast approaching: by 31 December 2023 at the latest, all data are to be transferred to a new, more advanced database structure that takes current requirements into account – the AAA® application schema 7.1.2. As if that were not enough, two new datasets – land use and land cover – will also be introduced as official geospatial reference data. For the real estate cadastre, which is still heterogeneous in some parts due to its historical development and which is maintained not only by the 16 Laender, but also partly by municipal cadastral authorities with a high degree of individuality in terms of content despite of all the standardisation; this change, the so-called migration, represents a great challenge.

The real estate cadastre is understood to be a geospatial reference information system. Its data is intended to benefit a large number of users. One particular user of the official real estate cadastre is the official land use statistics. It uses the actual use data from the real estate cadastre to assess land use in Germany. In this way, it answers which percentage of the country's area is developed and/or used for transport, how much is available for agriculture, or how much area is forested. If one compares the annual assessments, one can see how Germany changes from year to year.

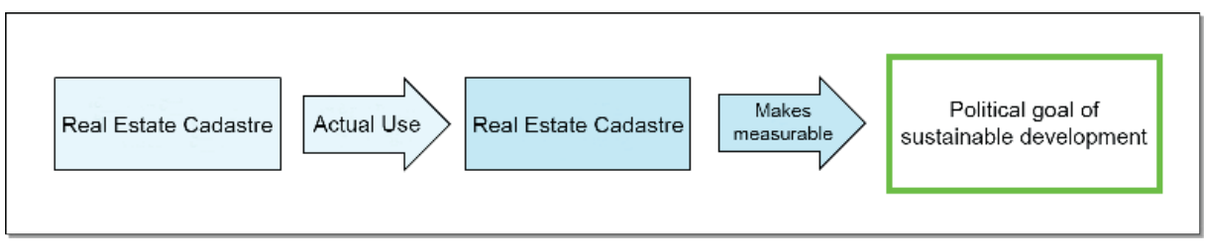


Fig. 13: The contribution of the real estate cadastre to land monitoring.

Not every change is desirable. For example, the use of land for settlement and transport is considered a loss of scenic open space and is understood as “land consumption”. In its sustainability strategy, the German government has therefore set the policy goal of reducing land consumption to 30 ha per day by 2030.

It is no coincidence that the changes due to take place on 31 December 2023 have therefore been coordinated in large part with the competent authorities for the area statistics. With the data available after the migration of the real estate cadastre, these statistical authorities will be able to examine the annual changes with more precision than ever before. In particular, they will be able to identify where and why changes have taken place. That will enable the area statistics to advise policymakers all the better.

Via the official land statistics, the data of the real estate cadastre contribute to making the social and political land consumption goal measurable in the first place. The area statistics authorities are therefore indeed a special user, because with their analyses, the data of the real estate cadastre is used to make policy. It is therefore all the more important that the migration of the data for the area statistics is completed, on time, at the turn of the year.

The real estate cadastre as a “1-click information system” in the property tax reform

The real estate cadastre, whose roots lie not only in the need for fair taxation of both land and property, is literally returning to its roots in the course of the property tax reform and now presents itself as a “1-click information system”.

Triggered by a ruling of the Federal Constitutional Court, the levying of property tax had to be placed on a completely new footing in recent years. The Federal Constitutional Court had criticised that the standard values on which the levying of property tax was based no longer properly reflected the development of property values over the past decades. As a result, the Laender have developed different models on the basis of which the property tax is to be levied from 2025.

As different as the models are, they all have the common need for data that is stored in the real estate cadastre. Depending on the Land and the model chosen, this concerns parcel designations, parcel sizes, types of use, land valuation data or land register sheet numbers. Often the standard land values are also required, which are determined by the expert committees for land values.

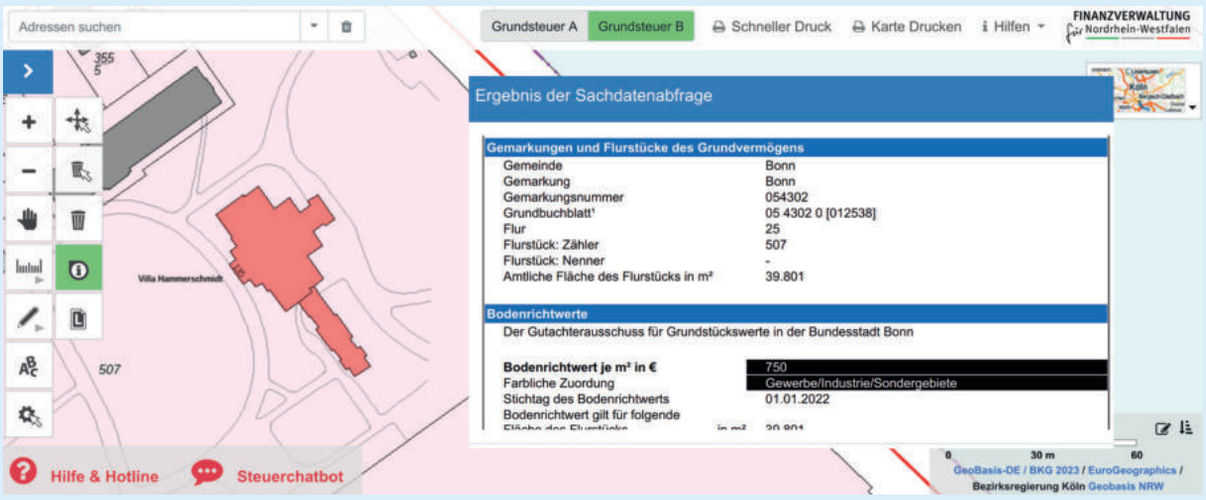


Fig. 14: NRW property tax portal.
The real estate cadastre as a “1-click information system”. This is the NRW property tax portal with an excerpt of factual data on “property tax B”.
It contains information on property size and standard land value.
(https://grundsteuer-geodaten.nrw.de/)

With the determination of a model, the question of how the required data from the real estate cadastre could be made accessible to the taxpayers automatically arose in every Land. It would have been unthinkable to imagine that every taxpayer would go to the land registry office and obtain analogue extracts from the real estate cadastre for their property.

Instead, internet portals have been created in cooperation between the surveying and tax authorities in the Laender, which save taxpayers the “trip to the office”. Typically, taxpayers select the parcel to be described via a map view and are presented with the required information. In this way, the cadastral authorities contributes its share to the success of the property tax reform.

4. Working Group Geotopography

Using the Authoritative Topographic-Cartographic Information System (ATKIS®), the surveying and mapping authorities of the Laender manage geospatial reference data that describes landscape in the product groups Digital Landscape Models, Digital Terrain Models, Digital Topographic Maps and Digital Orthophotos. The individual products of these product groups are kept current with regular updates. For key topographic features in the Digital Landscape Models, the updates take no more than a few months. The data of the ATKIS® product range is provided in a customer-oriented way, with contents that are sufficiently up to date, of the desired quality, and within the scope of the staffing and financial capacities of the AdV member authorities. During the reporting period, numerous documents accounted for by the Working Group Geotopography were revised and standardised in order to make standardised product and quality standards available for producing member authorities as well as the product-benefiting users.

Digital Landscape Models

One of the key tasks of the surveying agencies in the field of geotopography is to manage and update the Digital Basic Landscape Model (Basis-DLM) as the basis for the establishment of various specialised information systems in administration and business. The ATKIS®-Basis-DLM data pool also serves as the basis for the derivation of small-scale Digital Landscape Models, such as the ATKIS®-DLM50, -DLM250 and -DLM1000, for the production of official Digital Topographic Maps (DTK) and is also an essential data source for the AdV Smart Mapping project and the basemap.de products generated with it.

The regular updating of the Basis-DLM database takes place in different time frames. These cover the period from the emergence of change in the landscape up to the release of the updated database. A distinction is made between a peak update of three, six or twelve months for the object types or attributes that are most important for the users and the base update of the entire pool of data, in which the ATKIS®-Basis-DLM is checked and continued in the event of changes. The basic update period is three years. The DLM50 is derived fully automatically from the ATKIS®-Basis-DLM using model generalization. DLM250 and DLM1000 are processed and maintained by the BKG on behalf of the Laender and are updated annually.

The model accuracy of the ATKIS®-Basis-DLM is at least ±3 m and refers to the geometry of essential linear objects such as roads, rail-bound traffic routes (also on or in structures), the topological nodes (e.g. intersections of the economic road axes with the traffic road axes) in the network of roads and rail-bound traffic routes, essential structures (towers, wind turbines, masts, free-standing chimneys) and surface waters.

For quality assurance in data acquisition, modelling examples are kept and maintained for the ATKIS®-Basis-DLM, which help to achieve a uniform implementation in the Laender.

Furthermore, a specifically developed testing platform – the AdV-Testsuite – is set up in order to verify the requirements from AdV specifications. Approximately 250 test criteria are defined for the ATKIS®-Basis-DLM and over 100 for the ATKIS®-DLM50. The AdV test suite, as certified test software, has been available nationwide since 2022 and has been in use at the Central Office for Geotopography (ZSGT) in BKG since March 2023. The focus is on the test results of category a and b, which were sent to the Laender per test report for error correction in the first quarter of 2023.

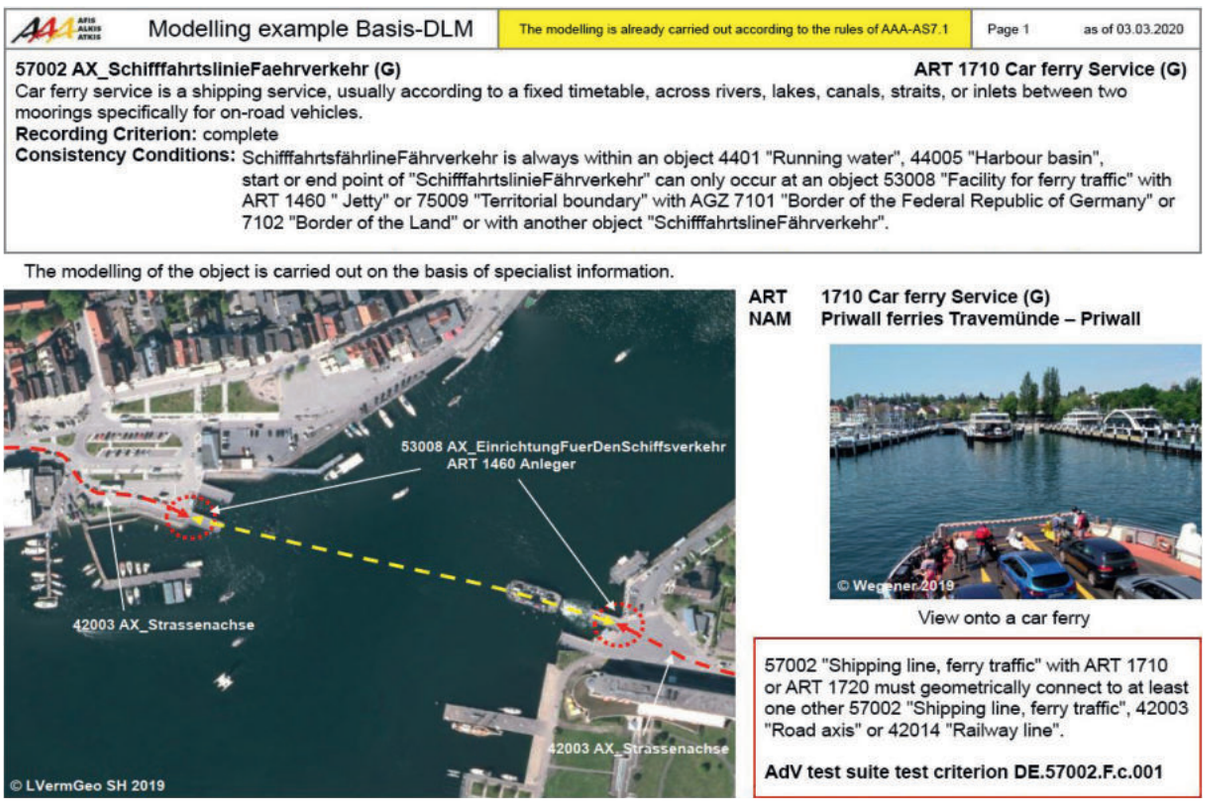


Fig. 15: Modelling example Basis-DLM, 57002 AX_SchifffahrtslinieFaehrverkehr (AX_Shipping Line Ferry Traffic), 2020.

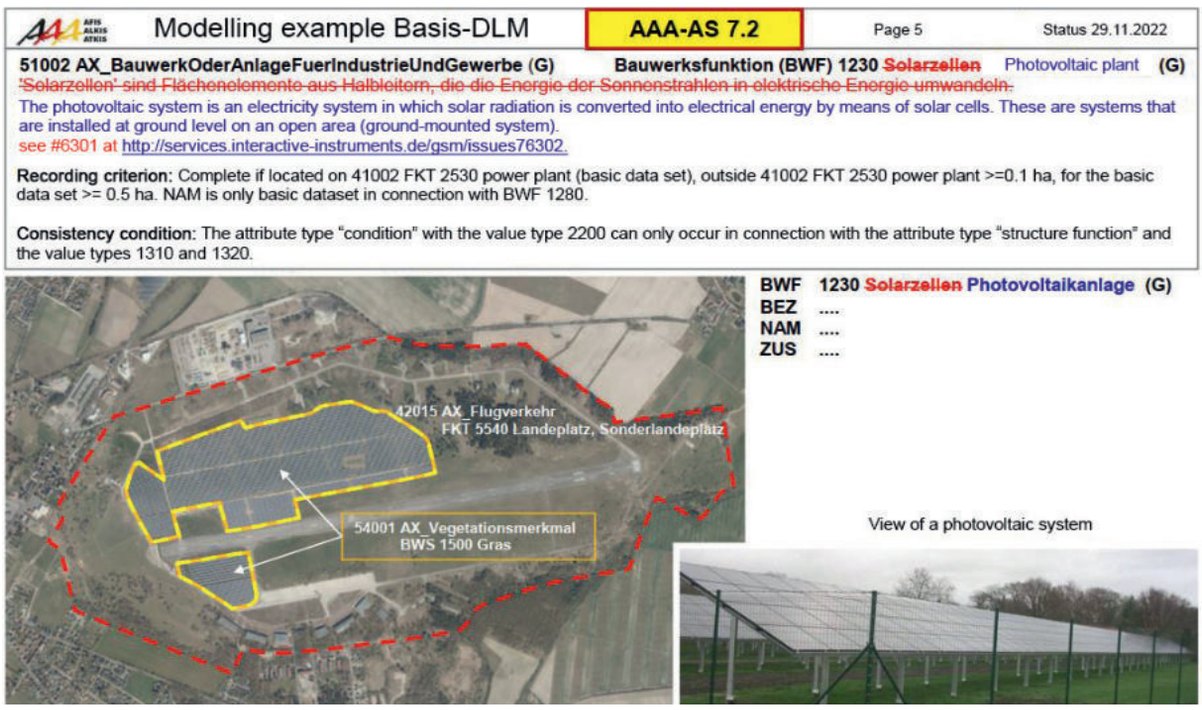


Fig. 16: Modelling example Basis-DLM, 51006 AX_BauwerkOderAnlageFuerSportFreizeitUndErholung (AX_Building or Structures for Sports, Recreation and Leisure), 2022.

- **a** (= error; i.e. serious defect; impeding production or exchange; to be rectified immediately, relevant for AdV quality standard, immediate error correction. For the Basis-DLM model type, this means that no data release will take place, e.g. area coverage error or inadmissible geometry type or missing structure).
- **b** (= warning; i.e. moderately severe defect; tolerable for users; to be remedied in the short term, relevant for AdV quality standard, data release, prompt correction within one year; e.g. incorrect combination assignment.

The tabular overview of all test criteria (as of 13 March 2023) and their explanation can be accessed via a link at https://adv-online.de/GeoInfoDok/.

Digital Elevation Models

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

The products of the product group Digital Terrain Models (ATKIS®-DGM) are structured according to their grid size. DGMs with a larger grid size are then usually automatically derived from DGMs with the lowest available grid size. For the ATKIS® technical concept, the object type catalogue-DGM is available in the documentation for modelling the geoinformation of official Surveying and Mapping (GeoInfoDok), the data quality is documented in the product and quality standards for Digital Terrain Models. For the DGM1, for example, this stipulates a terrain-type-related height accuracy of ± 0.15 m to ± 0.30 m with a confidence level of 95 % (2 σ). The foundation for this high precision is usually the high-precision Airborne Laser Scanning (ALS), which generates data for the DGM mostly automatically by now.

Currently, DGM data sets with a grid size of 1 m (DGM1), 5 m (DGM5), 10 m (DGM10), 25 m (DGM25), 50 m (DGM50), 200 m (DGM200) and 1,000 m (DGM1000) are available nationwide for the whole of Germany. Since 2004, the Central Office Geotopography (ZSGT) offers standardised Digital Terrain Models for the entire territory of the Federal Republic of Germany. Here, BKG is taking on the task of harmonising the height data collected by the Laender in the overlap areas between the Laender. The current Digital Terrain Model of Germany, available with a grid size of one meter, and all the other above-mentioned lower resolutions are constantly updated and continuously improved on the basis of the data updates of the Laender.

In the surveying and mapping agencies, Digital Surface Models (DOMs) are created in addition to DGMs. DOMs are digital, numerical models of the heights and shapes of the earth's surface, including structures and vegetation, reduced to a regular grid. As with the DGMs, DOMs are structured according to their grid size and DOMs with a larger grid size are automatically derived from the DOM with the lowest available grid size using new interpolation. DOMs are based on the method of ALS or the digital image correlation (image matching). A further increase in demand for these products by users can be observed. The DOM with their data quality is defined by the product and quality standard for Digital Surface Models.

Figure 17 shows the Telemax Hannover as a DOM; Figure 18 shows the Telemax Hannover as a DOM and as high-resolution ALS data coloured by height. The Telemax is a telecommunications tower and, with a height of 282 m, the tallest building in Lower Saxony and the fifth tallest of its kind in Germany. Its characteristic architecture with a square shaft and asymmetrically arranged operating pulpit (tower basket) in the form of a cube gives it a special visual position and makes it a modern architectural landmark.

The focus of the efforts during the reporting period was the further development of the standards for Digital Elevation Models. In addition to the already existing standard for a DOM, standards for 3D measurement data and image-based surface models were redefined and expanded. While the definition for Digital Terrain Models and Digital Surface Models up to now included models of the heights and shapes of the earth's surface reduced to a regular grid, this modelling was no longer compatible with results from image-based methods (e.g. Dense Image Matching – DIM, bDOM), as these are modelled as raster data. Weighing up the advantages and dis-

advantages of grid- and raster-based modelling, the data of the DTM and DOM elevation models will be successively converted to raster-based modelling by the end of 2023 in accordance with the current product and quality standards.

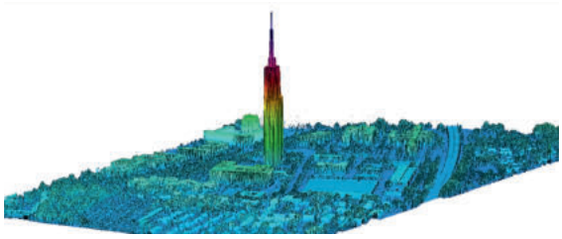


Fig. 17: Telemax Hannover DOM

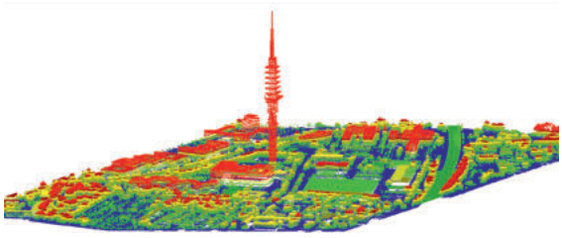


Fig. 18: Telemax Hannover DOM and high-resolution ALS data coloured by height.

3D Building Models

The surveying and mapping authorities within AdV have been offering the product 3D Building Models since 2013. The data is collected on the basis of the product and quality standards for 3D Building Models and the data format description in the AdV CityGML profile. The AFIS®-ALKIS®-ATKIS® model has been expanded to include 3D buildings and 3D structures as part of the AAA® modelling application scheme 7.1.

Nationwide, 3D Building Models have been available in the first degree of detail with the Level of Detail 1 (LoD1), for several years now. Here all buildings and structures are given a flat roof (“block model”). Since 2019 a nationwide uniform database for the Level of Detail 2 (LoD2) is available, which is provided by the Central Office for House Coordinates and Building Polygons (ZSHH) at the Bavarian Agency for Digitisation, High-Speed Internet and Surveying. In total, this database comprises more than 54 million buildings that have been modelled using standard roof shapes. The LoD1 is now derived fully automated from the LoD2.

Due to user requirements, the pool of data was expanded to include essential structures with 3D relevance in addition to the buildings. Modelling examples and realistic standard values are available for these additional object types such as towers, bridges, pylons, etc. (possible use with surface data that is not up-to-date). For the visualisation of wind turbines and high-voltage pylons, presentation objects that were created as prototypes can also be used. The additional structures have been available nationwide since 2021.

Digital Topographic Maps and Official Map Services

Based on the Digital Landscape and Terrain Models, the surveying and mapping authorities produce the DTK on the basis of the ATKIS® portrayal catalogues as part of the GeoInfoDok of the AFIS®-ALKIS®-ATKIS® model. The portrayal catalogues are available in a formalised form that is aligned with all the aforementioned information systems. For the ATKIS®-DTK sector, the signature catalogues are part of the product and quality standard, which combines all existing specifications on DTK within AdV.

The DTK are available in all Laender at the scales 1:25,000, 1:50,000 and 1:100,000.). For DTK50 and DTK100, the surveying and mapping authorities have made an agreement with the German Federal Ministry of Defence that they should be maintained and published as joint civilian and military maps. Due to the regular evaluation of the map contents and as requested by the Federal Armed Forces, the publications of DTK50 contain again the detached house display generated vial automated generalization processes.

At BKG the small-scale topographic maps 1:250,000 (DTK250), 1:500,000 (DTK500) as well as 1:1,000,000 (DTK1000) are derived from the digital landscape models DLM250 as well as DLM1000 and get updated regularly.

The analogue provision of the DTK has been subject to great dynamics for some years. Analogue provision as a printed topographic map (TK) is the exception today.

With the Smart Mapping project AdV has set themselves the ambitious target to service the production and provisioning processes for Digital Topographic Maps, the WebAtlasDE and TopPlusOpen from a single procedure. For the area of the Working Group Geotopography an intensive cooperation takes place in this project. In the meantime, the first results are visible and usable for the users. The new products basemap.de Web Vektor, basemap.de Web Raster and basemap.de Web Raster Shading are presented on the basemap.de website and made available for use (directly online in a viewer or as a service that can be integrated into GIS applications). The previous joint web map of the federal government and the Laender – the WebAtlasDE – was replaced by basemap.de Web Raster on 31 March 2023.

Currently, in the Smart Mapping project, intensive work is being done on the creation of basemap.de presentation outputs, which are to replace the DTK in the future.

With the TopPlusOpen product BKG is offering a continuous, freely usable worldwide web map on the base of official reference data of the Laender, official data of the federal government and Europe as well as of indepen-

dent geodata sources. Here, diverse data sources were joined, prepared and combined in order to achieve the optimum map display. The web map is available as an internet service via the standardised Open Geospatial Consortium (OGC) conform interfaces Web Map Service (WMS) and Web Map Tile Service (WMTS).

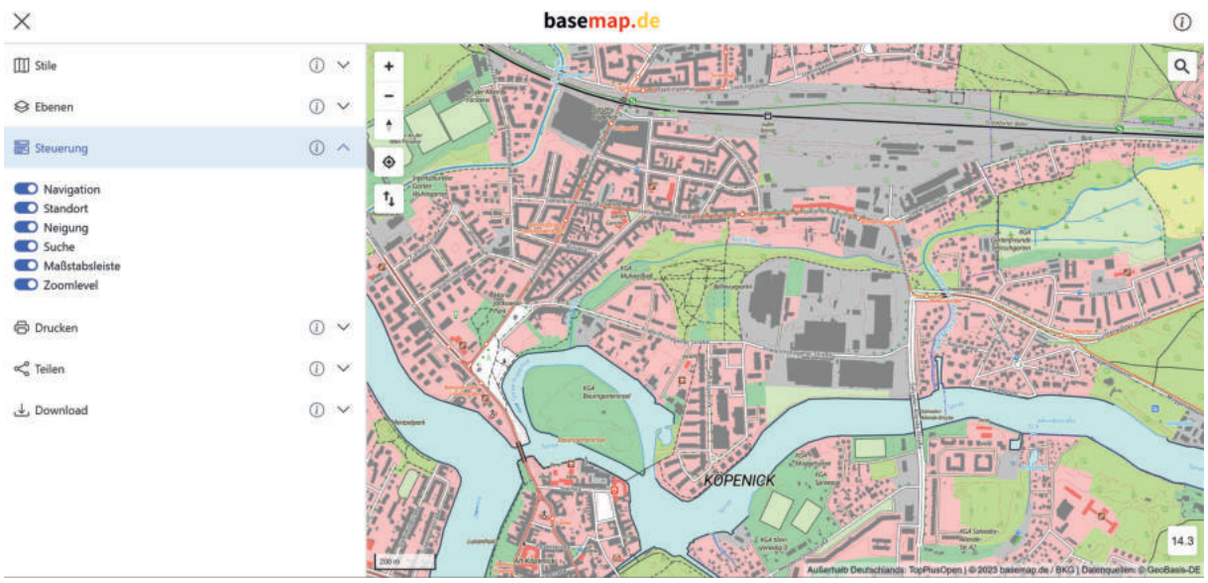


Fig. 19: Prototype of a presentation output from the basemap.de procedure.

Digital orthophotos

Aerial photographs form an essential basis for updating geotopographic data pools, such as the Digital Landscape Models and the Digital Topographic Maps. Therefore, the land surveying authorities of the Laender commission annual image flights for about half of the Federal Republic of Germany in order to be able to provide up-to-date aerial image information for this and for many other internal and external applications. Aerial photographs and the orthophotos generated from them have become a well-established and self-evident background representation for a wide variety of tasks. By combining them with various pools of data from the surveying authorities and other specialised agencies, they are indispensable for the digitisation of government tasks. Current examples are the property tax viewers, which made it easier for citizens to make declarations for the property tax reformation.

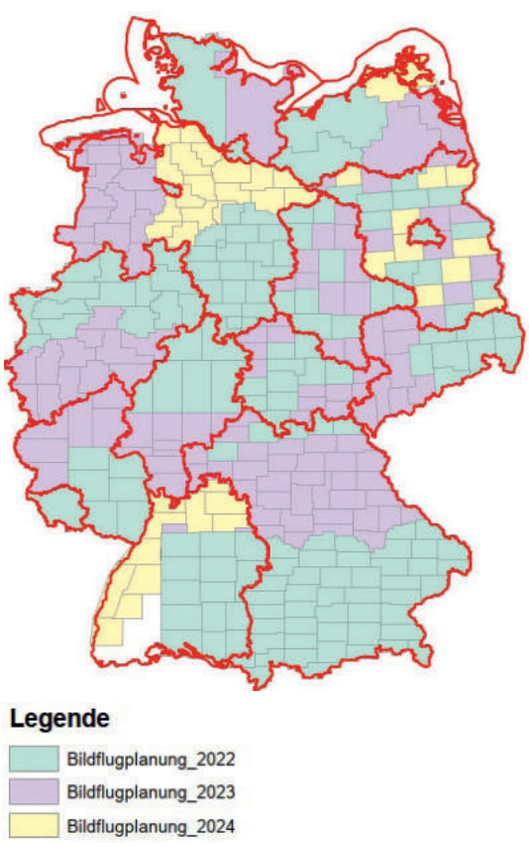


Fig. 20: Plans for Image flights 2022–2024.

For many years, digital orthophotos (ATKIS®-DOP) with a ground resolution of 20 cm (DOP20) have been reliably available for Germany in colour and with a renewal cycle of three years at the most. Individual Laender produce DOP10 or even DOP05, i.e. orthophotos with a ground resolution of 10 cm or 5 cm. As a rule, aerial photographs and orthophotos are produced as multichannel images, which allows the simultaneous use of black-and-white (PAN), colour (RGB) and colour-infrared (CIR) aerial image data. With the availability of the Near Infrared (NIR) channel, the pressing demands from surveying, forestry, agriculture and environmental administrations have thus been met.

In 2017, the AdV member administrations decided to further develop the AdV standard product DOP into a so-called TrueDOP.

TrueDOP does not contain any tilting effects, depicts all objects in the correct position and no occluded areas remain. In the meantime, almost all Laender have adapted their production processes to the TrueDOP, starting with adapted image flight parameters to high-performance computing technology to the expansion of storage capacities.

The product and quality standards for digital aerial photographs and digital orthophotos, which are continuously adapted to technical developments and changing user requirements, not only provide the prerequisites for a uniform quality level throughout Germany, but also for the consolidation of the Laender data in the ZSGT, which is based at BKG. Together with the Laender, the ZSGT offers the DOP and visualises it as a nationwide data pool in an online DOP viewer.

In addition to the ATKIS® DOPs, preliminary and intermediate products of the DOP production process, such as oriented aerial photographs or preliminary DOPs, are increasingly being offered. This means that up-to-date aerial image information is available after the aerial survey much faster and satisfies the needs of specialist users for time-critical applications, such as in the Integrated Administration and Control System (IACS).

The surveying authorities have built up collections of aerial photographs and orthophotos over many decades. This valuable data pool makes it possible to fulfil monitoring tasks by using time series of historical aerial photo information. Therefore, the digitisation of aerial photographs, some of which are still available in analogue form, as well as long-term preservation and history management are additional topics to which the surveying authorities are addressing. Uniform minimum standards have also been defined for this by the Geotopography Working Group in cooperation with the archive administration and various guidelines have been provided to the Laender.

Fig. 21: Time series for the stadium in Erfurt with aerial photographs from 1944, 1982 and 2021 (from left to right). ©GDI-Th

Remote Sensing and Copernicus

In recent years, satellite-based remote sensing has become increasingly important. The project group Satellite Remote Sensing and Copernicus (PG SatFernCop) was established to monitor the developments in this field and especially their points of contact with surveying and to bundle the projects of the member administrations. Through an intensive exchange of information, the PG SatFernCop pursues the goal of establishing satellite remote sensing in national surveying. A particular focus is on the Copernicus programme of the European Space Agency (ESA).

In order to ascertain a status quo of earth observation projects in the state surveying offices, a common product catalogue was created. This catalogue consolidates all remote sensing projects of the member countries. In this catalogue, each member lists and describes all previously published (and planned) remote sensing products. The product catalogue is constantly updated. The catalogue also includes the products (if available) of the member authorities that are not represented in the project group.

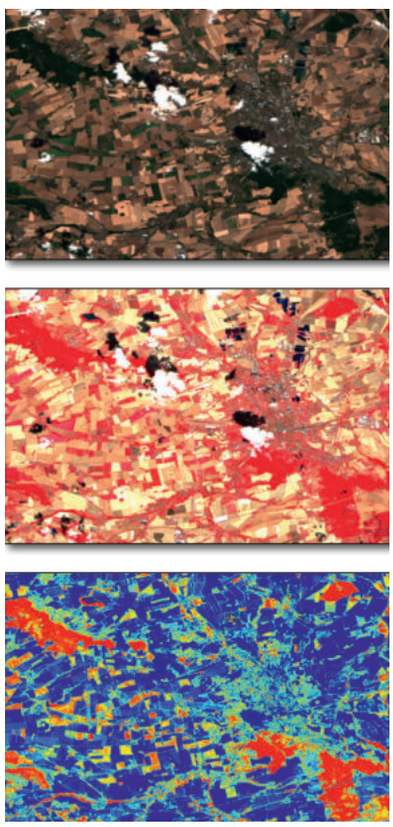


Fig. 22: Sentinel-2: RGB (top), CIR (middle), NDVI (bottom). Own illustration (Alexander Göbel, 2023)

	Download 10 m	Download 20 m	WMS RGB	WMS CIR	WMS NDVI	Fläche/Unterteilung	Aktualität	Verfügbarkeit	Plattform/Firma	Besonderheiten/Geplant
BKG			x	x		bundesweit/Europa	lich/3-Jahres-Zy	2018-2021/2018	BKG-Webseite	Open Source, aufwendige teils manuelle Korrekturen
BE	(x)		(x)	(x)		bundesweit	2021	2021	FIS Broker Berlin	WMS-Sentinel2-Dienst des BKG (Layer auswählbar: RGB, Nir, NirRER, Aktualitäten)
BW	x	x	x	x	x	Ganzes Land	monatlich	ab 01.01.2020	Geosystems: Sentinel Made Simple	
BB	(x)		(x)	(x)		bundesweit	2021	2021	Brandenburg-Viewer	WMS-Sentinel2-Dienst des BKG (Nir, NirRER und Aktualitäten direkt auswählbar; RGB über WMS Import darstellbar)
HE			x	x		Ganzes Land	monatlich	seit 2021	novaFACTORY, Geoportal Hessen	Open Source, bessere Wolkenkorrektur (vermutlich kachelweise)
HH			x	x	x	Ganzes Land	quartalsmäßig	ab 2018 - heute	CODE-DE	Open Source, Zeitreihenfunktion im Portal, zusätzliche "tagesaktuelle" Aufbereitung
MV	x		x	x		Ganzes Land	monatlich, falls möglich	seit 2018	GeoPortal MV	IMAGINE NoCloud, Homogenisierung
NI						Landkreise	ca. 20/Jahr	seit 2015	CODE-DE	Open Source, tagesaktuell
NW			x	x		Ganzes Land	alle 2-3 Tage, sofern wolkenfrei	seit 11/2021	tim-online.nrw.de / Webseite Geobasis NRW	Sehr hohe zeitliche Auflösung, Angabe des Aufnahmedatums
SL			x	x	x	Ganzes Land	mind. montlich	ab 2015	Geoportal SL (saarland.de)) /Zora	Open Source
RP			x	x	x	Ganzes Land	monatlich	seit 2018	lokal	Open Source
ST	x	x	x	x	x	Ganzes Land	halbjährlich	ab 2018	novaFACTORY [MOSS]	IMAGINE NoCloud, Homogenisierung, Höhere Aktualität
SH			x	x		Ganzes Land	aktuell/ quartalsmäßig	ab 2019	CODE-DE/lokal	aktuelles Mosaik und Quartalsmosaike, bessere Wolkenmasken und Atmosphärenkorrektur
TH	x		x			Ganzes Land	quartalsmäßig (1.,2.,3.)	ab 2018	Thüringen Viewer/ Opendata Portal	OpenSource, 10 km Randpuffer, WMS-Dienste über DataCubes (code-de.org)

Fig. 23: Summary product catalogue. Source: Project Group Satellite Remote Sensing and Copernicus (PG SatFernCop): Product Catalogue Satellite Imagery Data 2023, P.4

In the future, AdV plans to create product and quality standards for various remote sensing data sets in order to ensure the uniformity of remote sensing products in the state offices. In order to gain a larger overview of the inventory and demand for remote sensing products in state authorities, ministries, research institutions, etc., a nationwide survey was conducted in 2022. A total of 88 people from a wide range of disciplines took part.

Based on the results of the survey and the product catalogue, a first draft for a product and quality standard for Sentinel 2 RGB mosaics, Sentinel 2 NDVIs and Sentinel 2 CIR will be developed. The project group is aiming to produce this draft by the end of 2023. Figure 22 shows the products mentioned for the Erfurt area.

Toponomy

In collaboration with the Permanent Committee on Geographical Names (StAGN), BKG offers a standardised (gazetteer) service that provides the toponymy (GN-DE) from the vector data pool of the products DLM250, VG250 (Administrative Areas 1:250,000) and GN250 (Geographical Names 1:250,000). GN250 is generally available in a classification of names corresponding to the feature types of ATKIS® in the AFIS®-ALKIS®-ATKIS® data model. The data pool comprises around 187,000 entries of geographical names, including names of municipalities, parts of municipalities, landscapes, mountain ranges, mountains, islands, rivers, canals, lakes and seas.

The GN-DE database is usable as a standardised Web Feature Service (WFS) at the BKG Service Centre in accordance with the specifications of the OGC. This data set has been provided in INSPIRE-compliant form as a service for the European Open Data Portal.

In accordance with the relevant resolutions of the United Nations Group of Experts on Geographical Names (United Nations Group of Experts on Geographical Names – UNGEGEN), in 2018 the StAGN has compiled "Toponymic Guidelines for Transportation Areas within Germany". These guidelines are available on the StAGN website: http://www.stagn.de/empfehlung-verkehrsflaechen.

A synoptic list of state names is currently being revised. The revised map of landscape names (1:1 million), which has been prepared by the BKG and is available to the user as a digital data pool at the BKG as well as being published in a print version, is to be newly published in 2024. Reference is made to an interesting publication edited by Prof. Dr. Peter Jordan and entitled: Minority place-name standardisation. A comparison of regulations and approaches in Europe.

Launch of a joint technical office “Land Cover” of the Federal Government and the Laender to answer questions of environmental relevance.

Precise information on the cover of the earth’s surface forms the basis for most environmentally relevant questions, be it on the degree of sealing of the earth’s surface, for landscape planning, for climate simulations or also for reporting to the European Commission.

To answer these questions, all Laender and the federal government established the joint Technical Operating Unit for Land Cover on 15 May 2023 in accordance with the “One for All” approach. The Technical Operating Unit is managed by the Cologne District Government, Geobasis NRW and the Federal Agency for Cartography and Geodesy (BKG) as a dual head office. The state agency IT.NRW is responsible for the cross-state administration and coordination of the IT infrastructure.

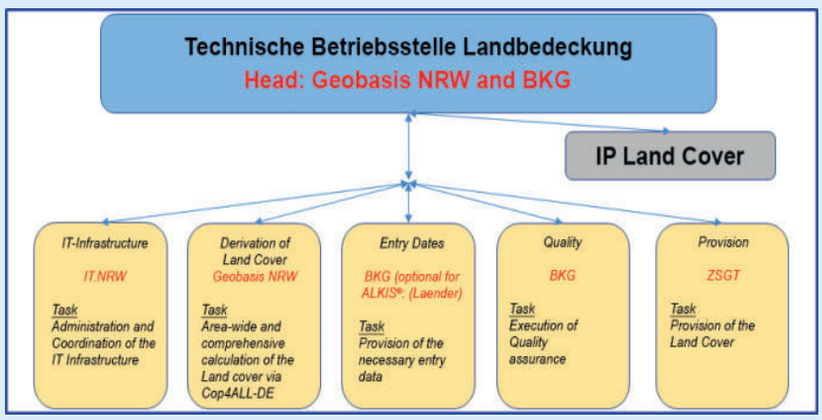


Fig. 24: Tasks of the Technical Unit for Land Cover
Source: AdV

For the determination of land cover, AdV has advocated the use and further development of the Cop4ALL NRW procedure developed in North Rhine-Westphalia and the derivation of land cover for Germany at a central location. The procedure will be called Cop4ALL-DE in the future.

The land cover data are provided by the operating unit in an up-to-date, geometrically accurate and demand-oriented manner for the entire federal territory. The main data used to calculate land cover are satellite data from the European Copernicus programme and aerial photographs available from the Laender. These remote sensing data are evaluated using automation-supported classification procedures and artificial intelligence methods. In order to provide the Laender with shared access to the calculations, the infrastructure of the German Administration Cloud (DVC) will be used in the future.

Fig. 25: Nationwide land cover data.
Source: AdV, own representation

With Cop4ALL-DE, the land cover of all of Germany will be recorded for the first time following uniform specifications in an unprecedented geometric resolution and updated at regular intervals. The goal is to offer a nationwide land cover dataset to the public in summer 2024.

Smart Mapping – From pilot project to central production of innovative products

The “Smart Mapping” working group was set up by the AdV plenum to establish a central procedure for the automated production of modern cartographic products based on official geospatial reference data. In doing so, a variety of requirements must be considered, such as actuality, nationwide uniformity and flexible expandability. Smart Mapping is thus not only a working group of AdV, but also a development project for the introduction of a central production process, which includes the specification, own software development up to the central, for fully automated production and provision via standardised interfaces (e.g. API). The AdV standard products that are now successively being created in the process are published under the newly introduced product range with the name basemap.de (see www.basemap.de).

The true innovation of Smart Mapping lies in the redesign of a central and modular development platform for the fast, flexible and economic generation of existing and new cartographic products of the surveying authorities. The functionality of this platform was first tested as a proof of concept and approved by the AdV plenum before replacing current products or generating and centrally providing new or further developed cartographic AdV standard products.

The working group is distributed throughout Germany, but still highly networked, and works almost exclusively in virtual meetings. Smart Mapping consistently uses automated procedures for the production of AdV geotopographic products. Product standards, regulations and all development of production processes are thereby aligned with automated methods and approaches and not vice versa.

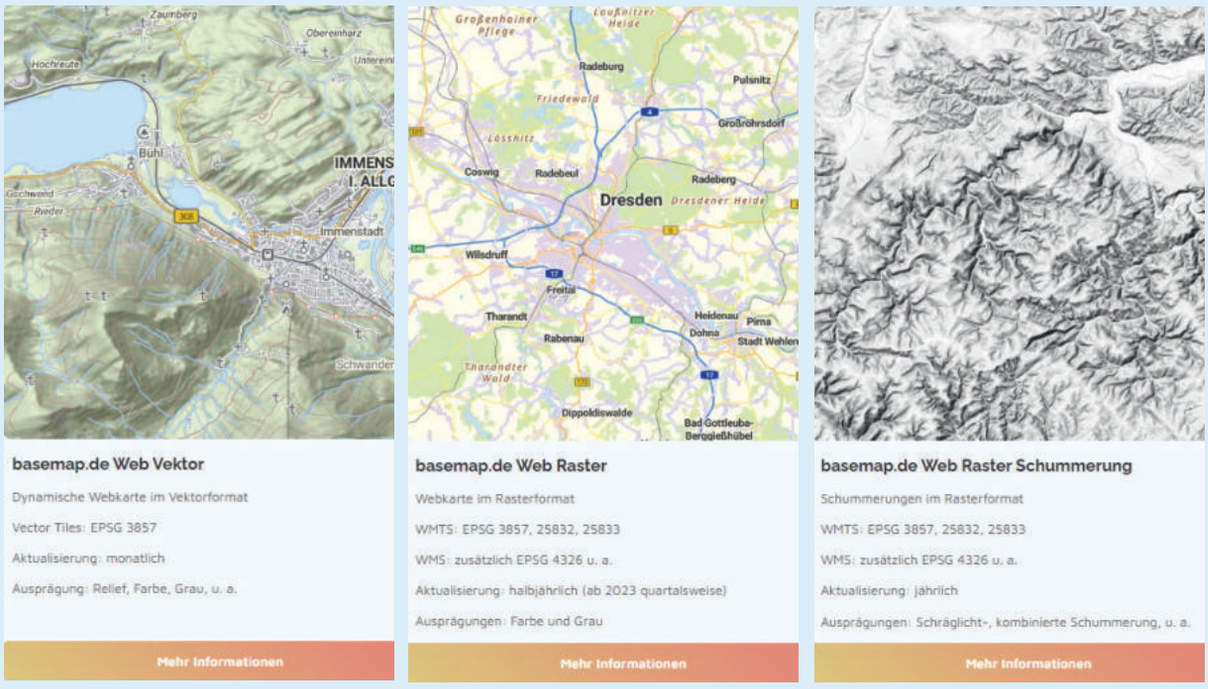


Fig. 26: Products from basemap.de

The quality of products must thus be adapted to the achievable automation results in order to avoid manual efforts.

One challenge here is to integrate all the necessary source data pools of the Laender and, above all, their constant updates into the procedure in a fully automated way. Source data (e.g. Basis-DLM) are provided by the Laender or the central offices (e.g. ZSHH) at fixed intervals. The required data pools are imported into a central processing database of the Smart Mapping Platform by means of transfer and import modules. Whenever differential interfaces such as the user-based inventory data update (NBA) procedure are available, they are used in order to achieve the highest possible up-to-datedness and shorter transfer times. Through this effective automation, the vector map (basemap.de Web Vector) can currently be produced and provided on a monthly basis; in the future, a 2-weekly update cycle is planned.

The first basemap.de products could be brought into operational use (Wirkbetrieb) in 2022. These are:

- the raster map service basemap.de Web Raster,
- the shading service basemap.de web Hillshade and
- the vector service basemap.de Web Vector.

Due to recent decisions of the AdV plenum, the use of basemap.de products, data and services is subject to the Attribution 4.0 International (CC BY 4.0) licence and the Data Licence Germany – Attribution – Version 2.0. The WebAtlasDE continued to operate for a transitional period until March 2023, after which it was switched off. Users were informed in advance and supported in the changeover. For the basemap.de web raster, the viewing component of Geoportal.de is used.

The product and quality standards (PQS) for the products basemap.de Web Raster and basemap.de Web Vektor as well as the completely new PQS for the presentation outputs (P outputs), which are necessary for effective operation, were passed in a joint working group under the leadership of the Geotopography Working Group.

In accordance with the work plan adopted by the AdV plenum, the first draft of the presentation edition 1:10,000 (P10) was handed over to the AK GT for coordination and evaluation and an iterative improvement process was started. In the third iteration step now planned, the improved prototype of the P10 available by then is to be compared for the last time with the PQS now available from 30 June 2023 and then adopted and published as an AdV standard product.

The basemap.de products are continually being further developed. The existing services are improved, but new products are also derived and published as beta versions for testing – most recently, for example, the new service for visualising LoD2 buildings, which was also combined with a 3D terrain.

5. Working group Information and Communication Technology

Cloud Computing

The basic principle of cloud computing is to enable a demand-oriented and flexible application of IT services. The IT services can range from applications, platforms for application development and operation, and basic infrastructure. They are provided in real time as a service via the Internet and enable flexible data processing. The possibilities offered by this form of data processing are closely linked to a considerable increase in computing power, the widespread availability of higher bandwidths for data transmission and the ease with which virtualisation technologies can be used. The services are provided exclusively via the internet, and only those services which are actually used are billed. Cloud computing can thus reduce individual operating costs and make the infrastructure overall more efficient.

The need to make the innovative technology of cloud computing usable for public institutions is increasingly visible and indispensable for the digital transformation. Cloud computing is also seen in public administration as an efficient solution to economically store large amounts of data, to jointly develop software applications, to use information independent of location and device, and to flexibly use IT resources of all kinds according to actual needs without having to incur their own acquisition and operating costs. Instead, a transparent payment based on actual consumption is made through user fees. Cloud computing fundamentally changes the traditional way of thinking with regard to IT resources.

Different models, types and services have been developed for different requirements of cloud systems in order to offer the ideal solution in each case. For the provision of service models, the following three options among others exist: The public cloud, the private cloud and the hybrid cloud (see Figure 27).

Fig. 27: Cloud service models (according to Bischof 2021).

Based on this, a categorisation is usually made into the cloud services or organisational forms IaaS (Infrastructure-as-a-Service), PaaS (Platform-as-a-Service), SaaS (Software-as-a-Service) and serverless computing (see Figure 28). These four types differ in terms of the scope of functions and the ability of the user to customise them. While SaaS usually provides self-contained software solutions for immediate use, PaaS “merely” contains a platform on which the user develops or independently sets up his applications.

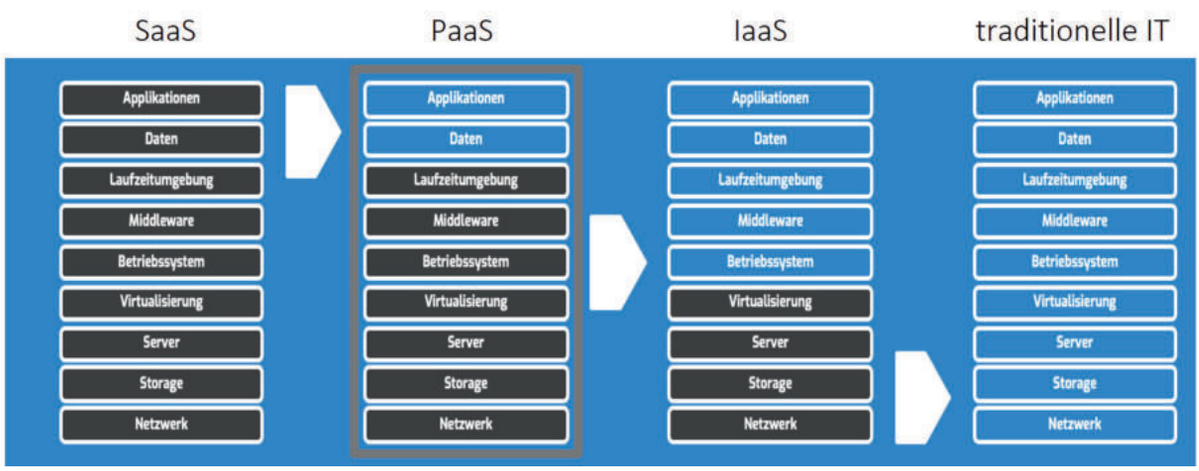


Fig. 28: Cloud structures (according to Bischof 2021).

IT responsibility is transferred to the cloud service provider as the service usage increases. At the same time, the cloud service provider must demonstrate sufficient information security for providing the relevant services (including the necessary infrastructural, organisational, personnel and technical components) by means of a valid “ISO 27001 on the basis of IT-Grundschutz” certificate or an equivalent BSI procedure or a procedure recognised by the BSI. The cloud service provider will also regularly be required to demonstrate a suitable data protection operating model. For the user, the proper selection of the necessary security level is essential. However, the cloud service provider will regularly take over the operational implementation for each individual application.

The member administrations of the AdV strive for resource bundling and the possibility of an agile utilisation of resources. In addition, the focus is on further technological AdV uniformity through joint developments, joint operation and increased joint, central deployment of internal and external services. Digital cooperation is to be increased in order to ultimately find innovative solutions to the challenges faced by the federal IT infrastructures.

To this end, the AdV member administrations want to use a federal and decentralised cloud infrastructure of the federal and Laender data centres, from established hyperscalers (including Microsoft, IBM, Google, Amazon), the sovereign administration clouds or Gaia-X. In addition to the already formulated open source-first strategy, a cloud-first strategy is now also outlined. The core of this future strategic approach is the readiness for joint, project-based, innovative IT solutions. To achieve solution agility, individual projects can be implemented by all, a few or even individual member administrations but always for all. The common platform is the unifying element. To achieve this, cooperation is also sought to build up and expand competence in the areas of (geo)information technology and to build up and expand competence and structures for agile cooperation.

INSPIRE-Basic Data Standard

To ensure a uniform approach to the further implementation of the INSPIRE Directive for the provision of interoperable services of the geospatial reference data in the INSPIRE data model by the AdV member authorities, the framework conditions and basic parameters are jointly specified.

The creation of the detailed derivation rules (formerly mapping tables, now AdV-INSPIRE alignments) was carried out on the basis of the “INSPIRE Affectedness of Geospatial Reference Data” adopted in 2017. In the course of the project, a number of new findings and strategies have emerged, as well as changes in the general conditions. This concerns, for example, the data pools on land cover (LB) and land use (LN) which will be

available in the future, will also be affected by INSPIRE as soon as they are created and, in turn, can supplement or replace previous solutions for the submission of such data sets. However, the assessment of possible derivations of INSPIRE themes, in this case soil, is also a reason for updating, as this does not always appear to be suitable. A new perspective on the effects of INSPIRE on geospatial reference data was reached with the resolution in autumn 2022.

	Source data sets								
INSPIRE Topic	ALKIS	HK	LoD2	ATKIS Basis-DLM	LB	LN	DOM1	ATKIS DGM 1	ATKIS DOP 20
Annex 1									
Addresses		X							
Parcels/Plot	X								
Geographic designation	X			X					
Waterways network				X					
Transportation				X					
Administration				X					
Annex 2									
Land Cover	[X]				X				
Height							X	X	
Orthophotography									X
Annex 3									
Land Use	[X]					X			
Buildings	X		X	[X]					

Tab. 2: INSPIRE base data standard of the surveying authorities (AdV).

In parallel to this approach and the necessity of further updates, the focus is also on the data that is currently available nationwide. Due to the changing strategic and economic directions in the Laender, also promoted by Open Data, it is foreseeable that there will be diverging offers of geospatial reference data and services. The aim of this overview is to show which INSPIRE topics can be reliably served nationwide in the future and are in accordance with the INSPIRE basic data standard (see Table 2).

The table follows certain principles:

- Even if INSPIRE datasets can be derived from several source datasets, and the different methods produce almost identical data, the derivation from one source dataset (example: addresses using only the dataset house coordinates) is favoured for the sake of uniformity.
- If INSPIRE datasets can be derived from several source data, but the different methods produce results of different quality, the derivation should be done from the source dataset that produces the more qualified results. The other datasets can be provided on an interim basis but should be dropped after the more suitable dataset has been provided (example: land cover from ALKIS® only on an interim basis for LB).
- The use of several model types (different resolutions) for an INSPIRE topic is avoided. The nationally coordinated data pool with the highest resolution is sufficient (example: only ATKIS® Basis-DLM and no DLM50).
- Some INSPIRE data specifications specify several target schemas. A clarification has been made as to which target schemas are to be supported (example: the water network is to be derived meaningfully only from ATKIS®).
- If data pools can only be transformed to INSPIRE with a disproportionately high effort, for example if area-shaped objects have to be generated from line-shaped objects, this is tantamount to a new acquisition of data that is not required under INSPIRE. In such cases, no INSPIRE datasets are provided (example: linear objects of actual use such as AX_road axis from ATKIS®).

It should be emphasised that these considerations represent a narrowing of the data topics as well as a focus on INSPIRE services that are actually relevant, of high value and sustainably available nationwide. In addition, a technical specification is made in order to provide at least the most suitable and qualified geospatial reference data in terms of content as a reliable basic service.

In addition to the technical update, organisational measures are also to be carried out in order to improve access to and thus the use of INSPIRE services. In particular, source data already available centrally should also be transformed and made available centrally according to INSPIRE. Against the background of the new version of the directive on open data and the re-use of public sector information (PSI Directive), the source data sets of the basic data standard that fall under it should, at least, be made available centrally in future in contemporary web standards and in a scalable manner for strategic and economic considerations. A discourse on this is to be initiated in the short term.

AG ImmoWert – AdV promotes further development of official property assessment

The steadily growing importance of the real estate market and thus of the appraisal information of the appraisal authorities for land values leads to a significant increase in the demand for high-quality, standardised and comprehensive information. This demand, e.g. from the tax authorities and DESTATIS, can only be met by greater cross-Laender cooperation in official land value determination. To this end, it is particularly important that there is cross-Laender, technical coordination on uniform data models and interfaces, as well as support for digitisation and legislative projects.

Fig. 29: Subject areas of the ImmoWert WG.

The formal responsibility for the official real estate valuation and thus for the implementation of the ordinance authorisation in Section 199 (2) of the Building Code and the administrative enforcement in the Laender lies with the supreme surveying authorities in almost all Laender. They coordinate their work within AdV and agree on common goals therein. With its infrastructure, AdV is therefore the ideal body to establish a nationally responsible body for cross-state coordination in the area of official real estate valuation. Even the few Laender where official real estate valuation is not located with the supreme surveying authorities can send representatives to this body. The responsibilities of the Laender remain unaffected.

With the Working Group of the Higher Valuation Committees, Central Offices and Valuation Committees in the Federal Republic of Germany (AK OGA), an expert body exists outside AdV, on the basis of an administrative agreement, in which all Laender and the Federal Government are each represented by one member or the chairperson of the Higher Valuation Committees and Central Offices. The task of the AK OGA is to create

nationwide property market transparency, which is required by the Building Code. This includes primarily the publication of the Real Estate Market Report Germany (IMB DE). There is currently no basis for this expert body to perform tasks beyond the scope of the administrative agreement.

At the meeting of AdV in May 2022, the plenum spoke out in favour of taking on the tasks of official real estate valuation more intensively within the AdV and taking on the cross-Länder coordination and agreement within the administrations responsible for the expert committees for real estate values. To this end, the Working Group on Real Estate Valuation (AG ImmoWert) was formed. All Laender are represented in the AG ImmoWert by the respective ministries responsible for the expert committees. Through the implementation of this body within the AdV, there is the possibility of making established structures of the AdV usable for official real estate valuation and to work together more intensively in the area of strategic and general direction. With the ImmoWert working group, a central contact point is also available for third parties in the normative area.

In order to avoid overlaps in the responsibilities and double the work, the ImmoWert working group was given the task of submitting a proposal for the future division of tasks between the two bodies in consultation with the OGA working group and to make corresponding proposals for implementation.

The first results of the work of the ImmoWert working group is the release of the completely revised version of the standard land value portal BORIS-D at INTERGEO 2022 in Essen as well as the adaptation and further development of the standard land value data model to the requirements of GeoInfoDok, ImmoWertV 2021 and to the current requirements for a suitable and up-to-date data structure and data management.

By forming the ImmoWert working group, AdV has created the basis for meeting the increased demands of administration, business and science as well as citizens with regard to official real estate valuation and for developing sustainable solutions.

The formation of the ImmoWert working group and the direct connection to the AdV chairmanship takes into account the AdV's commitment to increasingly take on the tasks of official real estate valuation and to be available as a single point of contact for federal ministries and other institutions. This reduces the coordination effort for legal regulations and standards in this area and increases awareness of this complex subject area.

Marco Ludwig, Chairman of the ImmoWert WG, Ministry of the Interior and Sport Rhineland-Palatinate

6. Working Group Public Relations and Marketing

INTERGEO 2022

After INTERGEO 2020, one of the world's leading platforms for geodesy, geoinformation and land management, was held purely digitally whilst the pandemic conditions were still severe, and INTERGEO 2021 took place both on the exhibition grounds in Hanover and digitally on the web, INTERGEO 2022 in Essen was once again held in presence. Due to the strong interest on site, AdV therefore decided against a hybrid event.

For the first time, AdV organised its trade fair appearance in Essen together with the Federal-Laender Working Group on Sustainable Rural Development (ArgeLandentwicklung) on a 132 m^2 joint stand in Hall 1. The Arge-Landentwicklung is a working committee of the Conference of Agriculture Ministers or rather the Conference of the Administrative Heads of the Ministries, where issues from the fields of rural development and land readjustment are discussed, solutions are worked out and recommendations are made.

The joint stand at INTERGEO 2022 was an important step for both sides in order to be able to continue to support the trade fair operations under changing conditions in the customary professional and user-oriented way.

The primary topics presented by ArgeLandentwicklung at the trade fair stand were aimed in particular at attracting newcomers, specialists and executives to the administration. AdV offered the suitable geodetic ambience with offers around the sales products of the "central offices" and information on the official geospatial reference data. Great interest was also shown in the beta version of the free basemap.de, which was developed jointly by the Federal Government and the Laender as part of the Smart Mapping project to redesign official cartography to replace WebAtlasDE.

Fig. 30: Joint stand of AdV and ArgeLandentwicklung. *Photo: AdV*

In addition, the surveying and geoinformation administration of North Rhine-Westphalia provided information on satellite-based radar remote sensing for the detection of mining-related ground movements (ground movement cadastre) and on the Cop4ALL NRW project for the automated derivation of land cover data from remote sensing data of the Sentinel satellites. Geobasis NRW has developed the remote sensing procedure Cop4ALL NRW to integrate freely available satellite data from the Copernicus programme into the business processes at Geobasis NRW and at the cadastral authorities in North Rhine-Westphalia. Cop4ALL NRW automatically derives a state-wide data pool for the so-called land cover. This data pool can be used to answer questions about environmental monitoring, the sealing of areas or also statistical reporting.

In the end, all participants drew a very positive balance of the cooperation on the joint stand. According to the fair organisers, the 450 exhibitors with around 14,000 trade visitors from numerous countries were able to build on their successes from before the Corona pandemic.

German-wide opinion on the distribution of geospatial reference data

The sales managers' meeting is made up of representatives of the surveying authorities of all Laender and the three sales offices, the so-called "central offices", which operate across the Laender and nationwide on behalf of AdV. Through this committee, a nationwide opinion can be quickly reached on issues such as product design, pricing, terms of use or technical implementation. It is also possible to exchange information quickly on supra-regional customer enquiries.

The meeting of the sales managers of the surveying authorities took place as a virtual event again in 2022. The main focus of the discussions initially concerned the geodata formats, in particular Shape and GeoPackage. The second topic was whether the official 3D building model in the form of "Level of Detail 1" (LoD1-DE), in which all above-ground buildings and structures are represented as simple blocks with flat roofs without taking into account the actual roof shapes, is still necessary. The third and final topic was the implementation of Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information (called the PSI Directive or Open Data Directive) and its transposition into national law through the Federal Data Use Act. In addition, recurring topics, such as the further development of the AdV Fees Directive and the central bodies, were discussed intensively and the licensing issues for open geospatial reference data were addressed. The focus was primarily on the Creative Commons open licence with attribution (CC BY 4.0) recommended by the European Commission for high-quality datasets. For many users, CC BY 4.0 is seen as an alternative to the data licence Germany with Attribution Version 2.0, which is frequently used in Germany. The sales managers also exchanged views on the future VAT liability with regard to legal persons under public law. The background to this is the formulation of the definition of entrepreneur for VAT purposes in conformity with European law, which has resulted in services provided by legal persons under public law being subject to VAT in future accordance with § 2b of the VAT Act, insofar as the provision of the service free of VAT would lead to greater competitive distortions.

All participants praised the lively exchange of information and saw it as a great benefit for modern future-oriented work to have the individual topics presented from different perspectives.

Uniform naming and descriptions of AdV products

The tasks of the project group for needs assessment and analysis (PG BB) include collecting customer requirements for nationwide products with involvement from the sales managers (surveys) and regular communication of the work status to the working group and the sales managers. One of the main pillars of communication with partners and customers are sufficiently detailed product descriptions. In addition to the needs assessment for individual products, the project group handled the product descriptions that the working groups were to create. But do all AdV products meet the criteria for a qualified product description? How can a user research AdV products on the Internet? Are there uniform naming rules and product documentation? In order to clear up these questions, a group headed by the PG BB and involving all working groups was commissioned to formulate guidelines for uniform product naming, to coordinate uniform cataloguing and to create and maintain a common product catalogue of all AdV standard products.

In order to obtain an overall view of the current status, the AdV metadata catalogue was completely reviewed and analysed with regard to the product names. In a further step, the product-related documentation of the individual working groups was examined. This revealed a difference in approach as well as in the form and design between the working groups. The result clearly showed the need for standardisation, especially from the customer's point of view. The analysis, evaluation and recommendation on product naming was accompanied by a bachelor's thesis at the Berlin University of Applied Sciences in 2022, so that the cross-working group can draw on the substantial knowledge gained. In 2023, the work will continue so that uniform product naming and documentation can be established for all working groups.

Flat-rate fees for geospatial reference data

The Licensing/Fee Model Project Group (PG LGM) develops licensing and fee models within the framework of the conditions policy, prepares recommendations for the further development of the AdV Fee Directive and adapts the model licence agreements for the use of geospatial reference data and geospatial reference services to further technical and legal development.

Within the reporting period, the PG LGM performed tasks based on the requirements of the Data Usage Act (DNG) and the announced implementing regulation of the EU Commission from 21 December 2022 concerning the definition of certain high-value data sets and the modalities of their publication and further use (DVO-HVD). For example, the project group discussed the effects of the Data Usage Act on the sales of the Laender and the sales of the central bodies in close cooperation with the working group "Implementation of the PSI Directive in the official cadastral surveying system" and, based on this, drafted a new fee model with a significantly simpli-

fied fee system (so-called “flat-rate fee principle”) and significantly reduced fees. This fee model is the basis for the AdV Fee Directive in version 4.0, which will enter into force on 9 June 2024.

In addition, the project group updated the AdV Fee Directive in version 3.2.9 and, in doing so, included the digital surface model based on image-oriented data, updated the subset specifications for the ATKIS® object type areas, adjusted the maximum fees for the individual products, including for the parcel information (FS-DE), house coordinates (HK-DE) and the Quasigeoid, as well as updating the Model Licence Agreement (MLV), revising the publisher’s note on topographic maps and showing a solution for the use of the geospatial reference data of the Laender by the Statistical Office of the European Union (Eurostat).

Management of the AdV homepage

The web design unit falls under the responsibility of the project group “Product Info, Corporate Design, Internet Portals”. In addition to conceptual design work for a potential homepage redesign, the project group focused on the introduction and operation of a collaboration and documentation platform for AdV for the storage, provision and joint processing of written documents as well as on considerations for the distribution of data and software in a user-friendly and yet data protection-secure environment during this reporting period.

Fig. 31: Team web design office of AdV Baden Württemberg.
From left to right: Christiane Klingelhöller, Silke Plonus, Martin Kessler

Application of the EU Implementing Regulation for high-quality data sets in official cadastral surveying and mapping

The European Commission describes open administrative data on its website[1] as information that has been collected, produced or paid for by public sector bodies and is freely available for general re-use. Public sector data may be used, redistributed and reused by anyone without restriction. The Open Data definition also found its way into the PSI Directive[2], which has been revised since 2019 and forms the foundation for the Open Data strategy at European level.

The PSI Directive obliges EU member states to release public sector documents for further use as a matter of principle. The directive is therefore also called the Open Data Directive. For certain documents, the "High-Value Datasets" (HVD), whose re-use is associated with important benefits for society, the environment and the economy, the PSI Directive defines a list of topic categories in an annex. Currently, six categories are defined: 1. geospatial, 2. earth observation and environment, 3. meteorology, 4. statistics, 5. business and business ownership and 6. mobility. The high-quality datasets must in principle be made available by the public bodies free of charge, in machine-readable formats, via application programming interfaces (API) and, where appropriate, as a bulk download.

The PSI Directive has given the EU Commission the power to broaden the categories in the Annex by means of delegated acts and to define, by means of implementing regulation acts, the high-quality public sector datasets for the thematic categories as well as specifications for publication and further use (e.g. data formats, licences). The Europe-wide list is intended to lay the foundation for exploiting the socio-economic potential of the data sets in conjunction with harmonised conditions, also in cross-border data applications and services. Innovative start-ups and small and medium-sized enterprises are among those targeted.

In Germany, the PSI Directive has been incorporated into national law with the 2021 Act on the Use of Public Sector Data[3] (Data Use Act – DNG). This affects all public sector bodies at the federal, Laender and local levels. In doing so, the federal government invokes Article 72 paragraph 2 of the Basic Law and thus the preservation of economic unity in the interest of the state as a whole[4]. During the legislative process, not all Laender followed the federal government's line of argument. However, constitutional concerns currently existing with regard to the federal government's competence to make regulations on the freedom of the Laender to charge for geospatial reference data have no effect on the validity of the DNG in practice. According to Section 10 paragraph 5 DNG, the free use of HVD applies no later than twelve months after 23 July 2021. However, in mid-2022, the EU Commission only evaluated the comments on the draft implementing regulation, which is why the cutting of the deadline in half by the federal government compared to the maximum possible two years according to the PSI Directive would ultimately not result in a provision obligation.

[1] https://data.europa.eu/de/trening/what-open-data, retrieved on 14. April 2023
[2] Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on Open Data and the re-use of public sector information (recast)
[3] Data Use Act of 16 July 2021 (BGBl. I pp. 2941, 2942; 4114)
[4] German Bundestag, Document 19/27442, Draft Act on the Amendment of the E-Government Act and the Introduction of the Public Sector Data Use Act.

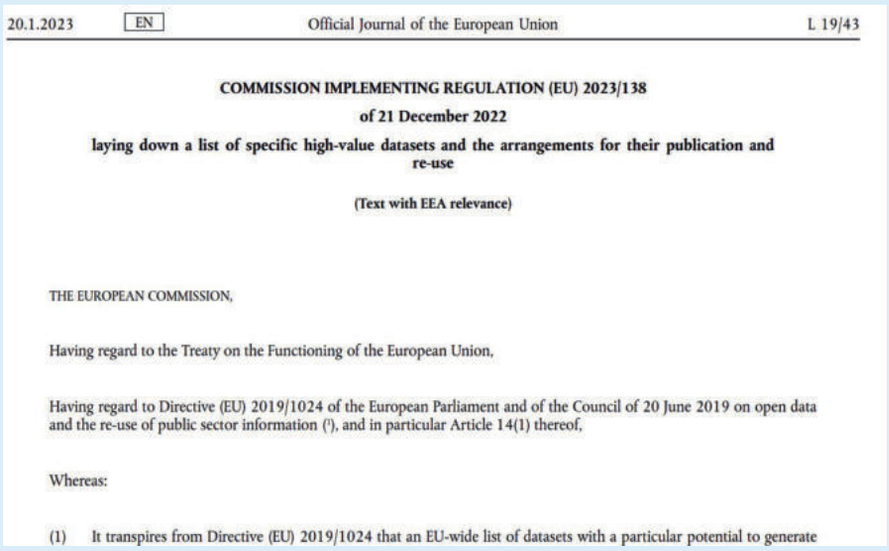
The European Commission adopted the Implementing Regulation on the definition of certain high-quality data sets and the modalities of their publication and re-use on 21 December 2022 (DVO-HVD) and published the list of HVDs in the Official Journal of the European Union on 20 January 2023. The DVO-HVD will enter into force 16 months after its publication. In purely arithmetical terms, the HVDs are therefore to be made available for free use from 9 June 2024.

The geospatial reference data offered by the surveying authorities of the Laender largely fall into three topical categories: geospatial reference data, earth observation and environment, and mobility.

The topical category "geospatial" includes all datasets that fall under the INSPIRE data themes administrative units, geographical names, addresses, buildings and cadastral parcels according to Annex I and Annex III of the INSPIRE Directive[5].

While the annex to the draft DVO-HVD still contained the specification "All generalisation levels available up to the level of scale 1:5,000" for "Cadastral Parcels" for this category in the line "Granularity", the data of the real estate cadastre in the DVO-HVD that has entered into force can no longer be excluded à priori from its HVD definition due to scale reasons. In the German translation of the Official Journal, it is still stated for the parcels that "all available generalisation levels with a granularity up to the scale of 1:5000" are affected. In the description of the data sets, however, it is further clarified: "If data sets are not available at the scale indicated in the following table, but are nevertheless available at one higher spatial resolution at the least, they shall be provided at the available spatial resolution." Thus the data set parcel in the resolution defined in the real estate cadastre falls under the HVD, unless the protection of personal data conflicts with this. In addition to the cadastral parcel information, the following are also fundamentally affected by the AdV standard products offered across the Laender: Administrative units, geographical designations, digital landscape model, basemap.de, house coordinates, unless third-party data are included, house perimeters and building models.

[5] Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)



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COMMISSION IMPLEMENTING REGULATION (EU) 2023/138

of 21 December 2022

laying down a list of specific high-value datasets and the arrangements for their publication and re-use

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information (1), and in particular Article 14(1) thereof,

Whereas:

(1) It transpires from Directive (EU) 2019/1024 that an EU-wide list of datasets with a particular potential to generate

Fig. 32: DVO-HVD of 21 December 2022.

Fig. 33: HVD parcel information from the real estate cadastre, Mercedes-Benz Arena. Geospatial reference data © LGL, www.lgl-bw.de

Fig. 34: Orthophoto as HVD with a ground resolution of 20 cm, Mercedes-Benz Arena. Geospatial reference data © LGL, www.lgl-bw.de

Fig. 35: Orthophoto, possibly not to be classified as HVD for data protection reasons due to a ground resolution of 10 cm, Mercedes-Benz Arena. Geospatial reference data © LGL, www.lgl-bw.de

The topical category Earth Observation and Environment includes Earth observation data, including space and remote sensing data, ground or “in situ” data, environmental and climate datasets specified in Annexes I–III of the INSPIRE Directive, as well as datasets created or generated in the context of legal acts on the environment in the fields of air, climate and emissions. Interestingly, these include both the most recent datasets and their historical versions, provided that they are available in a machine-readable format at all levels of generalisation up to a scale of 1:5,000 and together cover the entire area of Germany. In this category, too, the datasets are to be provided in the available higher spatial resolution, unless they can be offered in a generalisation degree smaller than or equal to 1:5,000.

Of the AdV standard products, the following are affected in this category: Water Bodies, Water Body Network, Digital Landscape Model, basemap.de, Digital Terrain Model, Digital Surface Model, Land Cover, Digital Orthophotos, Digital Topographic Maps, Information on soils from the real estate cadastre.

The topical category Mobility includes datasets that fall under the topic of transport networks according to Annex I of the INSPIRE Directive and that are available in all degrees of generalisation up to the scale of 1:5,000 and cover the entire area of Germany. Here, too, the higher resolution is to be provided if necessary.

The following AdV standard products are fundamentally affected by the mobility category: Transport Networks, Digital Landscape Model, basemap.de, Digital Topographic Maps.

As a result, it can be stated that the DNG affects most AdV standard products. As soon as the concrete products, or their characteristics, are defined and are affected by the definition as HVD, or those products that are not affected by the DNG, further measures will be arranged in the Laender. In particular, this includes the preparation of the technical arrangements in order to:

- be able to make the HVD available in machine-readable formats via application programming interfaces and, if necessary, also as bulk downloads,
- define the associated terms of use and quality of service criteria in terms of performance, capacity and availability; and
- to publish the services and their documentation.

Furthermore, the Laender shall designate a contact point for questions and problems related to the application programming interface. The products classified as high-quality datasets are subsequently tagged in the metadata descriptions of the Laender.

Only the concretisation of the high-quality data sets in the DVO-HVD has made the regulations in the DNG applicable to the public bodies. Until the DVO-HVD is valid, it is up to the regional authorities, i.e. the Laender and the municipalities concerned, to implement the regulations in the DNG and in particular the technical specifications according to the DVO-HVD in concrete measures.

7. Involvement in National and Internationalen Organisations

EuroGeographics

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

AdV is an associated member and the Federal Agency for Cartography and Geodesy (BKG) a regular member of EuroGeographics. Both are actively involved in the work on products, in expert groups and in projects. Furthermore, the president of the BKG is a permanent member of the Management Board. Currently this role is being filled by the head of staff of the office for international affairs of BKG.

EBM, ERM, EGM, EuroDEM, Open Regional Gazetteer and Open Cadastral Maps

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

- **EuroBoundaryMap (EBM)** – data set in the scale 1:100,000 that contains all the administrative units of all national administrative levels in Europe, with names, unique code numbers and a reference to the statistical classifications NUTS/LAU of Eurostat (Statistical Office of the European Union).

- **EuroRegionalMap (ERM)** – the topographic reference data set in the scale 1:250,000. Production management is carried out by the BKG with the support of the regional coordinators.
- **EuroGlobalMap (EGM)** – the topographic reference data set in the scale 1:1,000,000 is automatically being derived from ERM. Production management is carried out by the "Institut national de l'information géographique et forestière (IGN)" France.
- **European Digital Elevation Model (EuroDEM)** – a digital terrain model computed by the BKG in 2008 from the national data sets with a position resolution of 2 arcseconds (approx. 60 m) and a height accuracy of 8 – 10 m.
- **Open Gazetteer** – an open European naming service containing geographical names of the EBM and ERM products. The name database is enriched with exonyms (geographical names in other languages) by a name expert is made available by the BKG.
- **Open Cadastral Map** (prototype, currently six Laender) – European cadastral map with information on administrative units, cadastral parcels (and cadastral zones), buildings (and parts of buildings) and addresses.

EBM, ERM, EGM and "Open Gazetteer" are published once a year. The "Open Cadastral Map" is updated every six months.

Product production management includes the organisation of the entire manufacturing process as well as its strategic planning and technical implementation. Another key task for the product managers is the communication with the data producers and regional coordinators. In cooperation with them, the manufacturing process is continuously reviewed and optimised if needed.

Knowledge Exchange Networks

The Knowledge Exchange Networks (KENs) provide platforms for an exchange of experiences on various topics between experts from the EuroGeographics members. One example is the QKEN, in which members deal with data quality and quality management issues as well as follow international standards in this area.

The BKG is represented and actively participates in most KENs. AdV – represented by the Secretary General – and the BKG are members of PolicyKEN, in which European strategies, directives and regulations are evaluated and position papers addressed to the European Commission or the European Parliament are prepared.

The youngest member of the KEN family is the Technical Data KEN (TDKEN). Here, application examples are collected on the topics of generalisation, boundary adjustment, harmonisation and data quality, among others.

Fig. 36: Members of EBM (EuroBoundaryMap).

Fig. 37: ERM members (EuroRegionalMap).

The Open Maps for Europe 2.0 (OME2) project

The aim of the project “Open Maps for Europe 2.0” is to build a productive system for large-scale (1:10,000 and larger) topographic data of the members of EuroGeographics and to make it available under a free licence. In a first step, the administrative units, the road and water network for 10 European countries will be prepared and made available. OME2 is intended to demonstrate that the user requirements of the European Commission (large scale, key topics, incremental updating, harmonised and border-adapted official data from all over Europe) can be met by the national surveying and cadastral authorities. OME2 will also contribute to the knowledge exchange between EuroGeographics members and implement the experience from the Technical Data Knowledge Exchange Network (TDKEN).

A central role is played by the platform developed in the previous project “Open Maps for Europe”, on which the following data are made available in a user-friendly way (viewing and downloading, www.mapsforeurope.org): topographic maps (ERM, EGM), the European name service “Open Gazetteer”, the digital elevation model EuroDEM, the cadastral map “Open Cadastral Map” and the European mosaic “Pan-European Imagery” produced by the BKG from satellite image data.

EuroGeographics is coordinating the OME2 project, which is divided into six work packages, with the support of a consortium of five surveying and cadastral authorities in Europe (France, Belgium, the Netherlands, Spain, Greece). The BKG will be responsible for the production management of several products as a subcontractor. The technical implementation of the platform will be carried out by the French company IDOX.

The project will run from 1 January 2023 to 31 December 2025 and is co-financed by the European Union’s “Digital Europe” funding programme.

OME2 will promote the re-use of open public data in the European Union and contribute to the development of information products and services through the use of high-quality datasets from EuroGeographics members.

UN-GGIM: Europe – Establishing efficient geodata management

The United Nations Global Geospatial Information Management (UN-GGIM) initiative of the United Nations (UN) has existed since 2011 and has set out to coordinate global geospatial information management. Important topics at UN-GGIM are the integration of statistical and geographic information, especially with regard to their significance for the 17 UN Sustainable Development Goals (SDGs).

At the European political level, UN-GGIM: Europe, a regional body that deals with geodesy and geoinformation issues across the board, has been in existence since September 2014.

The Working Group on Data Integration (Working group "Data Integration") is headed by the Federal Statistical Office (BKG). The agreed upon close cooperation between the BKG and the Federal Statistical Office (Destatis) is very gratifying.

In the last working period (2019–2022), the working group dealt with the analysis of individual SDG indicators, particularly from the environmental sector, and developed technical guidelines for calculating the indicators. Furthermore, various methods for data integration of geospatial and statistical data were analysed and the current challenges to data integration in the context of the new European data strategy or the European "Green Deal" were highlighted.

In June 2022, during the plenary session of UN-GGIM: Europe, the new work agenda for 2022–2025 was adopted, which includes five new lines of work (LoW) under the three pillars of "Sharing Knowledge", "Raising Awareness" and "Strategic Leadership":

- Data Integration (DI);
- Integrated Geospatial Information Framework (IGIF);
- Geodetic Reference Frame (GRF);
- Sustainable Development Goals (SDG);
- Data Strategy and Policy (DS&P).

In future, the former working group "Data Integration" will be continuing in the two LoWs "Data Integration" and "Sustainable Development Goals". The BKG has once again taken over the leadership for this and is working closely with colleagues from Europe. As a first task in the new working period, the working group is organising a series of webinars with the aim of improving the sharing of results and insights – within and outside UN-GGIM: Europe – in the field of data integration and SDG calculation (https://un-ggim-europe.org/events/).

The first webinar on “Data integration in Europe – challenges, findings, added value and cost saving” took place in mid-March 2023 and was organised by the EU Commission. The first webinar from the LoW SDG followed at the end of April with “Showcasing the added value of geospatial and statistical data integration to compute SDG indicators”.

Further information on the UN-GGIM: Europe Working Group “Data Integration” and the already published reports are available at: https://un-ggim-europe.org/working-groups/working-group-data-integration/

Copernicus

The European Earth observation programme Copernicus has developed rapidly since the launch of the first Sentinel satellite in 2014. At the end of 2020, the eighth Sentinel satellite was launched (21 November 2020, satellite Sentinel-6). The volume of satellite data products generated each day now reaches 32.2 Petabyte, and about 496,000 users are registered for data access with ESA, around 26,000 of them in Germany – more than in any other country in Europe[6]. The six Copernicus services are now well established and recognised as a reliable source of information. For example, the products of the Copernicus Climate Service are regularly picked up by the press and television and sometimes complement the weather report. The same applies to products of the atmospheric monitoring service, which are used for statements on air quality. Regular reports such as the Copernicus Climate Service’s “European State of the Climate” report (2021) or the Ocean State Report of the Marine Environment Monitoring Service (issue 6/2022) not only achieve wide dissemination, but also find their way into the conception of climate change adaptation measures, for example. Geoinformation based on satellite earth observation is increasingly establishing itself as a regular source of information for planning decisions.

In September 2017, the German government adopted a national Copernicus strategy. Through structured, targeted action, the benefits of the major European investment are to be maximised in Germany as well. National policy can and should also benefit from Copernicus in its implementation. To this end, the German government, under the leadership of the Federal Ministry for Digital and Transport (BMDV), has stepped up its efforts to effectively incorporate the needs of institutions in Germany into the development of European services. At the same time, capacities have been and are being created in selected institutions in Germany with targeted funding measures so that the potential of the EU Copernicus programme can be optimally exploited. To further strengthen the performance of Copernicus and increase its ability to contribute to key policy areas, six additional satellite missions will complement the six existing Sentinel missions starting in 2025.

[6] *https://scihub.copernicus.eu/twiki/pub/SciHubWebPortal/AnnualReport2021/COPE-SERCO-RP-22-1312_-_Sentinel_Data_Access_Annual_Report_Y2021_merged_v1.0.pdf (all links provided in this section were retrieved on 20 April 2023).*

In order to be able to make optimal use of the new satellites and the resulting thematic fields and, above all, to further support authorities in the implementation of Copernicus data, BMDV has extended the National Copernicus Integration Measure, which was already initiated in 2012, beyond the year 2020 until the end of 2024. Since support from the authorities will also be necessary after 2024 in order to sustainably anchor Copernicus in the official landscape, it is currently being discussed how the integrative measure can be continued in the long term.

In order to do justice to the growing thematic diversity of Copernicus applications, further specific specialist networks have been established. Four field topics have been identified here. The network offices Forest, Transport, Municipal and Soil could be implemented in the meantime. The Transport Network Office, for example, was approved as of 1 April 2022 and will be managed by the Federal Highway Research Institute (BASt). There have already been several consulting sessions on the application of Copernicus in the topic area of transport, including in the BASt departments “Bridge and Civil Engineering” and “Road Construction Technology”, as well as a presentation of the network office at the Autobahn GmbH of the Federal Government. Information material was prepared for these consulting sessions in the form of a project list and a satellite overview with example applications. In March 2023, the first workshop was held with interested parties in attendance. In addition, the series of events “LunchEOn Verkehr” takes place at regular intervals – a virtual meeting at lunchtime to exchange information on the use of satellite data in road and rail transport. All network offices received or will receive their own area on https://d-copernicus.de, where all important information, contacts and topics can be found.

As a new element of the continuation of the integrative measure, the promotion of so-called “lighthouse projects” (large networks) has been implemented. Two environmental lighthouses (a total of 10 individual projects) and two municipal lighthouses (7 individual projects) were set up. The environmental lighthouse of the collaborative project BIGFE deals with topics related to the recording of water quality and water surface area of inland waters via remote sensing. CopGruen has already been launched in 2021 with the aim of integrating and transferring Copernicus activities into practice for comprehensive official monitoring of grassland. Both projects have conducted user surveys to concretise the needs and carried out an elaborate data harmonisation of the corresponding in situ data. The municipal lighthouses with the two collaborative projects CoKLIMAx and UrbanGreenEye on the topic of climate adaptation strategies for urban areas have also started their work. In order to sharpen the synergies of the two projects, a joint use case is being developed. UrbanGreenEye is strongly involved in the product development for the four main topics (thermal stress and relief, hydrological relief and deficit analysis), whereas CoKLIMAx will contribute in the area of the adapted system structure for municipal users (connection to ESRI and provision via CODE-DE) as well as with the platform of the tools as well as the visualisation.

The Space Agency at DLR also supports smaller pilot applications with funding from the BMDV. For example, the SENSchiene project: Satellite-supported recording of surface characteristics and changes in usage in the field of rail transport. Within the framework of the SENSchiene project, two specific regulatory tasks of the Federal Railway Authority are to be supported by means of remote sensing: Firstly, the enforcement control and monitoring of miti-

gation and restoration measures under nature conservation law, which railway infrastructure companies have to implement as part of the impact regulation in the plan approval process, and secondly, the assessment in connection with the application. As a result of the SENSchiene project, a web-based demonstrator for the automated retrieval of satellite-based information on land characteristics and probability of use for rail transport will be developed.

Since 2017, the DLR Space Agency has been providing access to Copernicus data, products and services optimised for the needs of government users in Germany on behalf of the Federal Ministry for Digital and Transport through the CODE-DE platform (https://code-de.org). The importance of CODE-DE in official use was highlighted, among other things, in the study “Evaluation of user penetration and impact of the Copernicus programme in Germany”[7]. The operational period of CODE-DE was initially extended until the end of September 2024. Currently, deliberations are being made as to how the provision of the platform can be secured in the long term. By providing a hybrid cloud infrastructure, the transfer of large amounts of data can be avoided, as work can be done directly in the cloud – where the data is available. More than 50 different governmental institutions use CODE-DE to develop and implement applications via Virtual Machine (VM) access. In the development of such offerings, authorities are receiving targeted support from the German Space Agency at DLR. In addition to a complete archive of Sentinel data over Germany, the platform's data offering also includes digital terrain models and access to selected other satellite data and derived products and the Copernicus services. The products on CODE-DE are freely usable. Parts of the offer are only accessible to certain user groups, such as government users, according to the individual data license conditions. In the user-generated contributions section, data and results of projects were presented via web services, just as the TimeStamp service for the precise area check of greening catch crops within the framework of agricultural subsidies and the area monitoring of the EU’s Common Agricultural Policy (GAP) could now be made permanent via CODE-DE[8]. Furthermore, the LaVerDi service provides landscape change information on the basis of the Sentinel 2 data for one year at a time. For simplified data access, two different data cube architectures were implemented for CODE-DE use[9].

Fig. 38: Homepage of the CODE-DE website.

[7] *https://www.erdbeobachtung.info/fileadmin/Content/News/230307_PD-Perspektiven_Copernicus-Evaluation.pdf*
[8] *https://code-de.org/de/portfolio/?q=community-contribution*
[9] *https://code-de.org/de/portfolio/?q=DataCubes*

Via a CODE-DE contingent for the use of virtual machines, the following surveying offices and authorities are or were already active users of CODE-DE:

- State Office for Surveying and Geoinformation Schleswig-Holstein,
- State Office for Geoinformation and Surveying of Lower Saxony,
- Saxony-Anhalt State Office for Surveying and Geoinformation,
- State Office Geoinformation and Surveying Hamburg,
- Federal Office for Cartography and Geodesy.

Current trends at OGC and ISO/TC211

The new OGC API family of standards is currently being developed at a high pace in order to enable data providers in the future to make geodata available on the web to a wide range of users in a simple way.

The central technical core is the various programme interfaces (API). For this purpose, the standardisation bodies (especially OGC and ISO/TC211) are developing a series of user-tested specifications that are intended to further develop or even replace the existing web services. While these standards build on the previous OGC web service standards (WMS, WFS, WCS, WPS, etc.), they define resource-oriented APIs that use modern web technologies. In the meantime, it has been clearly communicated that this is not about defining new versions of the existing OGC web services, as initially assumed, but about defining modular building blocks for use in modern web APIs. The previous separation of services according to resources is largely omitted. This is intentional and reflects a technological change in how geodata are to be provided via open standards in the future.

This realignment of web standards has a significant impact on the way official geospatial data can and should be made available in the future. Some laws (e.g. the EU's Open Data Directive) even require open application interfaces (Open API). Although the previous OGC services can also be regarded as APIs, it can be assumed that the legislator wanted to demand the new application interfaces, which are easier to use, rather than the retention of the previous technology, which represents a niche in general web technology and, moreover, will probably no longer be maintained by OGC itself in the future.

Some surveying authorities of the German Laender already provide APIs in isolated cases, in particular the OGC API Features, which as successor to the Web Feature Services (WFS) can transport structured objects. Smart Mapping also relies on the OGC VectorTiles API, which was adopted at the end of 2022.

The Information and Communication Technology Working Group (AK IK) has commissioned the GDI Standards Project Group to work on corresponding AdV profiles, even though some of the specifications at OGC have not yet been finally adopted.

From the large number of forthcoming specifications, the following APIs have been identified as relevant to AdV:

- Tiles: already used in Smart Mapping; about to be adopted. The API Tiles is also suitable for the delivery of raster tiles (formerly WMTS).
- Features: is already offered in some Laender. The standard consists of several parts, in addition to the general part, the parts for the description of the CRS as well as filtering are required.
- Processes: is needed, e.g. for functions within the AdV test suite.
- Records: successor to the catalogue interface (CSW). Can be used e.g. for the AdV code list registry. In addition, in this context there is an interface to Spatial Temporal Asset Catalogue (STAC), via which information on remote sensing data can be easily provided.
- Coverages: still to be checked whether relevant for the AdV or whether there are alternative deployments (e.g. Cloud Optimised GeoTiff).
- Styles: probably relevant for the provision of presentation rules (e.g. in Smart Mapping).
- 3D Volumes: for alternative delivery of LOD2 and CityGML data, in future also for 3D terrain.

The question of the type of provision goes hand in hand with the question of what data the user needs (similar to the question of what should be provided via GeoPackage). From today's perspective, the very complex NAS data is not suitable for this. The AK IK addresses this question by examining the extent to which simple data models can be derived and how a user-friendly geodata offer can be provided via the new APIs.

Permanent Committee on Cadastre in the European Union

On 1 January 2022 France assumed the EU Council Presidency and thus also the Presidency of the Permanent Committee on Cadastre in the European Union (PCC) for the first half of 2022. As the highlight of the Presidency, the PCC Conference and General Assembly took place in a hybrid format on 31 May and 1 June 2022. While most of the presenters spoke on-site in Paris, additional participants were able to connect virtually. The focus of the conference was on the topic "Valorisation of Digital Cadastral Data – Towards a More Sovereign, Effective, and Ecological European Model". The focus was thus on contributions of cadastral administrations to the realisation of political priorities of the EU, such as digital transformation and sovereignty or the economic and social transformation towards climate neutrality (so-called "Green Deal").

As of 1 July 2022, France handed over the PCC presidency to the Czech Republic. The theme of the Czech PCC Presidency was "Cadastral Information in Support of Infrastructure Development". The conference, held in Prague as a hybrid on 22 and 23 November 2022, shed light on potential contributions of the cadastre in addressing current challenges posed by the pandemic as well as the Ukraine war that broke out in February. The main focus was on the protection of so-called critical infrastructure, in particular utilities and their pipelines (e.g. water, electricity, heat, telecommunications), cyber security as well as contributions of the cadastre to environmental and climate protection

On 1 January 2023, Sweden followed in the Presidency of the Council of the EU and thus in the Presidency of the PCC for the first half of 2023. The conference in Gävle from 7 to 9 June 2023 was also hybrid. With the motto "Security and Prosperity – The Cadastral Authorities Role and Contribution", it picked up on the motto of the Czech Presidency.

In the second half of 2023, Spain chairs the PCC. The topic of their presidency had not yet been decided when this activity report went to press.

Further information can be found at www.eurocadastre.org.

Explanation of frequently used abbreviations

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

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